EnergyCo

Waratah Super Battery – Munmorah

Appendix D - Biodiversity Development Assessment Report

November 2022

www.energyco.nsw.gov.au

EnergyCo

Waratah Super Battery – Munmorah

Appendix D - Biodiversity Development Assessment Report

November 2022

www.energyco.nsw.gov.au

NSW GOVERNMENT

Project name		Waratah Super Battery - Munmorah					
Document title		Waratah Super Battery | Biodiversity Development Assessment Report					
Project number		12582669					
File name		12582669-REP_App D_Waratah Super Battery BDAR.docx					
Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S0	0	Andrew Smith Patrick Costello	Kirsten Crosby		D.Chubb		04/11/2022

GHD Pty Ltd ABN 39 008 488 373

Level 15 133 Castlereagh Street

Sydney, NSW 2000, Australia

T +61 2 9239 7100 | **F** +61 2 9239 7199 | **E** sydmail@ghd.com | **ghd.com**

Executive Summary

GHD Pty Ltd (GHD) has been engaged by NSW Department of Planning and Environment (DPE) to prepare a Biodiversity Development Assessment Report (BDAR) for impacts resulting from the development of proposed infrastructure for the Waratah Super Battery – Munmorah ('the proposed development' or 'the proposal'). The Waratah Super Battery - Munmorah is located within Lot 10 DP 1201414 at Waratah, NSW ('the project'). The project is proposed to be undertaken in the Central Coast Council (CCC) Local Government Area (LGA).

This Project would include the following components:

– a SIPS system, designed to reserve and deploy battery power to support the NSW electricity grid when required due to a contingency event
– a (up to) 850 MW / 1680MWh battery energy storage system
– connecting transmission and related infrastructure to connect the battery (or batteries) to the existing grid
– other infrastructure and services required for the project.

The battery component of the project is part of the SIPS and is designed to provide reserve transmission capacity and stability, rather than additional electricity storage capacity. In this regard, the Waratah Super Battery will allow consumers to access more energy from existing electricity generators while maintaining network security.

The development requires consent under the *Environmental Planning and Assessment Act 1979* (EP&A Act) whereby the Environmental Impact Statement (EIS) for the development must comply with the requirements in Part 8, Division 2 of the *Environmental Planning and Assessment Regulation* 2021. The EIS is required to address Biodiversity and Biodiversity impacts of the project in accordance with Section 7.9 of the *Biodiversity Conservation Act 2016* (NSW) (BC Act), the Biodiversity Assessment Method (BAM) 2020 and documented in a Biodiversity Development Assessment Report (BDAR).

The project location was chosen to minimise direct and indirect impacts on native vegetation, TECs, threatened species and their habitat as well as prescribed impacts listed in Table 6.1 by siting the development within the previously disturbed Munmorah Power Facility. Detailed environmental investigations were conducted for the project including an assessment of a broader subject area to identify key constraints during the feasibility and design phases. Investigations identified that the nature of the site and its existing barriers to fauna movement presented an opportunity to redevelop an already degraded area. Due to the development suitability of the site, alternative project locations were not investigated.

The project would result in residual direct impacts to a total of 0.10 hectares (ha) of native vegetation in moderate condition. The direct impacts to include 0.16 ha of PCT 1636 and 0.10 ha to PCT 1724 (the latter of which is commensurate with Swamp Sclerophyll Forest on Coastal Floodplains threatened ecological community) (Table E.1). Outside of these mapped areas, the majority of the subject land is already cleared and denuded. The areas of native vegetation are fragmented providing minimal fauna habitat and connectivity in the context of the surrounding landscape. Vegetation clearing outside of the mapped PCT 1636 and 1724 consists of the removal non-native plants including priority and high threat weed species. The removal of 0.10 ha of native vegetation is insignificant at the regional scale and is unlikely to threaten the persistence of populations of native plants and vegetation communities.

The vegetation that would be removed provides habitat resources for native fauna species, including threatened species. The proposal would result in direct impacts on habitat for the 18 threatened flora and fauna species that were recorded or assumed present within the subject land and assumed to use resources in the subject land (Table E.2). The proposal would remove up to 0.26 ha of habitat resources for these species. This includes one specimen of Charmhaven Apple (*Angophora inopina*), or 0.16 ha of habitat.

The clearing of 0.26 ha of native woodland and forest would include the removal of a relatively young forest with no large canopy trees harbouring hollows appropriate for fauna. The habitat is also fragmented and exists within a completely fenced site with limited fauna permeability. The removal constitutes a small proportion of available flora and fauna resources. Plot and transect data collected at the site corroborates this interpretation as no hollow bearing trees exist.

Potential indirect impacts are considered limited as they would have a low likelihood and consequence due to a range a mitigation measures that would be implemented. Further, no prescribed impacts are considered of high relevance to the proposal.

Corunastylis sp. Charmhaven (NSW896673) is listed as Critically Endangered under the BC Act and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Whilst this species was not recorded within the subject land, surveys where not undertaken during the correct time period and the species has been presumed to be present. However, the proposed impact to its potential habitat is considered small in extent (0.16 ha) and is also limited by the degraded nature of this habitat.

A range of proposed mitigation and management measures have been proposed for residual impacts. These include measures that would be undertaken during the construction and operation of the proposed development.

Table E.1 Impacts that require an offset – ecosystem credits

Vegetation zone	PCT	TEC/EC	Impact area (ha)	Number of ecosystem credits required
Zone 1	1636-Scribbly Gum - Red Bloodwood - *Angophora inopina* heathy woodland on lowlands of the Central Coast	-	0.16 ha	4
Zone 2	1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions – Endangered under the BC Act	0.10 ha	3

Table E.2 Impacts that require an offset – ecosystem credits

Common name	Scientific name	Loss of habitat (ha) or individuals	Number of species credits required
Charmhaven Apple	*Angophora inopina*	0.16 ha	4
Trailing Woodruff	*Asperula asthenes*	0.26 ha	7
Netted Bottle Brush	*Callistemon linearifolius*	5 estimated individuals	8
Eastern Pygmy-possum	*Cercartetus nanus*	0.16 ha	4
Large-eared Pied Bat	*Chalinolobus dwyeri*	0.26 ha	11
-	*Corunastylis* sp. Charmhaven NSW896673)	0.16 ha	7
Wallum Froglet	*Crinia tinnula*	0.26 ha	5
Leafless Tongue Orchid	*Cryptostylis hunteriana*	0.16 ha	3
Giant Burrowing Frog	*Heleioporus australiacus*	0.16 ha	3
Pale-headed Snake	*Hoplocephalus bitorquatus*	0.26 ha	7
Green and Golden Bell Frog	*Litoria aurea*	0.26 ha	7
Green-thighed Frog	*Litoria brevipalmata*	0.26 ha	5
-	*Maundia triglochinoides*	0.10 ha	3
Tall Knotweed	*Persicaria elatior*	0.10 ha	3
Squirrel Glider	*Petaurus norfolcensis*	0.26 ha	7
Brush-tailed Phascogale	*Phascogale tapoatafa*	0.26 ha	7
Common Planigale	*Planigale maculata*	0.26 ha	7
Mahony's Toadlet	*Uperoleia mahonyi*	0.26 ha	7

Glossary of terms and acronyms

Term	Definition
AEMO	Australian Energy Market Operator
APZ	Asset Protection Zone
AOBV	Areas of Outstanding Biodiversity Value
Assessment area	The area of land in the 1500 metre buffer zone surrounding the subject land.
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Calculator
BC Act	*Biodiversity Conservation Act 2016* (NSW)
Bio Act	*Biosecurity Act 2015* (NSW)
BC Regulation	Biodiversity Conservation Regulation 2017 (NSW)
BDAR	Biodiversity Development Assessment Report
BOAMS	Biodiversity Offsets and Agreement Management System
BOS	Biodiversity Offsets Scheme
Cwlth	Commonwealth
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
GPM	Generator Property Management Pty Ltd
HBT	Hollow-bearing tree
HTE	High threat exotic
IBRA	Interim Biogeographic Regionalisation for Australia
Project site	The area shown as Project site in Figure 1.1, Figure 1.2 and other figures throughout this report
MNES	Matters of national environmental significance
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NSW	New South Wales
PCT	Plant community type
SAII	Serious and irreversible impact
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
Subject land	The area shown as Subject land in Figure 1.1, Figure 1.2 and other figures throughout this report as the development footprint.
TBDC	Threatened Biodiversity Data Collection
TEC	Threatened ecological community
WoNS	Weeds of National Significance

Declarations

Certification under Section 6.15 of the *Biodiversity Conservation Act 2016*

I, Andrew Smith (BAAS19007) certify that this Biodiversity Development Assessment Report and the accompanying finalised credit report dated 4 November 2022 has been prepared in accordance with the requirements of (and information provided under) the Biodiversity Assessment Method.

This BDAR has been prepared to meet the requirements of BAM 2020. Appendix A provides an assessment of compliance with the minimum information requirements outlined in BAM.

Andrew Smith (BAAS19007)
04/11/2022

Details and experience of authors and contributors

Table 1. Authors and contributors

Name	BAM Assessor Accreditation no. (if relevant)	Position/Role	Tasks performed	Relevant qualifications
Andrew Smith	BAAS19007	Senior Ecologist	Report preparation, BAM-C data entry and analysis, BAM plot surveys targeted threatened flora surveys, targeted threatened fauna surveys.	B.Sc. (Envio. Bio.), Ph.D.
Kirsten Crosby	BAAS17011	Technical specialist - Biodiversity	Document review.	B.Sc., PhD
Patrick Costello	-	Ecologist	Report preparation, BAM plot surveys, targeted threatened flora surveys, targeted threatened fauna surveys.	B.Env.Man.
James Baldry	-	Ecologist (Botanist)	BAM plot surveys, targeted threatened flora surveys, targeted threatened fauna surveys.	M.Cons.Bio.
Molly Fredle	-	Spatial Analyst	Figure preparation.	B.Sc., M.Sc.

Contents

Table index

Figure index

Appendices

Stage 1: Biodiversity assessment

1. Introduction

1.1 Proposed development

The NSW Department of Planning and Environment (DPE) is proposing to develop the Waratah Super Battery – Munmorah ('the proposed development' or 'the proposal'). The Waratah Super Battery - Munmorah is located within Lot 10 DP 1201414 at Waratah, NSW ('the project'). The project is proposed to be undertaken in the Central Coast Council (CCC) Local Government Area (LGA). The project site under assessment is identified in the site map on Figure 1.1.

1.1.1 Development overview

The NSW Government has developed a comprehensive plan to ensure NSW continues to have reliable and affordable electricity. For many decades, energy generation in NSW has been powered by a fleet of large coal-fired power stations and has provided reliable and abundant energy distributed across NSW. Four of the States' five existing coal fired power stations are expected to close within the next fifteen years, starting with the Liddell Power Station in 2022–2023. These power stations currently provide around three quarters of NSW's electricity supply and two thirds of the capacity required to meet peak energy demand.

The NSW Electricity Infrastructure Roadmap (see Section 2.2), enabled under the *Electricity Infrastructure Investment Act 2020*, is the NSW Government's plan to transform the State's electricity system into one that is reliable, affordable and clean. The Act establishes an Energy Security Target to ensure sufficient capacity is available on a conservative basis to meet the State's energy needs at all times.

The first Energy Security Target Monitor (ESTM) Report was released in December 2021 and identified a possible deficit of the target in 2028–2029. In the report, the Australian Energy Market Operator (AEMO) identified that new transmission developments that increase transfer limits into the Sydney-Newcastle-Wollongong area would help alleviate major transmission constraints and avoid any target deficit in the next decade.

In February 2022, Origin Energy announced the planned closure of the Eraring Power Station in August 2025, some 7 years earlier than originally planned. Eraring is Australia's largest coal-fired power station with a capacity of 2.8 GW. In light of this announcement, the projected deficit of the Energy Security Target in 2028–2029 has been brought forward to 2025–2026.

In response to this, the NSW Government has developed a comprehensive plan to ensure NSW continues to have reliable and affordable electricity following the closure of the Eraring Power Station. The plan includes a range of measures developed to accelerate the implementation of the NSW Electricity Infrastructure Roadmap. This includes the 'Sydney Ring Project', designed to reinforce the electricity supply to Sydney, Newcastle and Wollongong. The Sydney Ring Project, which includes the Waratah Super Battery, will increase transfer capacity into the Sydney, Newcastle and Wollongong area by approximately 5 GW.

AEMO has indicated that the planned additional transmission capacity provided by the Sydney Ring Project will give the State access to enough electricity generation to meet the Energy Security Target at the time of the planned closure of the Eraring Power Station in 2025.

To ensure NSW continues to have a reliable energy supply following the planned closure of the Eraring Power Station in 2025, the NSW Government is procuring a System Integrity Protection Scheme (SIPS) control and standby network battery system, dedicated to supporting the transmission grid.

This Project would include the following components:

– a SIPS system, designed to reserve and deploy battery power to support the NSW electricity grid when required due to a contingency event
– a (up to) 850 MW / 1680MWh battery energy storage system
– connecting transmission and related infrastructure to connect the battery (or batteries) to the existing grid
– other infrastructure and services required for the project.

The battery component of the project is part of the SIPS and is designed to provide reserve transmission capacity and stability, rather than additional electricity storage capacity. In this regard, the Waratah Super Battery will allow consumers to access more energy from existing electricity generators while maintaining network security.

The Waratah Super Battery will be the largest standby network battery in the Southern Hemisphere and together with other minor transmission upgrades, will allow Sydney, Newcastle and Wollongong consumers to access more energy from existing electricity generation.

The development requires consent under the *Environmental Planning and Assessment Act 1979* (EP&A Act) whereby the Environmental Impact Statement (EIS) for the development must comply with the requirements in Part 8, Division 2 of the *Environmental Planning and Assessment Regulation* 2021. The EIS is required to address Biodiversity and Biodiversity impacts of the project in accordance with Section 7.9 of the *Biodiversity Conservation Act 2016* (NSW) (BC Act), the Biodiversity Assessment Method (BAM) 2020 and documented in a Biodiversity Development Assessment Report (BDAR).

1.1.2 Location

The Waratah Super Battery - Munmorah Project occurs within Lot 10 DP 1201414 at 301 Scenic Drive, Colongra NSW (the project). The regional location and project site are located on Figure 1.1. The subject land (construction and operational footprint) and study area are shown on Figure 1.2. The project site is located within the Central Coast Council (CCC) and Local Government Area (LGA).

1.1.3 Proposed development and the subject land

The project site has been subject to significant ground disturbance and clearing due to previous use as a stockpile and loading area to transfer coal to the now decommissioned Munmorah Power Station. Small, fragmented patches of vegetation exist amongst the cleared and denuded areas which are regularly maintained by Generator Property Management Pty Ltd (GMP). GMP are currently in the process of the demolition and rehabilitation of the Munmorah Power Station site under consent number, DA/413/2014. On the selected site for the Waratah Super Battery, this involves the partial removal of the coal loader structure, sedimentation basin and weed removal. The concrete structure will be broken down to below ground level. The demolished concrete will be crushed and used to backfill the void. As part of the rehabilitation of the site, GPM are also removing all residual coal, existing stockpiles of crushed concrete, and any other waste or debris.

Infrastructure proposed to support the development of the Waratah Super Battery includes the following:

– Battery energy storage system (including batteries, inverters, transformers, and switchgear)
– Connecting transmission and related infrastructure including:
    - Switchyard
    - Overhead transmission line
– Ancillary infrastructure including:
    - Upgraded construction access road
    - Site services, including power, water, sewage, stormwater drainage, and telecommunications
    - Administration building and light vehicle parking
    - Maintenance building, storage yard, and heavy vehicle parking
    - Signage and security
– Bushfire asset protection zones
– Retention of existing fence line surrounding study area.

The project site boundary and the development layout are shown on Figure 1.3. The development layout lies within the subject land donating the operational footprint, construction footprint, as well as the clearing associated with temporary and ancillary construction facilities and infrastructure. The subject land does not include any areas of mapped high biodiversity values.

The project included the project site as shown in Figure 1-3 as well as areas to the north across the former power station where some upgrades to existing infrastructure would be undertaken. These include areas for the transmission easement where three support structures (lattice towers and a pole) would be constructed and upgrades to existing road infrastructure for temporary and permanent site access. These areas have already been cleared or developed by ongoing remedial activities by GPM, already provide existing infrastructure and/or have been historically disturbed as part of former operations or demolition activities associated with the power station. For this reason, the impact assessment focusses primarily on the project site.

1.1.4 Other documentation

All other documentation submitted with the proposed development that is relevant to biodiversity are incorporated in the EIS report, including detailed bushfire and aquatic assessments.

1.2 Biodiversity Offsets Scheme entry

The BOS applies to the proposed development as the SEARs stipulate that:

> *an assessment of the biodiversity values and the likely biodiversity impacts of the project in accordance with Section 7.9 of the Biodiversity Conservation Act 2016 (NSW) (BC Act), the BAM 2020 and documented in a Biodiversity Development Assessment Report (BDAR), including a detailed description of the proposed regime for avoiding, minimising, managing and reporting on the biodiversity impacts of the development over time, and a strategy to offset any residual impacts of the development in accordance with the BC Act, unless BCD and DPE determine the proposed development is not likely to have any significant impacts on biodiversity values.*

1.3 Matters of national environmental significance

The purpose of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is to ensure that actions likely to cause a significant impact on Matters of National Environmental Significance (MNES) undergo an assessment and approval process. Under the EPBC Act, an action includes a project, a development, an undertaking, an activity or a series of activities, or an alteration of any of these things. An action that 'has, will have or is likely to have a significant impact on a matter of MNES is deemed to be a 'controlled action' and may not be undertaken without prior approval from the Australian Minister for the Environment. MNES relevant to this report include threatened species and ecological communities and migratory species.

The NSW Government and Australian Government finalised amendments to the Assessment Bilateral Agreement after changes to NSW legislation, and the Amending Agreement no. 1 was signed on 24 March 2020. The Australian Government formally endorsed the NSW BOS through the EPBC Act Condition-setting Policy (DAWE, 2020).

The EPBC Act condition setting policy (DAWE, 2020) notes that where a proposal demonstrates compliance with an endorsed state or territory policy, the proponent will not be required to simultaneously comply with the corresponding Australian Government policy. Therefore, only one decision including conditions on the approval is made by NSW, accounting for impacts to MNES occurring in NSW. Specific consideration of the assessment, approval and offsetting requirements for MNES under the bilateral agreement are only required for controlled actions. As such, a proponent is not required to calculate offsets separately using the EPBC Act offsets policy (SEWPaC, 2012) and associated calculator, unless offsets are required for a species not listed under the BC Act.

The EPBC Act has been considered in this assessment through:

– desktop review to determine the listed biodiversity MNES that are predicted to occur within the locality of the project and hence could occur, subject to the habitats present
– targeted field surveys for listed threatened biota and migratory species

– assessment of potential impacts on threatened and migratory biota, including assessments of significance in accordance with the EPBC Act Significant Impact Guidelines 1.1 (DotE, 2013a)
– identification of suitable impact mitigation and environmental management measures for threatened and migratory biota, where required.

Based on the assessments of significance of impacts on MNES presented in this BDAR, the project is unlikely to result in a significant impact on any MNES., The project is also unlikely to be required to be referred to the Commonwealth Minister for the Environment for assessment.

1.4 Information sources

Key information sources used in the BDAR, including but not limited to:

– BAM 2020 (DPIE, 2022a)
– BAM 2020 Operational Manual Stage 1 (DPE, 2022a)
– BAM 2020 Operational Manual Stage 2 (DPIE, 2019a)
– BDAR Template (DPE, 2022d)
– BAM-C (DPE, 2022b) and manual (OEH, 2018b; DPIE, 2019b)
– NSW BioNet Threatened Biodiversity Data Collection (TBDC) (DPE, 2022h)
– NSW BAM flora and fauna survey guidelines:
    - Flora (DPIE, 2020e)
    - Frogs (DPIE, 2020d)
    - Micro-bats (OEH, 2018a)
    - Koala (DPE, 2022e).

1.5 Scope and limitations

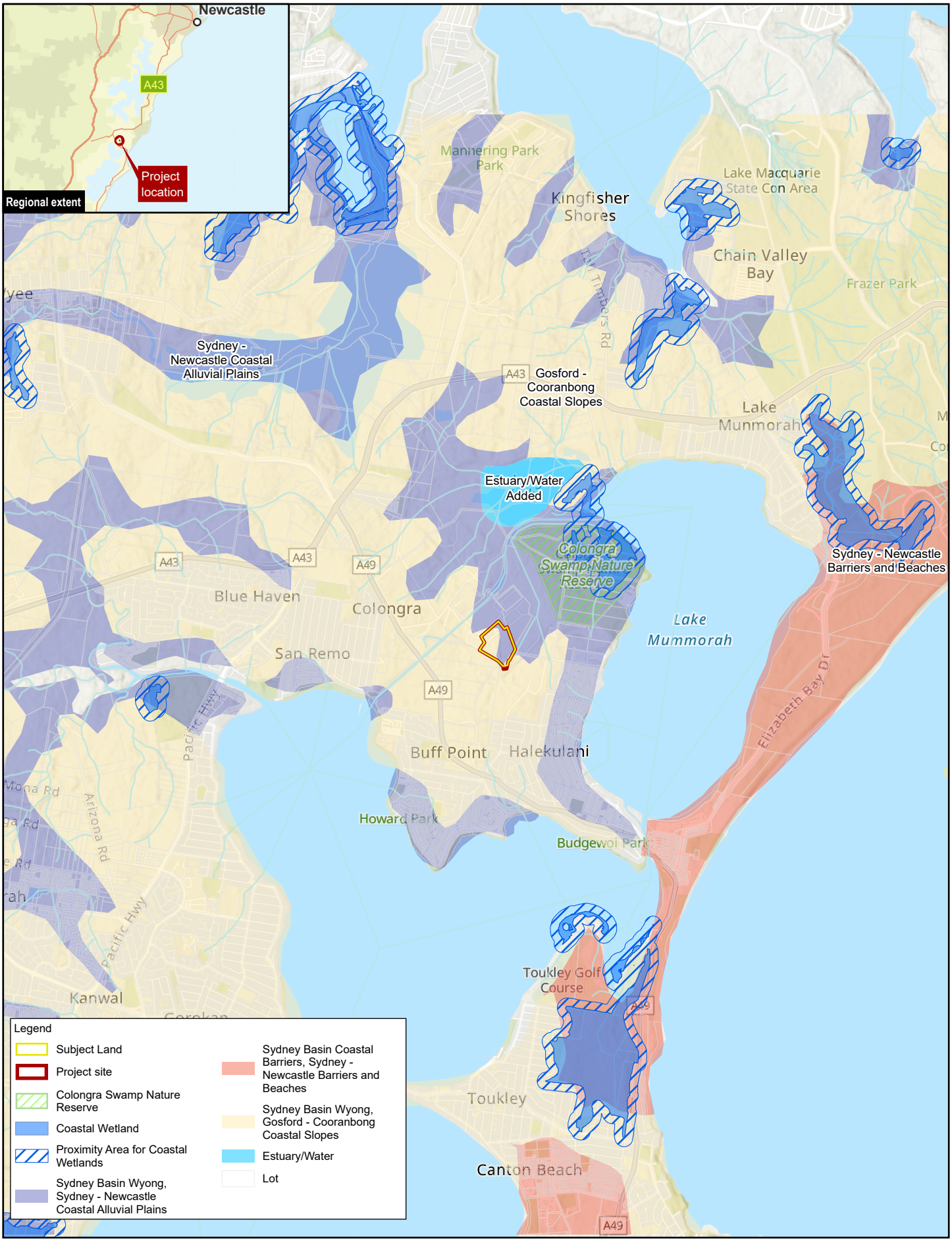
This report: has been prepared by GHD for Energy Corporation of NSW and may only be used and relied on by Energy Corporation of NSW for the purpose agreed between GHD and Energy Corporation of NSW as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Energy Corporation of NSW arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.



Paper Size ISO A4

0 1

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Energy Co
Waratah Super Battery - BDAR

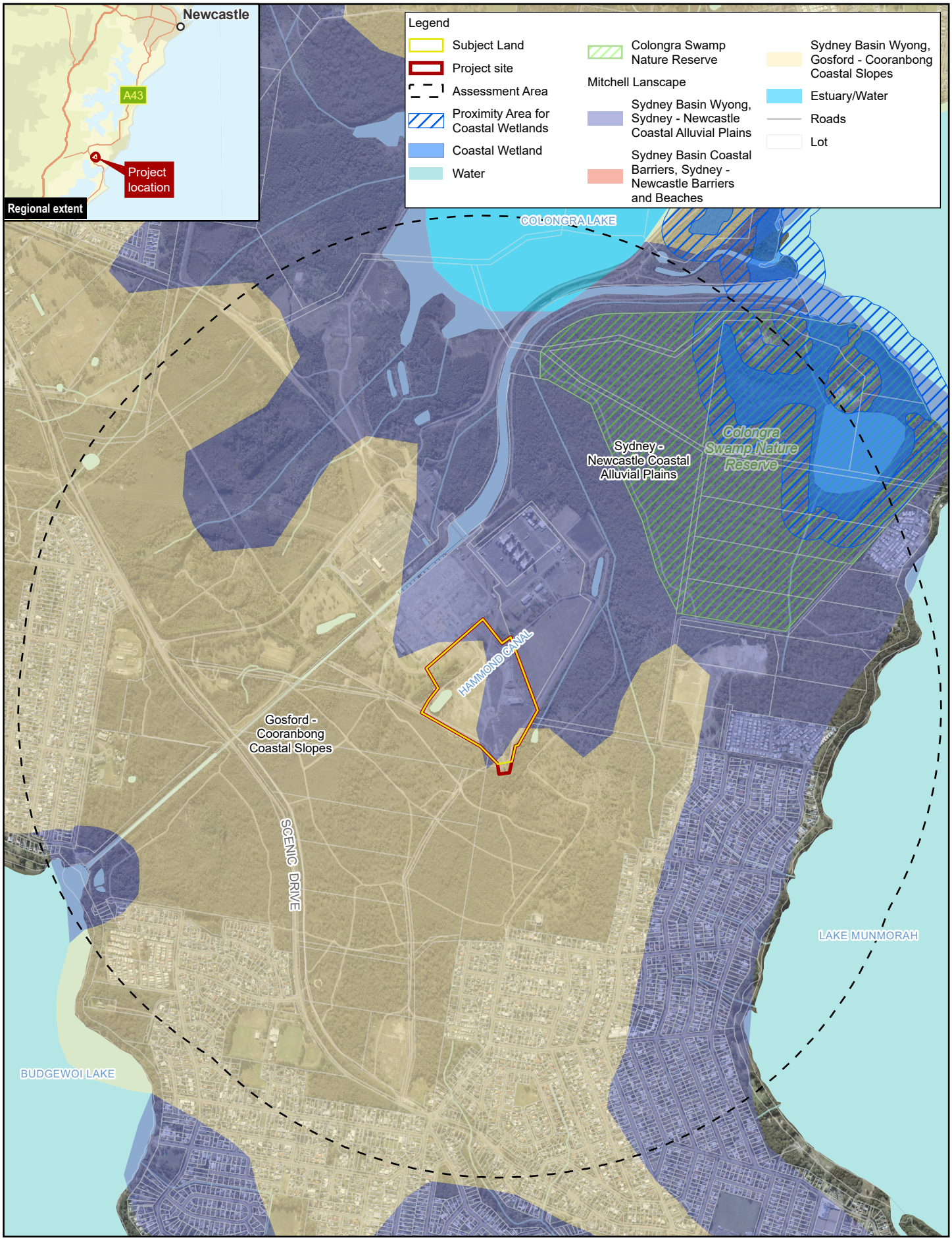
Site map

Project No. **12582669**
Revision No. **0**
Date **26/10/2022**

FIGURE 1.1

\\ghdnet\ghd\AU\Newcastle\Projects\21\12582669\GIS\Maps\Deliverables\12582669_BDAR.aprx
12582669_BDAR_001_Fig1_1_SiteMap
Print date: 26 Oct 2022 - 10:42

Data source: DPIE, 2016; DFSI, 2022; DCS, 2022; World Topographic Map: Esri, HERE, Garmin, Foursquare, METI/NASA, USGS
World Street Map: Esri, HERE, Garmin, FAO, NOAA, USGS
World Hillshade: Esri, Geoscience Australia, NASA, NGA, USGS. Created by: mfredle



Paper Size ISO A4

0 1 Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

GHD

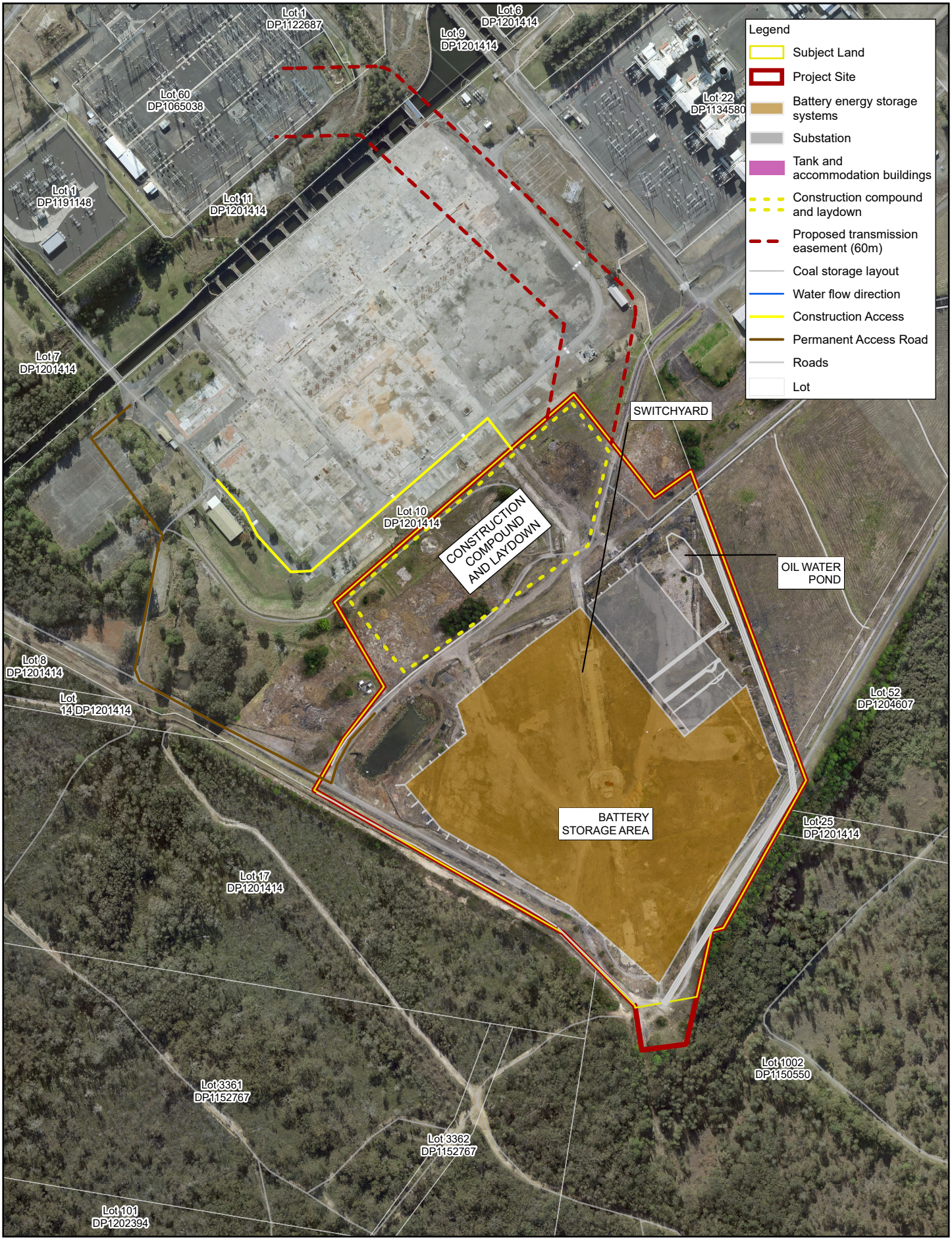
EnergyCo
Waratah Super Battery - BDAR

Location map

Project No. **12582669**
Revision No. **0**
Date **26/10/2022**

FIGURE 1.2

Data source: Fibre Optic Easement - Energy Co; NPWS Reserves, Waterways - DFSI, 2022; Crown Land, Roads, Railways - DCS, 2022; Metromap Tile Service: World Street Map: Esri, HERE, Garmin, FAO, NOAA, USGS. Created by: mfredle



Paper Size ISO A4

0 50 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

EnergyCo
Waratah Super Battery - BDAR

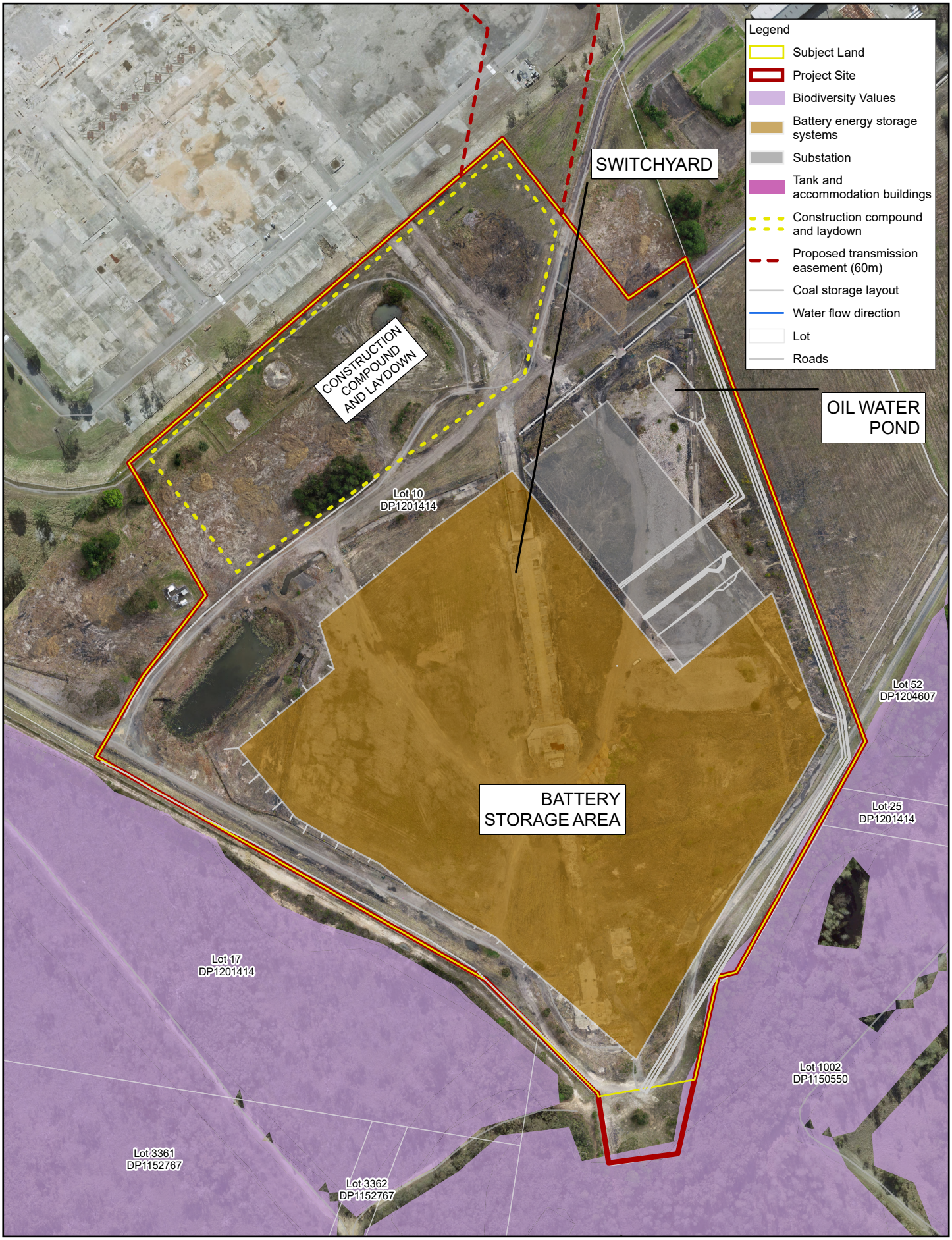
Development layout

Project No. **12582669**
Revision No. **0**
Date **31-Oct-22**

FIGURE 1.3

\\ghdnet\ghd\AU\Newcastle\Projects\21\12582669\GIS\Maps\Deliverables\12582669_BDAR.aprx
12582669_BDAR_003_Fig1_3_Development
Print date: 31 Oct 2022 - 11:47

Data source: Imagery, captured by Energy Co on September 2022; Metromap Tile Service: Roads, Railways - DCS, 2022; Metromap Tile Service: . Created by: mfredle



Paper Size ISO A4

0 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

EnergyCo
Waratah Super Battery - BDAR

Biodiversity values map

Project No. **12582669**
Revision No. **0**
Date **26/10/2022**

FIGURE 1.4

\\ghdnet\ghd\AU\Newcastle\Projects\21\12582669\GIS\Maps\Deliverables\12582669_BDAR.aprx
12582669_BDAR_013_Fig1_4_BiodiversityValues
Print date: 26 Oct 2022 - 12:01

Data source: Fibre Optic Easement - Energy Co; NPWS Reserves, Waterways - DFSI, 2022; Crown Land, Roads, Railways - DCS, 2022; Metromap Tile Service: .
Created by: mfredle

2. Methods

2.1 Site context methods

2.1.1 Landscape features

A desktop database review was undertaken to identify the extent and condition of landscape features within the project site including the following:

– IBRA bioregions and IBRA subregions
– rivers, streams, estuaries and wetlands
– habitat connectivity
– karst, caves, crevices, cliffs, rocks or other geological structures
– areas of outstanding biodiversity value
– NSW (Mitchell) landscape
– soil hazard features.

Information sources used in the desktop assessment to identify these landscape features included:

– Interim Biogeographic Regionalisation of Australia (IBRA) mapping. Version 7.0 (DAWE, 2012)
– Fisheries Spatial Data Portal mapping (DPI, 2022a)
– Atlas of Groundwater Dependent Ecosystems mapping (GDE) (BoM, 2022b)
– aerial photographs and satellite imagery of the project and buffer area using Nearmap (11 August 2022)
– NSW Biodiversity Values Mapping (DPE, 2022c)
– NSW (Mitchell) Landscapes mapping and landscape descriptions (DECC, 2002)
– eSPADE online Soil landscapes mapping tool (DPIE, 2022).
– NSW BioNet Vegetation Classification PCT mapping (DPE, 2022g).

The landscape features within the project site were reviewed and spatially layered onto a Site Map (Figure 1.1) and Location Map (Figure 1.2) in accordance with Section 3.1 of the BAM (DPIE, 2020a).

In addition to the desktop assessment, field reconnaissance was undertaken by ecologists in June 2022. This preliminary site assessment identified any vegetated areas, cleared and heavily disturbed areas, waterways and ephemeral bodies of water, and any geologically significant areas (as relevant), included searches for caves, crevices and cliffs, and assessed the connectivity values of the project site and the surrounding landscape.

2.1.2 Native vegetation cover

The methodology to determine native vegetation cover included desktop assessment, Geographic Information System (GIS) analysis, stratification of biodiversity values and vegetation mapping and BAM plot surveys.

In addition to the desktop assessment undertaken for the assessment of landscape features (2.1.1), previous ecological reports relevant to the site were evaluated including:

– Targeted Flora and Fauna Surveys of Conservation Area for Munmorah Power Station undertaken by Niche Environment and Heritage (Niche, 2020; 2021)
– Swift Parrot habitat assessment undertaken by Ecological Australia Pty Ltd (ELA) dated 4 August 2022 (ELA, 2022).

Assessment of these reports, desktop assessment and GIS analysis were undertaken to accurately determine native vegetation cover, extent and connectivity. Aerial imagery examined at scales between 1:2000 and 1:4000, was interpreted to define vegetation patches and evaluate differences between the extent of NSW PCT mapping. The percent native vegetation cover was calculated within the 1,500 m buffer area identified as the assessment area (Figure 1.2). Field reconnaissance helped confirm these values.

Field reconnaissance, conducted on the morning of 22 June 2022 reviewed and compared PCT mapping and aerial imagery with the on-site vegetation cover and the extent of cover was assigned to one of the following classes:

– 0-10%
– >10-30%
– >30-70%
– >70%.

Native vegetation cover (woody and non-woody) was then assessed via floristic survey where patch size was defined in accordance with the BAM as an area of native vegetation that:

– Includes native vegetation that has a gap of less than 100 metres from the next area of native vegetation (or ≤ 30 metres for non-woody ecosystems).

The extent of native vegetation and native vegetation cover is identified in Section 3.

2.2 Native vegetation, threatened ecological communities and vegetation integrity methods

2.2.1 Existing information

Vegetation was described and assessed in accordance with the BAM (DPIE, 2020a). This process included desktop assessment of aerial imagery, a review of the BioNet vegetation classification database and the Biodiversity Values Map (DPE, 2022c). NSW State Mapped PCTs (DPE, 2022i) and Biodiversity areas were compared with vegetated areas identified via aerial imagery and stratified into preliminary vegetation zones. Areas within the project site that did not contain native vegetation were identified for further review on site. These areas were then used to determine the survey effort required to map and ground truth the extent of native vegetation.

Existing field survey reports were also examined. Two survey reports have been previously prepared by Niche Environment and Heritage in 2020 and 2021 (Niche, 2020; 2021). Previous ecological studies occurred within and in proximity to the project site (Niche, 2020; 2021). However, ecological survey directly within the project site was minimal. Surveys undertaken in 2019 and 2020 (Niche, 2020) targeted threatened fauna within the project site and in the surrounding locality. No targeted threatened flora surveys were undertaken in the project site although, extensive survey effort was undertaken further south of the project site.

The details of these reports have been used to inform the understanding of the background environment at and around the project site and potential presence of species and ecological communities.

2.2.2 Mapping native vegetation extent

The extent of native vegetation was ground-truthed and stratified into vegetation zones using digital aerial photography, PCT vegetation mapping and floristic survey. A vegetation zone is defined in the BAM as a relatively homogenous area that is the same PCT and has the same broad condition state (DPIE, 2020a). The following areas were removed from the assessment:

– cleared areas
– non-native vegetation
– human-made dams, ponds and other waterbodies
– buildings
– non-native plantings.

The balance of native vegetation was verified according to community type, floristic and structural homogeneity within patches. The entirety of the project site and vegetated areas were inspected in accordance with the minimum number of plots required per zone area as per Section 4.3.4 of the BAM.

Native vegetation communities were assigned to the closest equivalent plant community type (PCT) held in the BioNet Vegetation Classification database (DPE, 2022g). This was determined through a comparison of the

floristic descriptions of PCTs in the database with the vegetation integrity plot data collected from the site. In addition to floristic and structural similarity, the landscape position, soil type and other diagnostic features of the vegetation communities were compared to the descriptions in the database in order to determine the most suitable PCT.

Previous studies mapped PCT 1636 to the south and west of the project site and PCT 1724 to the north east Niche (2020; 2021). This information was used as a guide to compare the species identified during survey with the species compositions of PCT 1636 and 1724.

A planted trees assessment was carried out in accordance with Appendix D.1 of the BAM. Threatened ecological communities (TECs) as defined in NSW and Commonwealth legislation, were also identified.

2.2.3 Plot-based vegetation survey

Two plot-based vegetation surveys were undertaken to identify the most likely PCTs within the preliminary stratified vegetation zones. Outcomes of the plot-based floristic vegetation surveys were recorded and interpreted using data from the BioNet vegetation classification. The following vegetation survey data was collected:

– growth form for each recorded native species
– scientific name of each native and exotic species
– estimates of foliage cover for each native and exotic species within the boundaries of each plot
– abundance rating of each native and exotic species rooted within each plot.

The plot-based surveys take into consideration the methodology for surveying vegetation integrity plots (assessing site condition) and as such, plots were located where possible to comply with the minimum number of plots required by Table 3 in the BAM (DPIE, 2020a). These surveys allowed for the final stratification of vegetation into zones and corresponding mapped polygons. Survey methodologies are detailed further in Section 2.2.6, with the floristic survey results identified in Section 4 of this BDAR. Survey locations are shown on Figure 1.2 and vegetation survey data in Appendix C.

2.2.4 Vegetation integrity survey

Stratified vegetation zones were sampled using vegetation integrity plots for the calculation of biodiversity credits in accordance with Section 4.3.4 of the BAM. The Senior Ecologist walked a random distance into the vegetation zone establishing plots on a random bearing whilst ensuring the location captured attributes relevant to that vegetation zone. This was then repeated for subsequent plots in the other vegetation zone.

Plots were not located near ecotones, tracks and their edges or other locally disturbed areas to the greatest extent possible. However, due to the degraded nature of the site, adequate setbacks from disturbed areas such as tracks could not be achieved and the most suitable locations were chosen.

Vegetation integrity scores were determined by assessing ten attributes used to measure function, composition and structure of vegetation within a 50 m by 20 metre plot centred on a 50 metre transect. All flora species within a 20 metre by 20 metre quadrat within the 50 metre by 20 metre plot were identified according to the nomenclature of the Royal Botanic Gardens and Domain Trust (RBGDT, 2022). Each species identified was allocated a growth form group[1] and designated as either native, exotic or a High Threat Exotic (HTE) in accordance with the lists accessed by assessors via the BAM C.

The overall condition of vegetation was assessed through general observation and comparison against the PCT condition benchmark data as well as using parameters such as species diversity, history of disturbance, weed invasion and canopy health. In addition, the presence of hollow bearing trees and vegetation function was assessed in consideration of habitat suitable for candidate threated species identified in Section 5.

The survey was stratified and targeted to assess expected environmental variations and addressed any areas with gaps in the existing mapping and information.

[1] TG – tree, SG – shrub, GG – grass/grasslike, FG – forb, EG – fern, OG – other (Table 2 of the BAM (DPIE, 2020a))

In total, two plots were sampled, one within each vegetation zone. The location and plot survey requirements are identified in Section 2.2.6. No modified benchmarks were applied to assess vegetation integrity (DPIE, 2020b).The BAM-C was the only source benchmark data that was used to assess vegetation integrity attributes in each zone.

2.2.5 Threatened flora survey methods

Desktop analysis and background information informed the methodology for threatened flora surveys. This assessment included the following:

- NSW BioNet Atlas for records of threatened biota previously recorded in a 10 km radius around the subject land (Appendix B; DPE, 2022f) and Threatened Biodiversity Data Collection (TBDC) profiles of threatened species listed under the BC Act (DPE, 2022h)
- NSW BioNet Vegetation Classification to help identify matching plant community types (PCTs) in the project site (DPE, 2022g)
- EPBC Act Protected Matters Search Tool – for a 10 km radius around the subject land (Appendix C; DCCEEW, 2022b: searched March 2022)
- Commonwealth listed threatened Species Profile and Threats Database, online profiles (DCCEEW, 2022c)
- The list of species credit-type species and predicted species identified by the BAM calculator using version 1.4.0.00 (DPE, 2022b)
- landscape-scale features of the project site in accordance with Subsection 3.1.3 of the BAM (DPIE, 2020a)
- site context of the project site that includes assessing vegetation cover
- a list of predicted and candidate threatened species and populations of flora and fauna to assess the habitat suitability and threatened biodiversity data collection as required under Section 5 of the BAM (DPIE, 2020a).

Predicted threatened flora species were generated using the BAM calculator in combination with searches of threatened species databases to identify additional potential candidate threatened flora species (to those generated by the credit calculator) that are known or predicted to occur in the locality. The potential for these predicted threatened flora species to occur within the project site was further refined through the desktop assessment methodologies above, habitat resources observed during field surveys, records during the surveys and knowledge and experience of the assessor.

A habitat constraints and geographic limitations assessment was attributed to potential candidate species based on this information and used to compile lists of confirmed ‘candidate threatened species’ (that is, threatened flora requiring targeted survey) based on Section 5.2 and Section 5.3 of the BAM (DPIE, 2020a).

Cleared and denuded areas dominated by exotic species or hardstand surfaces were discounted as supporting populations of threatened plant species and are clearly depicted through aerial imagery (Figure 1.2). Patches of vegetation considered likely to provide potential habitat for select threatened flora species were identified for survey effort focus.

Targeted surveys of threatened flora were also determined based on time constraints associated with the client and the project timeline. A list of species assumed to be present was generated based on these time limitations.

Surveys for canopy species, *Angophora inopina* (Charmhaven Apple), *Eucalyptus parramattensis* subsp. *decadens, Eucalyptus parramattensis* subsp. *parramattensis, Melaleuca biconvexa* (Biconvex Paperbark), *Eucalyptus camfieldii* (Camfield’s Stringybark), were undertaken using 10–20 metre spaced transects across the entire area of native vegetation in accordance with the threatened flora species survey guidelines in August 2022(DPIE, 2020e).

Shrub species, *Melaleuca groveana* (Grove’s Paperbark), *Grevillea parviflora* subsp. *parviflora* (Small-flower Grevillea), *Callistemon linearifolius* (Netted Bottle Brush), were surveyed using 10–15 metre spaced transects across the entire area of native vegetation in accordance with the threatened flora species survey guidelines in August 2022 (DPIE, 2020e).

Surveys for ground cover species, *Astrotricha crassifoli* (Thick-leaf Star-hair), *Acacia bynoeana* (Bynoe’s Wattle), *Tetratheca glandulosa,* and *Rutidosis heterogama* (Heath Wrinklewort), were completed by walking parallel 5–10 metre spaced transects within areas of suitable habitat in accordance with the threatened flora species survey

guidelines in August (DPIE, 2020e). These surveys were focused in areas of proposed impact in potentially suitable habitat and within immediately adjoining vegetation.

Additional survey were undertaken by walking parallel 5–10 metre spaced transects in September for *Tetratheca juncea* (Black-eyed Susan), *Genoplesium insigne* (Variable Midge Orchid), and *Rhizanthella slateri* (Eastern Australian Underground Orchid). Additional 10–15 metre transects were also undertaken to ensure that no threatened flora species was overlooked.

2.2.6 Field surveys

Staged surveys were undertaken within the project site in accordance with Section 5.3 of the BAM 2020 and the threatened species survey guidelines for targeted species. Surveys were conducted in the project site Figure 2.1 and included the following methodologies:

– initial site stratification, preliminary investigation of biodiversity values and vegetation mapping
– BAM plot surveys
– incidental threatened flora surveys
– fauna habitat assessment
– opportunistic fauna surveys
– targeted surveys for threatened flora
– targeted surveys for threatened fauna.

The Survey effort undertaken for this BDAR is summarised in Table 2.1 below.

Table 2.1 Summary of survey techniques and timing

Stage	Date	Survey Technique
Initial site stratification and vegetation mapping / BAM assessment survey	22 June 2022	Vegetation mapping
Sampling of vegetation and stratification of vegetation mapping	22 June 2022 / 3 August 2022	Plot-based vegetation survey Vegetation integrity plots
BAM assessment survey: Sampling of vegetation integrity plot / transects and targeted surveys for threatened flora and ecological communities	3 August 2022 6 September 2022	Plot-based vegetation survey Vegetation integrity plots Systematic traverses for threatened flora

Vegetation integrity plots (assessing site condition)

Vegetation integrity plots were undertaken on 22 June 2022 and 3 August 2022. Table 2.2 identifies the minimum plot survey requirements in accordance with the BAM.

Two flora species lists were undertaken titled Q01 and Q02 (Figure 2.1). These plots were not used within this report as they fell outside of the subject land.

Table 2.2 Minimum plot survey requirements

Vegetation zone	Area in project site (ha)	Minimum number of plots required	Number of plots included in BAMC	Plot IDs used in BAMC	Additional plot IDs in or near the alignment
1636 - Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast - Moderate	0.16	1	1	Q03	-

Vegetation zone	Area in project site (ha)	Minimum number of plots required	Number of plots included in BAMC	Plot IDs used in BAMC	Additional plot IDs in or near the alignment
1724 - Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast - Moderate	0.10	1	1	Q04	-

Attributes assessed within each plot are listed in Table 2.3.

Table 2.3 Site data collected within each plot

Attribute	Area assessed
Native plant species richness	20 X 20 metre plot
Percent foliage cover for each species, aggregated to give the total cover of each plant growth form group	20 X 20 metre plot
Estimated number of individuals for each species	20 X 20 metre plot
HTE vegetation cover, aggregated from the cover of each HTE plant species	20 X 20 metre plot
Number of large trees	50 X 20 metre plot
Tree regeneration (presence/absence)	50 X 20 metre plot
Tree stem size class (presence/absence)	50 X 20 metre plot
Total length of fallen logs	50 X 20 metre plot
Litter cover	5 times 1 X 1 metre plot
Hollow bearing trees	50 X 20 metre plot

The overall condition of vegetation was assessed as per Sections 2.2.3 and 2.2.4.

Threatened flora species survey

Targeted surveys were undertaken for the candidate threatened flora species with the potential to occur within the project site given known distributions, previous records in the locality and habitat requirements for each species (Figure 2.1 and Figure 2.2). Candidate threatened flora species that were targeted during these surveys and the appropriate survey period specified in the BAM calculator are listed in Table 2.4.

Targeted searches were completed by systematically walking parallel traverses with varying spacing across the entirety of each vegetation zone, with reference to the threatened plant survey guidelines (DPIE, 2020e).

Table 2.4 Candidate flora species credit entities targeted during surveys

Common name	Scientific name	Survey method (transects or grids)	Survey period	Survey effort (systematic traverses) (BAM-C)	Assumed presence
Bynoe's Wattle	*Acacia bynoeana*	Transects	All year	3 person transects with 5-10m spacing - 3 August 2022	No
Charmhaven Apple	*Angophora inopina*	Transects	All year	3 person transects with 10–20m spacing - 3 August 2022	No
Trailing Woodruff	*Asperula asthenes*	Transects	October – December	No surveys undertaken	Yes

Common name	Scientific name	Survey method (transects or grids)	Survey period	Survey effort (systematic traverses) (BAM-C)	Assumed presence
Thick-leaf Star-hair	*Astrotricha crassifolia*	Transects	July–December	3 person transects with 5–10m spacing - 3 August 2022	No
Netted Bottle Brush	*Callistemon linearifolius*	Transects	October–January	3 person transects with 5–10m spacing - 3 August 2022 2 person transects with 5–10m spacing - 6 September 2022	Yes
Wyong Midge Orchid 2	*Corunastylis* sp. Charmhaven (NSW896673)	Transects	November – April	No targeted surveys undertaken	Yes
Leafless Tongue Orchid	*Cryptostylis hunteriana*	Transects	November – January	No targeted surveys undertaken	Yes
Camfield's Stringybark	*Eucalyptus camfieldii*	Transects	All year	3 person transects with 10–20m spacing - 3 August 2022	No
-	*Eucalyptus parramattensis* subsp. *decadens*	Transects	All year	3 person transects with 10–20m spacing - 3 August 2022	No
Eucalyptus parramattensis C. Hall. subsp. *parramattensis* in Wyong and Lake Macquarie local government areas	*Eucalyptus parramattensis* subsp. *parramattensis* - endangered population	Transects	All year	3 person transects with 10–20m spacing - 3 August 2022	No
Variable Midge Orchid	*Genoplesium insigne*	Transects	September–November	2 person transects with 5–10m spacing – 6 September 2022	No
Small-flower Grevillea	*Grevillea parviflora* subsp. *parviflora*	Transects	August–November	3 person transects with 10m spacing - 3 August 2022	No
-	*Maundia triglochinoides*	Transects	November - March	No targeted surveys undertaken	Yes
Biconvex Paperbark	*Melaleuca biconvexa*	Transects	All year	3 person transects with 10–20m spacing - 3 August 2022	No
Grove's Paperbark	*Melaleuca groveana*	Transects	All year	3 person transects with 10–15m spacing - 3 August 2022	No

Common name	Scientific name	Survey method (transects or grids)	Survey period	Survey effort (systematic traverses) (BAM-C)	Assumed presence
Tall Knotweed	*Persicaria elatior*	Transects	December – May	No targeted surveys undertaken	Yes
Eastern Australian Underground Orchid	*Rhizanthella slateri*	Transects	September–November	2 person transects with 5–10m spacing – 6 September 2022	No
Heath Wrinklewort	*Rutidosis heterogama*	Transects	All year	3 person transects with 5–10m spacing - 3 August 2022	No
-	*Tetratheca glandulosa*	Transects	August–November	3 person transects with 10–15m spacing - 3 August 2022	No
Black-eyed Susan	*Tetratheca juncea*	Transects	September–October	2 person transects with 5–10m spacing – 6 September 2022	No

2.2.7 Habitat constraints assessment

To further refine the list of threatened flora species for assessment, an evaluation of habitat constraints on the site was undertaken. Potential candidate threatened species that could occur in the project site were based on the habitat resources observed during field surveys and confirmed as candidate threatened species targeted for survey.

Several species could be reliably discounted as occurring within the project site based on habitat types present and/or the known distribution of the species. Ecologists during field surveys investigated:

– geographic limitations
– habitat constraints
– vagrant species
– rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnel
– hollow bearing trees
– presence of waterbodies, rivers, freshwater and estuarine wetlands and lakes
– soil limitations
– evidence of fire.

Geographic limitations, habitat constraints and vagrant species are the only reasons used for excluding ecosystem credit species. Detailed justification for the exclusion of candidate species is provided in Section 5.

2.3 Threatened fauna survey methods

2.3.1 Review of existing information

A desktop assessment was undertaken to inform the threatened fauna survey methods. This assessment included the following:

– NSW BioNet Atlas for records of threatened biota previously recorded in a 10 km radius around the subject land (Appendix B; DPE, 2022f) and Threatened Biodiversity Data Collection (TBDC) profiles of threatened species listed under the BC Act (DPE, 2022h)

– NSW BioNet Vegetation Classification to help identify matching plant community types (PCTs) in the project site (DPE, 2022d)
– EPBC Act Protected Matters Search Tool – for a 10 km radius around the subject land (Appendix C; DCCEEW, 2022b: searched March 2022)
– list of species credit-type species and predicted species identified by the BAM calculator using version 1.4.0.00 (DPE, 2022b)
– landscape-scale features of the project site in accordance with Subsection 3.1.3 of the BAM (DPIE, 2020a)
– Commonwealth listed threatened Species Profile and Threats Database, online profiles (DCCEEW, 2022c).

Using the above information, a table list of ecosystem credit species and fauna credit species likely to occur on or use the project site was populated in the BAM-C. Species were then retained or excluded from the BAM-C list based on geographic limitations and habitat constraints. In addition, previous terrestrial fauna surveys undertaken by Niche Environment and Heritage were reviewed (Niche, 2020: 2021).

2.3.2 Habitat constraints assessment

Habitat constraints assessments considered what threatened fauna species could occur within the project site due to the presence of habitat features. Fauna habitat assessments were undertaken throughout the project site and wider project site during all survey periods, including observations of potential shelter, basking, roosting, nesting and/or foraging sites. Specific habitat features and resources such as water bodies, food trees, the density of understorey vegetation, the composition of ground cover, the soil type, presence of hollow-bearing trees, leaf litter and ground debris were noted.

Indicative habitat criteria for targeted threatened species (i.e. those determined as having the potential to occur within the project site following the desktop review) were identified prior to fieldwork. Habitat criteria were based on information provided in threatened species profiles (DPE, 2022j; DEECCW, 2022c), TBDC (DPE, 2022h), field guides, and the knowledge and experience of GHD field ecologists.

2.3.3 Field surveys

Staged surveys were undertaken within the project site in accordance with Section 5.3 of the BAM 2020 and the threatened species survey guidelines for targeted fauna species. Survey locations are identified in Figure 2.3.

Fauna field surveys included:

– initial site stratification and vegetation mapping
– habitat assessments
– targeted surveys for threatened ecological communities and fauna species.

Survey effort that was undertaken for this BDAR are summarised in Table 2.5.

Table 2.5 Fauna survey techniques and timing

Stage	Date	Survey Technique
Initial site stratification and vegetation mapping / BAM assessment survey	22 June 2022	Vegetation mapping
Fauna survey	22 June 2022 / 3 August 2022, 6 September 2022	Fauna habitat assessment Targeted fauna survey including: – diurnal bird surveys – spotlighting – active searches for scats and signs – systematic identification and survey of candidate nests or roosts – call playback – opportunistic fauna surveys.

Fauna habitat assessment

Habitat assessments included searches for resources of potential value to threatened fauna including:

– trees with bird nests or other potential fauna roosts
– rock outcrops or overhangs providing potential shelter sites for fauna
– burrows, dens and warrens
– waterbodies
– distinctive scats or latrine sites, owl white-wash and regurgitated pellets under roost sites
– tracks or animal remains
– evidence of activity such as feeding scars, scratches and diggings
– specific food trees and evidence of foraging
– assessment of hollow bearing trees

Locations and qualitative descriptions of significant habitat features were also captured with a handheld GPS unit.

Opportunistic and incidental observations of fauna species were recorded at all times during field surveys. This included a conscious focus on suitable areas of habitat during flora surveys, for instance fallen timber was scanned and/or turned for reptiles, calls of frogs and waterbirds were noted near waterbodies and mature trees and stags were scanned for roosting birds.

Targeted fauna surveys

The study of confirmed candidate species credit matters, i.e., species credit species and habitat resources such as nesting or roosting habitat for dual credit species, requires targeted, seasonal surveys. Potential candidate species credit matters were identified in accordance with section 5 and 6 of the BAM and based on the results of the desktop assessment, identification of PCTs and fauna habitat assessment.

To determine fauna species targeted for survey, a habitat constraints and geographic limitations assessment was attributed to potential candidate species and confirmed ‘candidate threatened fauna species’ were compiled.

Candidate species credit matters that were considered to occur within the project site were targeted with specific survey techniques and are listed in Table 2.6.

Targeted surveys appropriate to each species credit matter were planned and conducted with reference to the threatened species survey guidelines (DEC, 2004) and the BAM threatened species survey assessment guidelines (DPE, 2020e; DPIE, 2022e). Surveys were planned and undertaken using the following framework:

– habitat resource assessment confirmed presence (or absence) and condition of suitable microhabitats or habitat resources for the candidate species credit matter. This stage may be conducted at any time of year.
– stratification of habitat resources based on the extent and quality of habitat and planning of targeted seasonal survey techniques appropriate to each confirmed candidate species and habitat type.
– delivery of targeted seasonal survey techniques appropriate to each confirmed candidate species.

Targeted fauna survey techniques and effort conducted in the project site are summarised in Table 2.6 and fauna survey locations are mapped on Figure 2.1. Where possible, surveys were conducted in the survey season identified by the BAM-C, however time constraints posed by the project timeline limited the survey effort. Species that could not be surveyed for and required assumption of presence are listed in Table 2.4.

Fauna observations were recorded on pro forma field data sheets or electronic data capture forms or apps. Further detail regarding candidate fauna species targeted during surveys is provided in Section 5.2.1.

Targeted surveys are not required for threatened fauna species that can be reliably predicted to occur within the project site based on habitat surrogates (predicted / ecosystem credit species). These species are assumed to be present within certain PCTs, given a certain patch size and condition. In general, all fauna species were recorded if observed within the project site. The presence of fauna aids as a general guide to the condition and biodiversity value of the project site.

Table 2.6 identifies targeted fauna survey techniques and effort.

Table 2.6 Targeted fauna survey techniques

Common name	Scientific name	Survey method	Survey period	Survey effort
Bush Stone-curlew	*Burhinus grallarius*	General diurnal bird survey, call playback, Spotlighting.	August – September	2 hours by 2 people – 3 August and 6 September
Gang-gang Cockatoo (Breeding)	*Callocephalon fimbriatum*	Hollow-bearing tree search and general diurnal bird survey.	All year	1 hours by 2 people - 22 June, 3 August and 6 September
Glossy Black-Cockatoo (Breeding)	*Calyptorhynchus lathami*	Hollow-bearing tree search and general diurnal bird survey.	All year	1 hours by 2 people - 22 June and 3 August
Wallum Froglet	*Crinia tinnula*	Spotlighting.	All year	1 hours by 2 people 3 August and 6 September
White-bellied Sea-Eagle (Breeding)	*Haliaeetus leucogaster*	Nest tree survey and general diurnal bird survey.	July – January	1 hours by 2 people 3 August and 6 September
Little Eagle (Breeding)	*Hieraaetus morphnoides*	Nest tree survey and general diurnal bird survey.	August - September	1 hours by 2 people 3 August and 6 September
Green and Golden Bell Frog	*Litoria aurea*	Spotlighting.	January - March	1 hours by 2 people 3 August and 6 September
Green-thighed Frog	*Litoria brevipalmata*	Spotlighting.	November – December	1 hours by 2 people - 22 June and 3 August
Square-tailed Kite (Breeding)	*Lophoictinia isura*	Nest tree survey and general diurnal bird survey.	September – January	1 hours by 2 people 3 August and 6 September
Barking Owl (Breeding)	*Ninox connivens*	Hollow-bearing tree search, call playback, spotlighting.	August – September	2 hours by 2 people 3 August, and 6 September
Powerful Owl (Breeding)	*Ninox strenua*	Hollow-bearing tree search, call playback, spotlighting.	May – June	2 hours by 2 people - 3 August and 6 September
Eastern Osprey (Breeding)	*Pandion cristatus*	Nest tree survey.	July – September	1 hours by 2 people - 22 June, 3 August, and 6 September
Koala	*Phascolarctos cinereus*	2 x SAT surveys 4 call playback, and 2 x spotlighting nights.	All year	2 hours by 3 people - 3 August, and 6 September
Grey-headed Flying-fox (Breeding)	*Pteropus poliocephalus*	Breeding camping search, spotlighting.	October – December	1 hours by 2 people - 3 August, and 6 September
Masked Owl (Breeding)	*Tyto novaehollandiae*	Hollow-bearing tree search, call playback, spotlighting.	March – July	1 hours by 2 people - 3 August, and 6 September
Mahony's Toadlet	*Uperoleia mahonyi*	Spotlighting.	October – January	1 hours by 2 people - 3 August, and 6 September

2.3.4 Weather conditions

Flora and fauna surveys were undertaken between June and September 2022. The prevailing environmental conditions at the time of each of the surveys are described in Table 2.4. The environmental conditions were generally appropriate to support the survey techniques employed and the species targeted.

Table 2.7 Environmental conditions during threatened species surveys (BoM, 2022a)

Survey undertaken (e.g. method / targeted species)	Date	Time	Temperature (min. & max.)	Wind (light, mod…)	Rainfall (mm)	Other conditions relevant to the species
Flora transects, BAM plots, bird surveys, habitat searches	22 June 2022	10:00–16:00	8.6°C–17.5°C 09:00–12.1°C 15:00 –16.6°C	09:00 - 15km/h 15:00 - 6km/h	0.8mm	Calm during the day with small amounts of rain at night
Flora transects, BAM plots, bird surveys, habitat searches	3 August 2022	09:00–17:30	6.6°C–23.0°C 09:00–13.1°C 15:00–22.8°C	09:00 - 4km/h 15:00 - 7km/h	0.0mm	Calm during the day with no rain
Spotlighting, call playback	3 August 2022	17:30–19:00	6.6°C–23.0°C	Light	0.0mm	Calm during the night with no rain
Flora transects, bird surveys, habitat searches	6 September 2022	09:00–17:30	9.7°C–16.9°C 09:00–13.5°C 15:00 – 15.7°C	09:00 - 11km/h 15:00 - 9km/h	1.6mm	Calm during the day with no rain
Spotlighting, call playback	6 September 2022	17:30–18:30	9.7°C –16.9°C	Light	1.6mm	Calm during the night with no rain

Source: BoM, 2022b.

2.4 Survey limitations

Most of the project site consists of cleared and denuded areas due to the previous use of the project site. All areas outside the native vegetation zones were not subject to survey effort. This includes hardstand areas, roads, disused and demolished infrastructure, human-made waterbodies and weed infested areas that form part of pre-existing demolition conditions.

The existing landowners routinely carry out maintenance activities to the property under existing consent conditions for the facility. Vegetated areas subject to maintenance included weed removal which occurred in July–September. These areas were surveyed before weed maintenance occurred resulting in the removal of a significant amount of pine trees.

The impact assessment and conclusions of this report draw upon the areas within the subject land in question as well as information obtained from a variety of sources in addition to the field survey data. Where it is considered that the likelihood of observing a particular threatened species was diminished due to the extent of survey effort or seasonal or climatic factors, then this has been indicated.

An assessment of the likelihood of occurrence of threatened species has been provided, on the basis of known distributional ranges, previous records in the locality, and habitat and resource availability at the project site. The assessment of impacts includes threatened species recorded within the project site during field surveys as well as species considered likely to occur and impacted by the proposal. Candidate species that were not able to be surveyed in the appropriate season or in particularly locations were assumed present where necessary.

Table 2.8 identifies the suitably qualified ecologists involved with surveys and the writing and review of the BDAR.

Table 2.8 Qualifications and licences

Name	Position/Project role	Qualifications	Relevant experience
Dr Kirsten Crosby	Technical specialist - Biodiversity technical review	BSc, PhD Accredited BAM Assessor (BAAS17011)	17+ years
Dr Andrew Smith	Technical lead – fauna / field surveys, credit calculations, lead author of BDAR	BSc (Environmental Biology), PhD Accredited BAM Assessor (number BAAS19007)	11+ years
James Baldry	Ecologist (Botanist)	MConsBio	2.5 years
Patrick Costello	Ecologist – fauna and flora surveys	B.EnvMan	5 years

Paper Size ISO A4

0 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

EnergyCo
Waratah Super Battery - BDAR

Survey effort - flora August

Project No. **12582669**
Revision No. **0**
Date **26/10/2022**

FIGURE 2.1

\\ghdnet\ghd\AU\Newcastle\Projects\21\12582669\GIS\Maps\Deliverables\12582669_BDAR.aprx
12582669_BDAR_004_Fig2_1_SurveyEffort_FloraAug
Print date: 26 Oct 2022 - 10:56

Data source: Fibre Optic Easement - Energy Co; NPWS Reserves, Waterways - DFSI, 2022; Crown Land, Roads, Railways - DCS, 2022; Metromap Tile Service: .
Created by: mfredle

Paper Size ISO A4

0 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

EnergyCo
Waratah Super Battery - BDAR

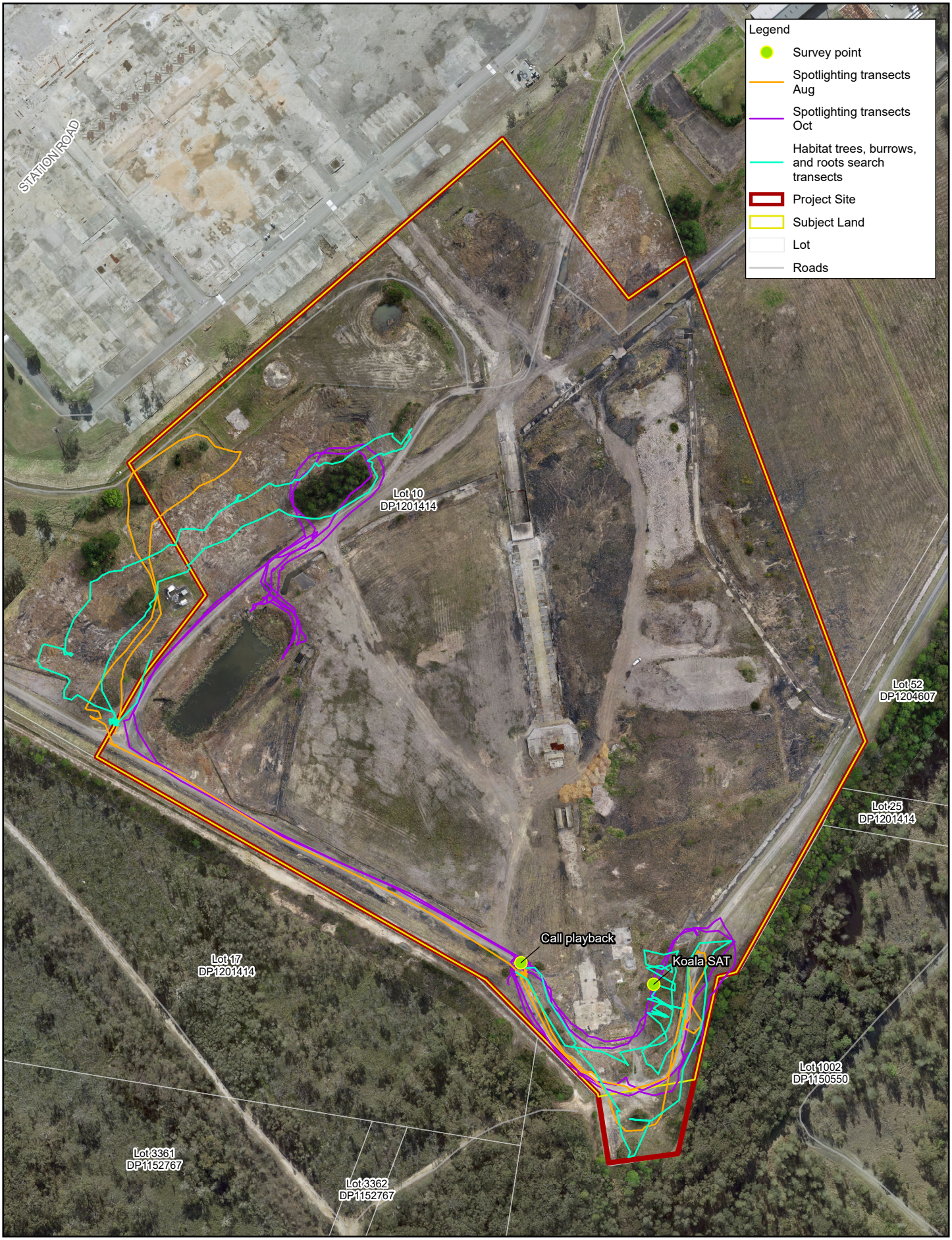
Survey effort - flora September

Project No. **12582669**
Revision No. **0**
Date **26/10/2022**

FIGURE 2.2

\\ghdnet\ghd\AU\Newcastle\Projects\21\12582669\GIS\Maps\Deliverables\12582669_BDAR.aprx
12582669_BDAR_015_Fig2_2_SurveyEffort_FloraOct
Print date: 26 Oct 2022 - 10:36

Data source: Imagery, captured by Energy Co on September 2022; Roads, Railways - DCS, 2022; Metromap Tile Service: . Created by: mfredle



Paper Size ISO A4

0 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

EnergyCo
Waratah Super Battery - BDAR

Project No. **12582669**
Revision No. **0**
Date **26/10/2022**

Survey effort - fauna

FIGURE 2.3

\\ghdnet\ghd\AU\Newcastle\Projects\21\12582669\GIS\Maps\Deliverables\12582669_BDAR.aprx
12582669_BDAR_005_Fig2_3_SurveyEffort_Fauna
Print date: 26 Oct 2022 - 10:36

Data source: Imagery, captured by Energy Co on September 2022; Roads, Railways - DCS, 2022; Metromap Tile Service: . Created by: mfredle

3. Site context

The BAM requires the assessment of landscape features to establish the site context, describe the biodiversity values of the project site and assess the impacts of the project on the subject land. Landscape features within the project site, assessment area and subject land relevant to the BAM calculations are discussed below.

3.1 Assessment area

The project site is located at 301 Scenic Drive, Colongra, 2259 on title 10 DP1201414 and within the Central Coast Local Government Area (LGA). The project area includes the main battery storage area and switchyard and easements for the transmission line and permanent access roads (see Figure 1.3). The easements are located over hardstand and gravel surfaces. The site is bordered to the north, north-east and north-west by the Colongra Power station. Directly south, southeast and southwest is undeveloped vegetated land zoned for Electricity and generating works under the Central Coast Land zones overlay. The project site and subject land have been historically cleared and are considered heavily degraded due to the sites previous use for coal fired electricity generation.

The assessment area is defined as the area of land within the 1500 metre (m) buffer zone surrounding the subject land for site-based development (Figure 1.2).

3.2 Landscape features

The majority of the project site is highly modified and disturbed, with vegetated areas separated by exotic grassland, existing roads and hardstand. A small detention basin exists within the project site which at the time of harboured vegetation dominated by pine trees. The boundary of the lot is delineated by a chain-link barbed wire fence.

3.2.1 IBRA bioregions and IBRA subregions

The project site and assessment area occur within the Sydney Basin IBRA bioregion and Wyong IBRA subregion (DAWE, 2012; Figure 1.2).

3.2.2 Rivers, streams, estuaries and wetlands

The project site is not intersected by any rivers, streams, estuaries or wetlands (Figure 1.2). However, there are several rivers, streams, estuaries and wetland features located within the surrounding locality, including:

- Hammond canal located to the north-west and north-east of the subject land
- Lake Mummorah located approximately 1.1 km east of the subject land
- Colongra Lake located approximately 1.1 km north of the subject land
- Budgewoi Lake located approximately 1.5 km south-west of the subject land
- Colongra Swamp Nature Reserve located approximately 650 m north-east of the subject land
- A patch of Coastal Wetland and proximity area as listed SEPP (Coastal Management) 2018 located approximately 1.1 km north-east of the subject land (within close association with the Colongra Swamp Nature Reserve)
- Several small 1st and 2nd order streams.

3.2.3 Habitat connectivity

The extent of patches of native vegetation and fauna permeability determines the capacity of a location to support habitat connectivity or ecological corridors. Patch size is defined under the BAM 2020 (DPIE, 2020a) as an area of native vegetation that:

- Includes native vegetation that has a gap of less than 100 metres from the next area of native vegetation (or ≤ 30 metres for non-woody ecosystems).

The project site does not harbour patches of vegetation that can contribute to a consistent corridor and fauna habitat connectivity as shown on Figure 1.2. This is due to the site's past use as an active underground coal mining site to support surface infrastructure. It is predominantly devoid of contiguous native vegetation. The subject land does have the potential to provide plant-pollinator interactions. This may include connectivity for pollinators like insects and other vertebrates as well as other pollination mechanisms such as windblown seed (Prendagast *et al.,* 2022).

The security fencing topped with several rows of barbed wire is a significant barrier to fauna movement. Any habitat connectivity that may serve as potential movement corridors for threatened species is, therefore, likely to be limited to highly mobile species. The project site provides limited foraging and nesting opportunities for woodland birds, owls, raptors and bats and these species would likely fly over to surrounding areas of higher of the quality habitat.

3.2.4 Karst, caves, crevices, cliffs, rocks or other geological features of significance

There are no karst, caves, crevices, cliffs, rocks or other geological features of significance located within the project site, project site or known to occur within the assessment area. However, within the assessment area there may be a microbat roost site. Previous ecological survey suggests this site is located within riparian areas north-west of the project site further up Hammond Canal towards Colongra Lake (Niche, 2020; 2021; Figure 1.2). However, this species was not recorded using the potential roost site (Niche, 2020; 2021). Whilst there are records of cave roosting micro-bats species, including the Large-eared Pied Bat (*Chalinolobus dwyeri*), in the locality, these are mainly concentrated to the west of the subject land where cliff faces and other similar geographic features occur (DPE, 2022f). The presence of cave roosting micro-bats species within the subject land would likely be from foraging individuals.

3.2.5 Areas of outstanding biodiversity value

There are no areas of outstanding biodiversity value (AOBV), as identified under the BC Act, within the project site, subject land or assessment area.

3.2.6 NSW (Mitchell) landscape

Two NSW (Mitchell) landscapes are mapped within the project site and assessment area, (ELA, 2008) shown in Figure 1.2 and detailed in Table 3.1.

Table 3.1 NSW (Mitchell) landscape within the project site and assessment area (ELA, 2008)

Landscape name	Description (ELA, 2008)
Gosford - Cooranbong Coastal Slopes	Coastal fall of the Sydney Basin, rolling hills and sandstone plateau outliers of Triassic Narrabeen sandstones, extensive rock outcrop and low cliffs along ridge margins, general elevation 0 to 75m. Texture-contrast soils on lithic sandstones and shales. Loamy sand alluvium along creeks. Organic sand and mud in lagoons and swamps. Open forest and woodland of Smooth-barked Apple (*Angophora costata*), Red Bloodwood (*Corymbia gummifera*), Brown Stringybark (*Eucalyptus capitellata*), Sydney Peppermint (*Eucalyptus piperita*), Spotted Gum (*Corymbia maculata*), Bastard Mahogany (*Eucalyptus carnea*), Northern Grey Ironbark (*Eucalyptus siderophloia*) and Grey Gum (*Eucalyptus punctata*) on hills and slopes. Small areas of closed forest with; Turpentine (*Syncarpia glomulifera*), Lilly Pilly (*Acmena smithii*), Mountain Cedar Wattle (*Acacia elata*), Coachwood (*Ceratopetalum apetalum*), Sassafras (*Doryphora sassafras*) and Water Gum (*Tristaniopsis laurina*) in gullies under high escarpments Prickly-leaved Tea-tree (*Melaleuca stypheliodes*) and other shrubs with Swamp Mahogany (*Eucalyptus robusta*), Swamp Oak (*Casuarina glauca*), sedges and Common Reed (*Phragmites australis*) on swampy creek flats. Coastal heath subject to salt spray on headlands.

Landscape name	Description (ELA, 2008)
Sydney - Newcastle Coastal Alluvial Plains	Undulating plains and low rises on Quaternary sand or Permian/Triassic sandstone or shale with swampy valley floors. General elevation 0 to 80m, local relief 20m. Siliceous uniform sands, patches of deep podsol and yellow or brown texture-contrast soils on bedrock. Vegetation varies with soil and drainage. On the sands and podsols Coast Banksia (*Banksia aemula*), Red Bloodwood (*Corymbia gummifera*) and Smooth-barked Apple (*Angophora costata*) are common. On bedrock forest oak (*Allocasuarina torulosa*), Grey Gum (*Eucalyptus punctata*), Forest Red Gum (*Eucalyptus tereticornis*), and Scribbly Gum (*Eucalyptus haemostoma*), with a shrubby understorey are common and the swamps are typically surrounded by Broad-leaved Paperbark (*Melaleuca quinquenervia*), Coast Banksia (*Banksia integrifolia*), Swamp Oak (*Casuarina glauca*) and Swamp Mahogany (*Eucalyptus robusta*) with Spike Rushes (*Eleocharis* sp.) and Tall Swamp Sedge (*Gahnia* sp.). Open water supports a variety of aquatic plants including Common Reed (*Phragmites australis*), Floating Pondweed (*Potamogeton tricarinatus*), Water Primrose (*Ludwigia peploides*), Duckweed (*Lemna* sp.), Water Buttons (*Cotula coronopifolia*) and Red Azolla (*Azolla filiculoides*).

3.2.7 Additional landscape features identified in SEARs

No additional landscape features were identified in the Secretary's Environmental Assessment Requirements (SEARs) for the development.

3.2.8 Soil hazard features

The project site is mapped as a Disturbed terrain soil landscape which is indicative of extensive ground disturbance caused by human activity generally containing soil, rock, building and waste materials with the vegetation completely cleared (DPIE, 2022f). This soil type is highly variable and extensively modified.

Coastal potential acid sulfate soils occur in every coastal estuary in NSW and are common to mangrove and saltmarsh areas. They comprise natural sediments that contain iron sulfides found less than a metre above sea level and affect more than 260,000 (hectares) ha of land. They can reduce the pH of waterways, deoxygenate waterways, and harm aquatic life such as fish and benthos (DECC, 2007). Acid sulfate soil risk mapping in the broader project site indicates that there is a high probability of occurrence of acid sulfate soils within the waterways and lakes including Hammond Canal and Lake Colongra. (DPIE, 2022f).

3.3 Native vegetation cover

Native vegetation cover was assessed via desktop assessment and field survey within the assessment area. Table 3.2 summarises the extent of native vegetation cover within the assessment area using the State-wide PCT mapping (DPE, 2022i). Figure 4.1 illustrates the areas within the project site with native vegetation. Figure 1.2 shows native vegetation cover within the assessment area.

Table 3.2 Native vegetation cover in the assessment area

Parameter	Assessment area
Total area of native vegetation cover (ha)	Approximately 465.37 ha
Percentage of native vegetation cover (%)	Approximately 47.57%
Class (0-10, >10-30, >30-70 or >70%)	30–70%

4. Native vegetation, threatened ecological communities and vegetation integrity

4.1 Native vegetation extent

Native vegetation cover (woody and non-woody) was assessed in accordance with the methodology outlined in Section 2.1.2. The area and percent native vegetation cover within the project site was assessed to be 0.26 ha and 1.9**%**, respectively (Figure 4.1). Numerous high threat exotics (HTW) were also observed with in the subject land (Appendix D)

4.1.1 Changes to the mapped native vegetation extent

No areas within the project site are mapped as native vegetation on the NSW State Vegetation Type Map (DPE, 2022i). Vegetation zones and associated PCTs were mapped by GHD ecologist as shown in Figure 4.2 and Figure 4.3.

4.1.2 Areas that are not native vegetation

All areas that are not mapped as native vegetation include:

– cleared areas
– highly disturbed native / exotic vegetation
– human-made dams, ponds and other waterbodies
– buildings
– planted mixed native and exotic trees / shrubs
– exotic, roads and hardstands.

The areas not mapped as native vegetation are identified in Figure 4.2.

and constitute all areas outside of the mapped PCTs. Degraded vegetation in these areas included known pioneer species *Acacia* sp. (Wattles) and *Dodonaea* sp. (Hop Bush) that often inhabit highly disturbed sites. Other vegetation in these areas included isolated cultivar species and pine plantations dominated by *Pinus pinaster* (Cluster Pine) with an exotic understorey and no shrub layers.

Existing human-made dams, ponds and other waterbodies were highly disturbed due to regulated management and previous use as sedimentation basins. Little to no native species were associated with these areas.

4.1.3 Planted native vegetation assessment

A planted native vegetation assessment was undertaken to delineate vegetation occurring in the wild from planted specimens for rehabilitation, plantation and aesthetic or landscape amenity. Table 4.1 identifies there was no planted native vegetation within the project site.

Table 4.1 Planted native vegetation assessment

Number	Question	Answer
Question 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
Question 2	Is the planted native vegetation: a. planted for the purpose of environmental rehabilitation or restoration under an existing conservation obligation listed in BAM Section 11.9(2.), and b. the primary objective was to replace or regenerate a plant community type or a threatened plant species population or its habitat?	a. No b. No

Number	Question	Answer
Question 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: c. species recovery project d. Saving our Species project e. other types of government funded restoration project f. condition of consent for a development approval that required those species to be planted or translocated for the purpose of providing threatened species habitat g. legal obligation as part of a condition or ruling of court. This includes regulatory directed or ordered remedial plantings (e.g. Remediation Order for clearing without consent issued under the BC Act or the Native Vegetation Act) h. ecological rehabilitation to re-establish a PCT or TEC that was, or is carried out under a mine operations plan, or i. 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*)?	c. No d. No e. No f. No g. No h. No i. No
Question 4	Was the planted native vegetation (including individuals of a threatened flora species) undertaken voluntarily for revegetation, environmental rehabilitation or restoration without a legal obligation to secure or provide for management of the native vegetation?	No
Question 5	Is the native vegetation (including individuals of a threatened flora species) planted for functional, aesthetic, horticultural or plantation forestry purposes? This includes examples such as: windbreaks in agricultural landscapes, roadside plantings (including street trees, median strips, roadside batters), landscaping in parks, gardens and sport fields/complexes, macadamia plantations or teatree farms?	No

Paper Size ISO A4

0 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

EnergyCo
Waratah Super Battery - BDAR

Native vegetation extent

Project No. **12582669**
Revision No. **0**
Date **26/10/2022**

FIGURE 4.1

Data source: Imagery, captured by Energy Co on September 2022; Metromap Tile Service: . Created by: mfredle

4.2 Plant community types

4.2.1 Overview

Vegetation within the project site has been assessed in accordance with the BioNet Vegetation Classification for PCT ID, name, vegetation formation, vegetation class and percent cleared value as per the methodologies outlined in Section 2.1.2 and 2.2 (DPE, 2022g). Two PCTs were identified through flora survey and mapped within the project site including, PCT 1636 and 1724) (Figure 4.2). Table 4.2 and Table 4.3 present the BioNet Vegetation Classification PCT data associated with the PCTs. More detailed descriptions are provided in Table 4.4 and Table 4.5.

Table 4.2 PCT 1636 - Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast

PCT ID	1636
PCT name	Scribbly Gum - Red Bloodwood - *Angophora inopina* heathy woodland on lowlands of the Central Coast
Vegetation formation	KF_CH5B Dry Sclerophyll Forest (Shrubby sub-formation)
Vegetation class	Sydney Coastal Dry Sclerophyll Forest
Per cent cleared value (%)	58.00
Extent within subject land (ha)	0.16

Table 4.3 PCT 1724 - Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast

PCT ID	1724
PCT name	Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Vegetation formation	KF–CH9 Forested Wetlands
Vegetation class	Coastal Swamp Forests
Per cent cleared value (%)	31.00
Extent within subject land (ha)	0.10

The extent of each PCT is shown in Figure 4.2 Plant community types. Detailed descriptions of each PCT and justifications for selection are provided in the following sections.

Paper Size ISO A4

0 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

EnergyCo
Waratah Super Battery - BDAR

Plant community type

Project No. **12582669**
Revision No. **0**
Date **26/10/2022**

FIGURE 4.2

\\ghdnet\ghd\AU\Newcastle\Projects\21\12582669\GIS\Maps\Deliverables\12582669_BDAR.aprx
12582669_BDAR_007_Fig4_2_PCT
Print date: 26 Oct 2022 - 10:37

Data source: Imagery, captured by Energy Co on September 2022; Metromap Tile Service: . Created by: mfredle

Table 4.4 ***PCT 1636* description**

PCT 1636 - Scribbly Gum - Red Bloodwood - *Angophora inopina* heathy woodland on lowlands of the Central Coast	
Photo	
Survey effort	One BAM Plot
Conservation significance	BC Act - NA EPBC Act - NA
Patch size	>100 ha
Condition	Moderate
Current vegetation integrity score	55.1
Landscape position	Not associated with moist and topographically higher areas.
Structure	Woodland
Over-storey	*Allocasuarina littoralis* (Black She-Oak), *Angophora costata* (Sydney Red Gum), *Angophora inopina* (Charmhaven Apple), *Corymbia gummifera* (Red Bloodwood), *Eucalyptus haemastoma* (Broad-leaved Scribbly Gum) and *Glochidion ferdinandi* (Cheese Tree).
Mid-storey	*Acacia longifolia* subsp. *sophorae* (Coastal Wattle) and *Dodonaea triquetra* (Large-leaf Hop-bush).
Groundcover	*Capillipedium parviflorum* (Scented-top Grass), *Clematis glycinoides* (Headache Vine), *Entolasia stricta* (Wiry Panic), *Imperata cylindrica* (Blady Grass), *Lomandra filiformis* (Wattle Matt-rush), *Lomandra longifolia* (Spiny-headed Mat-rush), *Dianella caerulea* (Blue Flax-lily), *Lagenophora stipitata* (Common Lagenophora), *Lobelia purpurascens* (Whiteroot) and *Xanthorrhoea latifolia.*
Exotic species	*Cinnamomum camphora* (Camphor Laurel), *Lantana camara* (Lantana), *Andropogon virginicus* (Whisky Grass), *Asparagus aethiopicus* (Asparagus Fern), *Chloris gayana* (Rhodes Grass) and *Hyparrhenia hirta* (Coolatai Grass).

Table 4.5 **PCT 1724 description**

PCT 1724 - Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	
Photo	
Survey effort	One BAM Plot
Conservation significance	BC Act - *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* – Endangered (in some vegetation zones) EPBC Act - NA (does not meet the condition threshold (DAWE, 2021))
Patch size	<5ha
Condition	Moderate
Current vegetation integrity score	52.7
Landscape position	Associated with moist topographically lower areas.
Structure	Forest
Over-storey	*Allocasuarina littoralis* (Black She-Oak), *Cupaniopsis anacardioides* (Tuckeroo), *Glochidion ferdinandi* (Cheese Tree), *Livistona australis* (Cabbage Palm), and *Melaleuca quinquenervia* (Broad-leaved Paperbark).
Mid-storey	*Acacia longifolia* subsp. *sophorae* (Coastal Wattle), *Callistemon rigidus* (Stiff Bottlebrush) and *Dodonaea triquetra* (Large-leaf Hop-bush).
Groundcover	*Entolasia marginata* (Bordered Panic), *Gahnia clarkei* (Tall Saw-sedge), *Glycine clandestina* (Twining Glycine), *Imperata cylindrica* (Blady Grass), *Lepidosperma laterale* (Variable Sword-sedge), *Lomandra* obliqua, *Cryptostylis* spp., *Dianella caerulea* (Blue Flax-lily), *Dichondra repens* (Kidney Weed), *Goodenia heterophylla*, *Lobelia purpurascens* (Whiteroot), *Hypolepis* spp., *Marsdenia rostrata* (Milk Vine), *Parsonsia straminea* (Common Silkpod) and *Xanthorrhoea latifolia*.
Exotic species	*Lantana camara* (Lantana), *Andropogon virginicus* (Whisky Grass), *Ochna serrulata* (Mickey Mouse Plant) and *Pinus pinaster* (Cluster Pine).

4.2.2 Justification of PCT selection

The native vegetation communities within the development footprint include woodland and wet sclerophyll forest. There are clear delineations between these PCTs. PCT 1636: Scribbly Gum - Red Bloodwood - *Angophora inopina* heathy woodland on lowlands of the Central Coast was present within the south east corner of the project site where the soils are more free-draining. PCT 1724: Broad-leaved Paperbark –Swamp Oak – Saw Sedge swamp forest was in the topographically lower areas of the project site, where drainage was comparatively impeded.

The above factors affect the species assemblage, canopy composition and the degree of shrub cover in the understorey observed across project site and in each PCT. Diagnostic species, whole of species assemblage, vegetation structure and other landscape and soil characteristics described for each candidate PCT were compared with plot data and other site observations.

The pre-clear PCT mapping over the project site is identified as 3583, Hunter Coast Lowland Scribbly Gum Forest which is commensurate to PCT 1636 however, differs in species composition to PCT 1724 (DPE, 2022g).

Justifications for the PCT assignments are discussed below.

PCT - 1636: Scribbly Gum - Red Bloodwood - *Angophora inopina* heathy woodland on lowlands of the Central Coast.

In identifying candidate PCT 1636 within the subject area, IBRA subregional distribution and dominance of *Angophora costata* (Sydney Red Gum), *Corymbia gummifera* (Red Bloodwood), and *Eucalyptus haemastoma* (Broad-leaved Scribbly Gum) in the canopy were used as the main diagnostic factors. These species were co dominant in patches within the area in question, and positive indicators of the PCT. The location of the vegetation in space also matches the PCT description which describes PCT 1636 as eucalypt dominated Woodland with a shrubby mid-stratum and a graminoid ground cover occurring on coastal lowlands from northern Tuggerah Lake to the northern end of Lake Macquarie which aligned to the surveyed floristics. The substrate is sandstone with moist sandy soils and the elevation is usually under 100m (ELA, 2017). All the above factors are indicative of PCT 1636.

PCT - 1724: Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast

PCT 1724 was selected due to the characteristic species of its upper stratum specifically *Melaleuca quinquenervia* and *Livistona australis* as well as conforming to the IBRA Sydney Basin IBRA bioregion and Wyong sub-region. The vegetation in question contained *Melaleuca quinquenervia* and *Callistemon salignus* with diagnostic species *Dianella caerulea*, fitting the description of the PCT data in the BioNet Vegetation Classification system. This PCT is identified as Swamp Open Forest with areas of standing water dominated by Melaleucas with the ground stratum a mix of sedges; ferns grasses and graminoid species. All the above factors are indicative of PCT 1724.

4.2.3 Alignment with TECs listed under the BC Act

According to BioNet Vegetation Classification PCT data, no records can be found under PCT 1724 that associate it with Threatened Biodiversity or TECs. However, the ground-truthed PCT 1724 within the subject land contains characteristic plant species listed in Part of the Final Determination for Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions and is listed as an endangered ecological community under the BC Act.

Table 4.6 provides an assessment against the I.D. Guidelines for Swamp Sclerophyll Forest.

Table 4.6 Assessment against I.D Guidelines for Swamp Sclerophyll Forest

Key Indicators	Response
Is the site on the coastal floodplain of the NSW North Coast, Sydney Basin or South East Corner bioregion?	Yes, the subject land is within the coastal floodplain of the Sydney Basin bioregion
Is the site associated with humic clay or sandy loams soils?	No, the site is associated with a disturbed terrain soil landscape.

Key Indicators	Response
	The subject land is mapped as Gosford - Cooranbong Coastal Slopes which does include loamy soils along creek lines. However, as the mapped PCT area is not along a creek line, the site does not fall under this criterion.
Is the site subject to waterlogging and/or below the highest flood level?	Yes, the mapped PCT area is subject to waterlogging due to anthropogenic drainage lines and dams within proximity to the mapped area.
Are any of the tree species present at the site listed as characteristic of Swamp Sclerophyll Forest in the table?	Yes
Are any of the shrub and/or groundlayer species listed as characteristic in the table present?	Yes
Conclusion	PCT 1724 corresponds to Swamp Sclerophyll Forest in accordance with the Final Determination for Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions. The community is found on the coastal floodplains of NSW, has a dense to sparse tree layer of *Melaleuca quinquenervia* as the dominant species with other diagnostic species occurring such as *Livistona australis and Dianella caerulea*.

4.2.4 Alignment with EPBC Act listed TECs

PCT 1724 is commensurate with *Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland*, listed as an endangered ecological community under the EPBC Act. Table 4.7 provides an assessment of key diagnostics for the community (DAWE, 2021). Please see Appendix E for further MNES assessment.

Table 4.7 Key diagnostics (DAWE, 2021)

Criteria	Response:
Occurs on the mainland and islands near to the coast (within 20 km) from South East Queensland to south-eastern NSW specifically within these IBRA Bioregions: South Eastern Queensland (SEQ); NSW North Coast (NNC); Sydney Basin (SYB) and the Bateman sub-region of the South East Corner (SEC).	The subject site occurs within the SYB IBRA region.
Occurs in coastal catchments typically below 20m ASL, but occasionally up to 220m ASL.	The subject site occurs within a coastal catchment at ~50m ALS.
Occurs on hydric soils with inundation patterns ranging from intermittent to episodic.	The soil within vegetation patch is potentially hydric and intermittent inundation.
The vegetation structure varies from tall closed to open forest to woodland, to dense (closed) shrubland or scrub forest. Minimum crown cover (see footnote 5, p. 4) is at least 10%, but it is more typically in the range 50% to 70%.	The vegetation patch occurs has a canopy cover that is at least 10%.
From South East Queensland to the Sydney Basin Bioregion, the canopy is typically dominated or co-dominated by *Melaleuca quinquenervia* and/or *Eucalyptus robusta*. In some areas, the canopy may be locally dominated by other melaleuca species including *M. dealbata* (SEQ bioregion) (rarely); *M. biconvexa* (mid-NSW coast to south of Sydney); *M. decora* (north of Shoalhaven), frequently with *Parsonsia straminea* climbing on the trunks of canopy species. In the SEC bioregion, *M. ericifolia* may occur as a dominant canopy or sub-canopy species.	Canopy dominated by *Melaleuca quinquenervia* and *Parsonsia straminea* occurred.
Other tree species may occur in the canopy (or sub-canopy) in some areas, but they are not dominant across a patch, including *Casuarina glauca*, *Banksia* spp., *Callistemon salignus*, *Corymbia intermedia* (Pink Bloodwood), *E. tereticornis*, (Forest Red Gum/Queensland Blue Gum), *E.*	Sub-canopy species included *Casuarina glauca*, *Banksia* spp., *Callistemon salignus*, *Livistona australis* and *Lophostemon* spp.

Criteria	Response:
longifolia (Woollybutt), *E. botryoides* (Southern Mahogany/Bangalay), *E. ovata* (Swamp Gum), *Livistona australis* and/or *Lophostemon* spp.	
The understorey typically includes a variable ground layer, depending on the canopy cover and inundation rate/period. Tall sedges (typically *Gahnia* spp.) and/or ferns often dominate the ground layer, mixed with graminoids and other herbs, especially *Imperata cylindrica* (Blady Grass).	Understorey species included *Gahnia* spp., ferns, mixed with graminoids and other herbs, e.g. *Imperata cylindrica* (Blady Grass).
While they can occur regularly in the ground layer, the ecological community is not present if halophytic species, more typically associated with estuarine/saltmarsh areas, dominate the ground layer of a patch, for example, *Appium prostratum*, *Atriplex cineria*, *Chenopodium glaucum*, *Rhagodia candolleaus* and *Samolus repens*.	No halophytic species were present that are more typically associated with estuarine/saltmarsh areas.
Additional information to assist in identifying the ecological community:	**Response:**
The smallest patch size that can be identified is 0.25 ha.	The patch of vegetation is 0.10ha (<0.25ha)
Condition classes, categories, and thresholds – Patch size thresholds (Table 2 in DAWE, 2021):	**Response:**
Large patch - The patch is at least 5 ha. It may or may not be contiguous with other native vegetation.	Patch less than 5ha
Medium patch - The patch is at least 2 ha and less than 5 ha. It may or may not be contiguous with other native vegetation.	Patch less than 2ha
Small contiguous patch - The patch is at least 0.25 ha and less than 2 ha and is part of a larger area of native vegetation of at least 5 ha.	Patch is greater than 0.25ha but does not form part of a contiguous patch.
Small patch - The patch is at least 0.5 ha and less than 2 ha which is isolated or part of a small native vegetation remnant less than 5 ha in total.	Patch less than 0.5ha
Conclusion	As the patch of vegetation does not meet any of the patch size thresholds, the vegetation is not protected under the EPBC Act.

4.3 Threatened ecological communities

Presence or absence of TECs identified within the project site are detailed in Section 4.2.3 and 4.2.4. Table 4.8 and Figure 4.3 shows the extent of confirmed TEC Swamp Sclerophyll Forest within the subject land.

Table 4.8 TECs within the subject land

TEC name	Profile ID (from TBDC)	BC Act status	EPBC Act status	Associated vegetation zones within the subject land	Area within subject land (ha)
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	10786	E	(Vegetation did not meet the EPBC listing condition threshold (DAWE, 2021))	Zone 2	0.10

Paper Size ISO A4

0 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

EnergyCo
Waratah Super Battery - BDAR

Project No. **12582669**
Revision No. **0**
Date **26/10/2022**

Threatened ecological communities

FIGURE 4.3

\\ghdnet\ghd\AU\Newcastle\Projects\21\12582669\GIS\Maps\Deliverables\12582669_BDAR.aprx
12582669_BDAR_014_Fig4_3_TEC
Print date: 26 Oct 2022 - 10:39

Data source: Imagery, captured by Energy Co on September 2022; Roads, Railways - DCS, 2022; Metromap Tile Service: . Created by: mfredle

4.4 Vegetation zones

Vegetation zone(s) and patch size were based on an assessment of the condition of each confirmed mapped PCT or vegetation zone as per the methodologies identified in Section 2. Native vegetation communities in the project site were assigned to PCT 1636 (zone 1) and PCT 1724 (zone 2) by comparing floristic descriptions of PCTs in the BioNet database with BAM input data and plot datasheets. Appendix C shows the species and vegetation integrity plot data collected during survey and Appendix E shows the flora species recorded within the project site.

The native vegetation in the project site was stratified into vegetation zones in accordance with the BAM. A vegetation zone is defined in the BAM as a relatively homogenous area that is the same PCT and has the same broad condition state. Each vegetation zone was assigned a patch size in accordance with Subsection 4.3.2 of the BAM (DPIE, 2020a).

PCT - 1636: Scribbly Gum - Red Bloodwood - *Angophora inopina* heathy woodland on lowlands of the Central Coast, was defined as being subject to understorey clearing and other past disturbances and classed as in 'moderate' condition.

PCT - 1724: Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast, was defined as having a high composition and cover of native species associated with its PCT however, the canopy cover was dominated by *Pinus pinaster* (Cluster Pine). PCT 1724 was also of 'moderate' condition.

Table 4.1 and Figure 4.4 identify vegetation zones, condition state and area (ha) for zones delineated by plot Q03 and Q04 (Appendix C).

4.4.1 Vegetation integrity survey plots

Due to the small amount of native vegetation within the project site, one integrity survey plot was sampled for each of the two PCTs and each were treated each as a vegetation zone. This achieves the minimum number of plots required in accordance with the BAM (DPIE, 2020a).

The vegetation integrity scores for each zone are summarised in Table 4.10. The raw plot data can be found in Appendix F.

Flora species

A full list of flora species recorded within the project site and adjoining study area is provided in Appendix C. Characteristic plant species are discussed above in relation to the vegetation zones occurring at the study area.

Table 4.9 Vegetation zones and sizes

Vegetation zone ID	PCT ID number and name	Condition / other defining feature	Area (ha)	Patch size class (select multiple if areas of native vegetation are discontinuous)	No. vegetation integrity plots required	No. vegetation integrity plots completed	No. vegetation integrity plots used in assessment	Plot IDs of vegetation integrity plots used in assessment
Zone 1	**1636** - Scribbly Gum - Red Bloodwood - *Angophora inopina* heathy woodland on lowlands of the Central Coast	Moderate	0.16	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	1	1	Q03
Zone 2	**1724** - Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	Moderate	0.10	☒ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☐ >100 ha	1	1	1	Q04

Table 4.10 Vegetation integrity scores

Vegetation zone ID	Plot ID	Composition condition score	Structure condition score	Function condition score (where relevant)	Vegetation integrity score	Hollow bearing trees present?
Zone 1 – PCT - 1636	Q03	32.9	63.5	80.0	55.1	No
Zone 2 – PCT - 1724	Q04	71.8	37.8	53.9	52.7	No

Paper Size ISO A4

0 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

EnergyCo
Waratah Super Battery - BDAR

Vegetation zones

Project No. **12582669**
Revision No. **0**
Date **26/10/2022**

FIGURE 4.4

\\ghdnet\ghd\AU\Newcastle\Projects\21\12582669\GIS\Maps\Deliverables\12582669_BDAR.aprx
12582669_BDAR_008_Fig4_4_VegetationZones
Print date: 26 Oct 2022 - 10:38

Data source: Imagery, captured by Energy Co on September 2022; Metromap Tile Service: . Created by: mfredle

5. Habitat suitability for threatened and migratory species

5.1 Identification of threatened species for assessment

5.1.1 Ecosystem credit species

Table 5.1 lists all ecosystem credit species that are considered likely to occur on or use the project site. These species were derived using the following databases and reports:

– BAM-C (Biodiversity Assessment Method Calculator Version 1.4) (DPE, 2022b)
– TBDC (Threatened Biodiversity Data Collection) (DPE, 2022h)
– Previous surveys:
  - BioNet Atlas threatened flora and fauna records (DPE, 2022f)
  - Niche (Niche Environment and Heritage) (2020). Targeted flora and fauna surveys. Munmorah Power Station. Prepared for Generator Property Management Pty Ltd. July 2020 (Niche, 2020)
  - Niche (2021). Targeted flora and fauna survey of conservation areas. Munmorah Power Station. Prepared for Generator Property Management Pty Ltd. May 2021 (Niche, 2021).

Table 5.1 also identifies and provides justifications for the removal of species from the BAM-C auto-populated list in accordance with BAM Subsections 5.2.1 and 5.2.2 (DPIE, 2020a). Geographic limitations, habitat constraints and vagrant species are the only reasons used for excluding ecosystem credit species. No additional species were added due to being recently listed under the BC Act and not yet added to the TBDC.

Table 5.1 Predicted ecosystem credit species

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
Regent Honeyeater (Foraging)	*Anthochaera phrygia*	CE	CE	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	1724_Mod	Very High
Gang-gang Cockatoo (Foraging)	*Callocephalon fimbriatum*	V	E	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	1636_Mod 1724_Mod	Moderate
Glossy Black-Cockatoo (Foraging)	*Calyptorhynchus lathami*	V	-	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA –	1636_Mod 1724_Mod	High
Speckled Warbler	*Chthonicola sagittata*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	1636_Mod	High
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	1636_Mod	High
Varied Sittella	*Daphoenositta chrysoptera*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	1636_Mod 1724_Mod	Moderate

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
Spotted-tailed Quoll	*Dasyurus maculatus*	V	E	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	1636_Mod 1724_Mod	High
Black-necked Stork	*Ephippiorhynchus asiaticus*	E	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Habitat constraints: – No swamp – No shallow, open freshwater or saline wetlands or shallow edges of deeper wetlands within 300m of these swamps – No Shallow lakes, lake margins and estuaries within 300m of these waterbodies	NA	Moderate
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	1636_Mod	High
Little Lorikeet	*Glossopsitta pusilla*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	1636_Mod 1724_Mod	Very High
Painted Honeyeater	*Grantiella picta*	V	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Habitat constraints: – No mistletoes present at a density of greater than five mistletoes per hectare.	NA	Moderate

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
White-bellied Sea-Eagle (Foraging)	*Haliaeetus leucogaster*	V	-	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☒ Current survey	Yes	NA	1636_Mod 1724_Mod	High
Little Eagle (Foraging)	*Hieraaetus morphnoides*	V	-	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	1636_Mod 1724_Mod	Moderate
White-throated Needletail	*Hirundapus caudacutus*	-	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	1636_Mod 1724_Mod	High
Black Bittern	*Ixobrychus flavicollis*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Habitat constraints: – No land within 40 m of freshwater and estuarine wetlands, in areas of permanent water and dense vegetation.	NA	Moderate
Swift Parrot (Foraging)	*Lathamus discolor*	E	CE	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	1636_Mod 1724_Mod	Moderate
Square-tailed Kite (Foraging)	*Lophoictinia isura*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	1636_Mod	Moderate

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	1636_Mod	Moderate
Eastern Coastal Free-tailed Bat	*Micronomus norfolkensis*	V	-	No	☒ BAM-C ☐ TBDC ☒ Previous survey ☐ Current survey	Yes	NA	1636_Mod 1724_Mod	High
Little Bent-winged Bat (Foraging)	*Miniopterus australis*	V	-	Yes	☒ BAM-C ☐ TBDC ☒ Previous survey ☐ Current survey	Yes	NA	1636_Mod 1724_Mod	High
Large Bent-winged Bat (Foraging)	*Miniopterus orianae oceanensis*	V	-	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	1636_Mod 1724_Mod	High
Turquoise Parrot	*Neophema pulchella*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	1636_Mod	High
Barking Owl (Foraging)	*Ninox connivens*	V	-	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	1636_Mod 1724_Mod	High
Powerful Owl (Foraging)	*Ninox strenua*	V	-	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☒ Current survey	Yes	NA	1636_Mod	High

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
Eastern Osprey (Foraging)	*Pandion cristatus*	V	-	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	1636_Mod 1724_Mod	High
Yellow-bellied Glider	Petaurus australis	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Habitat constraints: – No hollow bearing trees – No hollows > 25cm diameter.	NA	High
Scarlet Robin	*Petroica boodang*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	1636_Mod	Moderate
Golden-tipped Bat	*Phoniscus papuensis*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	1636_Mod 1724_Mod	High
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	1636_Mod	Moderate
Eastern Chestnut Mouse	*Pseudomys gracilicaudatus*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	1636_Mod	Moderate

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
Grey-headed Flying-fox (Foraging)	*Pteropus poliocephalus*	V	V	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	1636_Mod 1724_Mod	High
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	1636_Mod 1724_Mod	High
Greater Broad-nosed Bat	*Scoteanax rueppellii*	V	-	No	☐ BAM-C ☐ TBDC ☒ Previous survey ☐ Current survey	Yes	NA	1636_Mod	High
Masked Owl (Foraging)	*Tyto novaehollandiae*	V	-	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	1636_Mod	High

5.1.2 Species credit species

All listed predicted species credit species were automatically populated in the BAM-C. Flora species credit species in Table 5.2 and fauna species credit species in Table 5.3 have been identified. Justifications are required where a species has been removed from the BAM-C auto-populated list. Geographic limitations, habitat constraints and microhabitats are the only reasons used for excluding a flora species credit species. Geographic limitations, habitat constraints, vagrant species and microhabitats are the only reasons used for excluding a fauna species credit species. Geographic limitations and habitat constraints used to justify removal of a species are based upon those held within the TBDC. All justifications for the removal of species are in accordance with BAM Subsections 5.2.1 and 5.2.2 (DPIE, 2020a).

Table 5.2 Predicted flora species credit species

Common name	Scientific name	Listing status		Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act				
Bynoe's Wattle	*Acacia bynoeana*	E	V	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 1 - 1636_Mod
Charmhaven Apple	*Angophora inopina*	V	V	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 1 - 1636_Mod Zone 2 - 1724_Mod
Trailing Woodruff	*Asperula asthenes*	V	V	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 1 - 1636_Mod Zone 2 - 1724_Mod
Thick-leaf Star-hair	*Astrotricha crassifolia*	V	V	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 1 - 1636_Mod
Netted Bottle Brush	*Callistemon linearifolius*	V	-	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 1 - 1636_Mod
-	*Corunastylis* sp. Charmhaven (NSW896673)	CE	CE	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 1 - 1636_Mod
Leafless Tongue Orchid	*Cryptostylis hunteriana*	V	V	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 1 - 1636_Mod
Camfield's Stringybark	*Eucalyptus camfieldii*	V	V	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 1 - 1636_Mod
-	*Eucalyptus parramattensis* subsp. *decadens*	V		☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 1 - 1636_Mod Zone 2 - 1724_Mod

Common name	Scientific name	Listing status		Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act				
Eucalyptus parramattensis C. Hall. subsp. *parramattensis* in Wyong and Lake Macquarie local government areas	*Eucalyptus parramattensis* subsp. *parramattensis* - endangered population	EP	-	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA (Note: Subject land occurs with the superseded Wyong LGA).	Zone 1 - 1636_Mod Zone 2 - 1724_Mod
Variable Midge Orchid	*Genoplesium insigne*	CE	E	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 2 - 1724_Mod
Small-flower Grevillea	*Grevillea parviflora* subsp. *parviflora*	V	V	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 1 - 1636_Mod Zone 2 - 1724_Mod
-	*Maundia triglochinoides*	V	-	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA (Note: Occurrence of riparian areas/drainage lines, water ponding, man-made dams and drainage channels up to 1 m)	Zone 2 - 1724_Mod
Biconvex Paperbark	*Melaleuca biconvexa*	V	V	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 2 - 1724_Mod
Grove's Paperbark	*Melaleuca groveana*	V	-	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 1 - 1636_Mod
Tall Knotweed	*Persicaria elatior*	V	V	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 2 - 1724_Mod
Tranquility Mintbush	*Prostanthera askania*	E	E	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Geographic limitations: - North of Wyong River in Central Coast LGA	NA

Common name	Scientific name	Listing status		Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act				
Eastern Australian Underground Orchid	*Rhizanthella slateri*	V	E	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 1 - 1636_Mod
Heath Wrinklewort	*Rutidosis heterogama*	V	V	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 1 - 1636_Mod
-	*Tetratheca glandulosa*	V	-	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 1 - 1636_Mod
Black-eyed Susan	*Tetratheca juncea*	V	V	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 1 - 1636_Mod Zone 2 - 1724_Mod

Table 5.3 lists fauna species credit species that were automatically populated from the BAM-C and provides justifications for the inclusion and removal of species in accordance with BAM Subsections 5.2.1 and 5.2.2 (DPIE, 2020a).

Table 5.3 Predicted fauna species credit species

Common name	Scientific name	Listing status		Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act				
Regent Honeyeater (Breeding)	*Anthochaera phrygia*	CE	CE	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Habitat constraints: – Mapped important areas for this species is a habitat constraint. The development footprint does not contain land that is mapped as an important area for this species.	NA
Bush Stone-curlew	*Burhinus grallarius*	E	-	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA (	Zone 1 - 1636_Mod Zone 2 - 1724_Mod
Gang-gang Cockatoo (Breeding)	*Callocephalon fimbriatum*	V	E	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Habitat constraints: – No Eucalypt tree species with hollows greater than 10 cm diameter or larger.	NA
Glossy Black-Cockatoo (Breeding)	*Calyptorhynchus lathami*	V	-	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Habitat constraints: – No living or dead tree with hollows greater than 15cm diameter and greater than 8m above ground.	NA
Eastern Pygmy-possum	*Cercartetus nanus*	V	-	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 1 - 1636_Mod Zone 2 - 1724_Mod

Common name	Scientific name	Listing status		Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act				
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 1 - 1636_Mod Zone 2 - 1724_Mod
Wallum Froglet	*Crinia tinnula*	V	-	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 1 - 1636_Mod Zone 2 - 1724_Mod
White-bellied Sea-Eagle (Breeding)	*Haliaeetus leucogaster*	V	-	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA –	NA
Giant Burrowing Frog	*Heleioporus australiacus*	V	V	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 1 - 1636_Mod
Little Eagle (Breeding)	*Hieraaetus morphnoides*	V	-	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Habitat constraint: – No large stick nests or breeding activity recorded.	NA
Pale-headed Snake	*Hoplocephalus bitorquatus*	V	-	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 1 - 1636_Mod Zone 2 - 1724_Mod

Common name	Scientific name	Listing status		Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act				
Swift Parrot (Breeding)	*Lathamus discolor*	E	CE	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Habitat constraints: – Mapped important areas for this species is a habitat constraint. The development footprint does not contain land that is mapped as an important area for this species. – Swift parrot breed only in Tasmania	NA
Green and Golden Bell Frog	*Litoria aurea*	E	V	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA (Note: Semi-permanent/ ephemeral wet areas).	Zone 1 - 1636_Mod Zone 2 - 1724_Mod
Green-thighed Frog	*Litoria brevipalmata*	V	-	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA (Note: Semi-permanent/ephemeral wet areas| Swamps| Waterbodies).	Zone 1 - 1636_Mod Zone 2 - 1724_Mod
Square-tailed Kite (Breeding)	*Lophoictinia isura*	V	-	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Habitat constraint: No stick nests within the project site.	NA
Little Bent-winged Bat (Breeding)	*Miniopterus australis*	V	-	☒ BAM-C ☐ TBDC ☒ Previous survey ☐ Current survey	No	Habitat constraint: – No cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records in BioNet with microhabitat code 'IC – in cave' – No observation type code 'E nest-roost' with numbers of individuals >500 or from the scientific literature	NA

Common name	Scientific name	Listing status		Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act				
Large Bent-winged Bat (Breeding)	*Miniopterus orianae oceanensis*	V	-	☒ BAM-C ☐ TBDC ☒ Previous survey ☐ Current survey	No	Habitat constraint: – No cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records in BioNet with microhabitat code 'IC – in cave'. – No observation type code 'E nest-roost' with numbers of individuals >500 or from the scientific literature.	NA
Southern Myotis	*Myotis macropus*	V	-	☒ BAM-C ☐ TBDC ☒ Previous survey ☐ Current survey	No	Habitat constraints: – No hollow bearing trees – Not within 200 m of riparian zones. – No bridges, caves or artificial structures within 200 m of riparian zones and waterbodies including rivers, creeks, billabongs, lagoons, dams and other waterbodies on or within 200m of the site. – No rivers, creeks, billabongs, lagoons, dams and other waterbodies on or within 200m of the site (dam will be removed).	NA
Barking Owl (Breeding)	*Ninox connivens*	V	-	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Habitat constraints: – No living or dead trees with hollows greater than 20 cm in diameter and greater than 4m above the ground.	NA
Powerful Owl (Breeding)	*Ninox strenua*	V	-	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Habitat constraints: – No living or dead trees with hollows greater than 20 cm in diameter at least 0.5 m deep.	NA
Eastern Osprey (Breeding)	*Pandion cristatus*	V	-	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Habitat constraints: – No presence of stick-nests in living and dead trees (>15m) or artificial structures within 100m of a floodplain for nesting).	NA

Common name	Scientific name	Listing status		Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act				
Giant Dragonfly	*Petalura gigantea*	E	-	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Habitat constraints: – The subject site is not < 500 m of a swamp or bog. Colongra Swamp Nature Reserve occur over 500m to the west of the project site.	NA
Greater Glider	*Petauroides volans*	-	V	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 1 - 1636_Mod Zone 2 - 1724_Mod
Squirrel Glider	*Petaurus norfolcensis*	V	-	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 1 - 1636_Mod Zone 2 - 1724_Mod
Brush-tailed Phascogale	*Phascogale tapoatafa*	V	-	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 1 - 1636_Mod Zone 2 - 1724_Mod
Brush-tailed Rock-wallaby	*Petrogale penicillata*	E	V	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Habitat constraints: – The project site is not within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines.	NA
Koala	*Phascolarctos cinereus*	E	E	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 1 - 1636_Mod Zone 2 - 1724_Mod

Common name	Scientific name	Listing status		Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act				
Common Planigale	*Planigale maculata*	V	-	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	NA	NA
Long-nosed Potoroo	*Potorous tridactylus*	V	V	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Habitat constraints: – The site lacks a dense shrub layer or alternatively high canopy cover exceeding 70% (to capture populations inhabiting wet sclerophyll and rainforest).	NA
Grey-headed Flying-fox (Breeding)	*Pteropus poliocephalus*	V	V	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Habitat constraints: – There are no breeding camps present within or in proximity to the project site or known to occur in the close proximity to the project site (DCCEEW, 2022a).	NA
Masked Owl (Breeding)	*Tyto novaehollandiae*	V	-	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Habitat constraints: – Project site harbours no living or dead trees with hollows greater than 20cm diameter or caves.	NA
Mahony's Toadlet	*Uperoleia mahonyi*	E	-	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	NA	Zone 1 - 1636_Mod Zone 2 - 1724_Mod

5.2 Presence of candidate species credit species

Table 5.4 identifies the candidate flora species credit species selected for further assessment or assumed present within the subject land based on the remaining list of candidate species credit species and in accordance with BAM Subsection 5.2.4. The species were determined as present using assumed presence within the subject land or targeted using threatened species survey methodologies.

Table 5.4 Determining the Prescence of candidate flora species credit species on the subject land

Common name	Scientific name	Listing status		Method used to determine presence	Present?	Further assessment required? (BAM Subsections 5.2.5 and 5.2.6)
		BC Act	EPBC Act			
Bynoe's Wattle	*Acacia bynoeana*	E	V	Targeted threatened species survey	No	No
Charmhaven Apple	*Angophora inopina*	V	V	Targeted threatened species survey	Yes	Yes
Trailing Woodruff	*Asperula asthenes*	V	V	Assumed present	Assumed present	Yes
Thick-leaf Star-hair	*Astrotricha crassifolia*	V	V	Targeted threatened species survey	No	No
Netted Bottle Brush	*Callistemon linearifolius*	V	-	Targeted threatened species survey	Assumed present	Yes
Wyong Midge Orchid 2	*Corunastylis* sp. Charmhaven (NSW896673)	CE	CE	Assumed present	Assumed present	Yes
Leafless Tongue Orchid	*Cryptostylis hunteriana*	V	V	Assumed present	Assumed present	Yes
Camfield's Stringybark	*Eucalyptus camfieldii*	V	V	Targeted threatened species survey	No	No
-	*Eucalyptus parramattensis* subsp. *decadens*	V		Targeted threatened species survey	No	No
Eucalyptus parramattensis C. Hall. subsp. *parramattensis* in Wyong and Lake Macquarie local government areas	*Eucalyptus parramattensis* subsp. *parramattensis* - endangered population	EP	-	Targeted threatened species survey	No	No
Variable Midge Orchid	*Genoplesium insigne*	CE	E	Targeted threatened species survey	No	No
Small-flower Grevillea	*Grevillea parviflora* subsp. *parviflora*	V	V	Targeted threatened species survey	No	No
-	*Maundia triglochinoides*	V	-	Assumed present	Assumed present	Yes
Biconvex Paperbark	*Melaleuca biconvexa*	V	V	Targeted threatened species survey	No	No

Common name	Scientific name	Listing status		Method used to determine presence	Present?	Further assessment required? (BAM Subsections 5.2.5 and 5.2.6)
		BC Act	EPBC Act			
Grove's Paperbark	*Melaleuca groveana*	V	-	Targeted threatened species survey	No	No
Tall Knotweed	*Persicaria elatior*	V	V	Assumed present	Assumed present	Yes
Eastern Australian Underground Orchid	*Rhizanthella slateri*	V	E	Targeted threatened species survey	No	No
Heath Wrinklewort	*Rutidosis heterogama*	V	V	Targeted threatened species survey	No	No
-	*Tetratheca glandulosa*	V	-	Targeted threatened species survey	No	No
Black-eyed Susan	*Tetratheca juncea*	V	V	Targeted threatened species survey	No	No

Table 5.5 identifies the candidate flora species credit species selected for further assessment or assumed presence within the subject land based on the remaining list of candidate species credit species and in accordance with BAM Subsection 5.2.4. The species were determined as present using assumed presence within the subject land or targeted using threatened species survey methodologies.

Table 5.5 Determining the Prescence of candidate fauna species credit species on the subject land

Common name	Scientific name	Listing status		Method used to determine presence	Present?	Further assessment required? (BAM Subsections 5.2.5 and 5.2.6)
		BC Act	EPBC Act			
Bush Stone-curlew	*Burhinus grallarius*	E	-	Targeted threatened species survey	No	No
Eastern Pygmy-possum	*Cercartetus nanus*	V	-	Assumed present	Assumed present	Yes
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	Assumed present	Assumed present	Yes
Wallum Froglet	*Crinia tinnula*	V	-	Assumed present	Assumed present	Yes
Giant Burrowing Frog	*Heleioporus australiacus*	V	V	Assumed present	Assumed present	Yes
Pale-headed Snake	*Hoplocephalus bitorquatus*	V	-	Assumed present	Assumed present	Yes
Green and Golden Bell Frog	*Litoria aurea*	E	V	Assumed present	Assumed present	Yes
Green-thighed Frog	*Litoria brevipalmata*	V	-	Assumed present	Assumed present	Yes
Greater Glider	*Petauroides volans*	-	V	Targeted threatened species survey	No	No

Common name	Scientific name	Listing status		Method used to determine presence	Present?	Further assessment required? (BAM Subsections 5.2.5 and 5.2.6)
		BC Act	EPBC Act			
Squirrel Glider	*Petaurus norfolcensis*	V	-	Assumed present	Assumed present	Yes
Brush-tailed Phascogale	*Phascogale tapoatafa*	V	-	Assumed present	Assumed present	Yes
Koala	*Phascolarctos cinereus*	E	E	Targeted threatened species survey	No	No
Common Planigale	*Planigale maculata*	V	-	Assumed present	Assumed present	Yes
Mahony's Toadlet	*Uperoleia mahonyi*	E	-	Assumed present	Assumed present	Yes

5.2.1 Weeds

Priority weeds

NSW priority weed species were recorded in the project site (Table 5.6). All of these species have a general biosecurity duty under the NSW *Biosecurity Act 2015* which requires any person who deals with the plant to ensure the biosecurity risk of the weed is prevented, eliminated or minimised, so far as is reasonably practicable. Regional measures for many species include the requirement that land managers should mitigate the risk of new weeds being introduced to their land.

Weeds of National Significance

Under the *Australian Weeds Strategy 2017 to 2027* (Invasive Plants and Animals Committee 2016), 32 introduced plants have been identified as Weeds of National Significance (WoNS). These weeds are regarded as the worst weeds in Australia because of their invasiveness, potential for spread, and economic and environmental impacts. Three WoNS were recorded in the study area (see Table 5.6).

High threat weeds

Many weeds are also identified as high threat weeds within the BAM. These are plants not native to Australia that if not controlled will invade and outcompete native plant species. The cover of high threat weeds in a plot is entered into the BAM calculator. 10 high threat weeds were recorded in the study area (Table 5.6).

Table 5.6 Weed species recorded

Species	NSW Priority weeds	Weed of National Significance	High Threat Weed
Camphor laurel (*Cinnamomum camphora*)		-	Yes
Micky Mouse plant (*Ochna serrulate*)	-	-	Yes
Whiskey grass (*Andropogon virginicus*)	-	-	Yes
Rhodes grass (*Chloris gayana*)	-	-	Yes
Pampas grass (*Cortaderia selloana*)	-	-	Yes
Coolatai grass (*Hyparrhenia hirta*)	-	-	Yes
Balloon vine (*Cardiospermum grandiflorum*)	-	-	Yes
Lantana (*Lantana camara*)	Yes	Yes	Yes
Boneseed (*Chrysanthemoides monilifera*)	Yes		Yes
Fireweed (*Senecio madagascariensis*)	Yes	Yes	Yes

5.3 Previous studies

Previous ecological studies targeted threatened fauna within the project site and in the surrounding locality and flora surveys were undertaken further south of the project site.

Targeted fauna surveys in proximity to and within the project site included:

– spotlighting
– call playback for threatened frogs as well as specific
– active threatened frog surveys
– echolocation recordings for threatened microbats.
– diurnal and nocturnal bird surveys
– habitat assessment
– nest box monitoring and remote sensing.

Species recorded within the project site included:

– *Miniopterus australis* (Little Bent-winged Bat)
– *Miniopterus orianae oceanensis* (Large Bent-winged Bat)
– *Micronomus norfolkensis* (Eastern Coast Free-tailed Bat)
– *Myotis macropus* (Southern Myotis)

The Southern Myotis was recorded approximately 330 metres west of the project site. The report suggested that due to the lack of riparian vegetation this species was considered to be foraging away from its roost which was assumed to be further north west up Hammond Canal towards Colongra Swamp Nature Reserve.

Threatened species recorded outside of the project site in the surrounding locality included:

– Squirrel Glider (*Petaurus norfolcensis*)
– Wallum Froglet (*Crinia tinnula*)
– Powerful Owl (*Ninox strenua*)
– Brown Treecreeper (*Climacteris picumnus victoriae*)
– Eastern Osprey (*Pandion cristatus*)
– White-bellied Sea-Eagle (*Haliaeetus leucogaster*)
– Grey-headed Flying-fox (*Pteropus poliocephalus)*
– White-throated Needletail (*Hirundapus caudacutus*).

Fauna habitat assessment identified hollow hollow-bearing trees stags >150 metres south west of the project site.

Four threatened specimens of *Thelymitra longiloba* (Lobed Sun Orchid) were observed. This species had eight previous recordings in the Atlas of Living Australia database prior to the surveys being undertaken. A small area supporting a population of *Angophora inopina* (Charmhaven Apple) (vulnerable under the BC Act and EPBC Act) is also known to be present to the south of the project site.

Targeted flora surveys in the surrounding location Niche (2020; 2021) identified two threatened flora species including *Corunastylis* sp. Charmhaven (NSW896673) (critically endangered under the BC Act and EPBC Act) and Charmhaven Apple. *Corunastylis sp.* was recorded approximately 1.2 km north of the project site and two Charmhaven Apple specimens were recorded approximately 800 metres to the northwest of the project site.

In summary, the majority of the project site was not directly surveyed. No PCTs or vegetation zones were stratified and mapped under the survey effort by Niche (2020; 2021). Fauna recorded within the project site included, the Eastern Coastal Free-tailed Bat, Little Bent-winged Bat, Greater Broad-nosed Bat and Southern Myotis.

5.4 Threatened species survey results

5.4.1 Threatened flora

One threatened flora species, *Angophora inopina* (Charmhaven Apple) was identified within the subject land via threatened species transects. No further threatened flora species were recorded within the project site during field surveys for this BDAR. Refer to Figure 2.1 to Figure 2.3 for survey locations and Figure 4.3 for threatened species recorded in the subject land. As identified in Table 5.4, a number of threatened flora species are assumed to be present, as surveys were not able to be conducted in the appropriate season.

Targeted threatened flora surveys were undertaken in June, August, and September 2022, and due to project timing constraints, addressed survey timing requirements for the candidate threatened flora species able to be surveyed all year or within that time period.

Table 5.7 identifies threatened species survey methods and effort. All other candidate flora species were assumed present within the subject land. Each flora specimen was surveyed using the guidelines published by the BAM.

Table 5.7 Threatened species surveys for candidate flora species credit species on the subject land

Common name	**Scientific name**	**Threatened flora species surveys**				**Present**	**Further assessment required (BAM Subsections 5.2.5 and 5.2.6)**
		Survey method (transects or grids)	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. people)		
Bynoe's Wattle	*Acacia bynoeana*	Transects	☒ Yes 3 August 2022 09:00-17:30	☐ No	10 hours by 3 people	No	No
Charmhaven Apple	*Angophora inopina*	Transects	☒ Yes 3 August 2022 09:00-17:30	☐ No	10 hours by 3 people	Yes	No
Thick-leaf Star-hair	*Astrotricha crassifolia*	Transects	☒ Yes 3 August 2022 09:00-17:30	☐ No	10 hours by 3 people	No	No
Netted Bottle Brush	*Callistemon linearifolius*	Transects	☒ Yes 3 August 2022 09:00-17:30	☐ No	10 hours by 3 people	No	No
Camfield's Stringybark	*Eucalyptus camfieldii*	Transects	☒ Yes 3 August 2022 09:00-17:30	☐ No	10 hours by 3 people	No	No
-	*Eucalyptus parramattensis* subsp. *decadens*	Transects	☒ Yes 3 August 2022 09:00-17:30	☐ No	10 hours by 3 people	No	No

Common name	Scientific name	Threatened flora species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (transects or grids)	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. people)		
Eucalyptus parramattensis C. Hall. subsp. *parramattensis* in Wyong and Lake Macquarie local government areas	*Eucalyptus parramattensis* subsp. *parramattensis* - endangered population	Transects	☒ Yes 3 August 2022 09:00-17:30	☐ No	10 hours by 3 people	No	No
Variable Midge Orchid	*Genoplesium insigne*	Transects	☒ Yes 6 September 2022 09:00-17:30	☐ No	5 hours by 2 people	No	No
Small-flower Grevillea	*Grevillea parviflora* subsp. *parviflora*	Transects	☒ Yes 3 August 2022 09:00-17:30	☐ No	10 hours by 3 people	No	No
Biconvex Paperbark	*Melaleuca biconvexa*	Transects	☒ Yes 3 August 2022 09:00-17:30	☐ No	10 hours by 3 people	No	No
Grove's Paperbark	*Melaleuca groveana*	Transects	☒ Yes 3 August 2022 09:00-17:30	☐ No	10 hours by 3 people	No	No
Eastern Australian Underground Orchid	*Rhizanthella slateri*	Transects	☒ Yes 6 September 2022 09:00-17:30	☐ No	5 hours by 2 people	No	No
Heath Wrinklewort	*Rutidosis heterogama*	Transects	☒ Yes 3 August 2022 09:00-17:30	☐ No	10 hours by 3 people	No	No
-	*Tetratheca glandulosa*	Transects	☒ Yes 3 August 2022 09:00-17:30	☐ No	10 hours by 3 people	No	No
Black-eyed Susan	*Tetratheca juncea*	Transects	☒ Yes 6 September 2022 09:00-17:30	☐ No	5 hours by 2 people	No	No

5.4.2 Threatened fauna

No threatened fauna species were recorded within the subject land. Table 5.8 provides a summary of the threatened fauna species previously recorded within the project site (see Figure 4.3). As identified in Table 5.5, a number of threatened fauna species that are species credit species are assumed to be present, as surveys were not able to be conducted in the appropriate season.

Threatened fauna were surveyed using specific survey requirements including the following methodologies:

– Diurnal bird survey
– Active searches (e.g. looking under logs and metal sheets)
– Hollow-bearing tree search
– Koala SAT
– Spotlighting
– Nest tree survey
– Call playback.

Figure 2.1 shows survey locations.

Table 5.8 Threatened species surveys for candidate fauna species credit species on the subject land

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. people)		
Bush Stone-curlew	*Burhinus grallarius*	General diurnal bird survey, Call playback, Spotlighting.	☒ Yes 3 August 2022 09:00-17:30	☐ No	2 hour by 2 people	No	No
Gang-gang Cockatoo (Breeding)	*Callocephalon fimbriatum*	Hollow-bearing tree search.	☒ Yes 3 August 2022 09:00-17:30	☐ No	1 hour by 2 people	No	No
Glossy Black-Cockatoo (Breeding)	*Calyptorhynchus lathami*	Hollow-bearing tree search.	☒ Yes 3 August 2022 09:00-17:30	☐ No	1 hour by 2 people	No	No
Wallum Froglet	*Crinia tinnula*	Spotlighting.	☒ Yes 3 August 2022 09:00-17:30 6 September 2022 09:00-17:30	☐ No	1 hour by 2 people	No	Yes
White-bellied Sea-Eagle (Breeding)	*Haliaeetus leucogaster*	Nest tree survey.	☒ Yes 3 August 2022 09:00-17:30	☐ No	1 hour by 2 people	No	No
Little Eagle (Breeding)	*Hieraaetus morphnoides*	Nest tree survey.	☒ Yes 3 August 2022 09:00-17:30	☐ No	1 hour by 2 people	No	No
Green and Golden Bell Frog	*Litoria aurea*	Spotlighting.	☐ Yes	☒ No 3 August 2022 09:00-17:30	1 hour by 2 people	No	Yes

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. people)		
Green-thighed Frog	*Litoria brevipalmata*	Spotlighting.	☐ Yes	☒ No 3 August 2022 09:00-17:30	1 hour by 2 people	No	Yes
Square-tailed Kite (Breeding)	*Lophoictinia isura*	Nest tree survey.	☒ Yes 6 September 2022 09:00-17:30	☒ No 3 August 2022 09:00-17:30	1 hour by 2 people 1 hour by 2 people	No	Yes
Barking Owl (Breeding)	*Ninox connivens*	Hollow-bearing tree search, call playback, spotlighting.	☒ Yes 3 August 2022 09:00-17:30	☐ No	2 hours by 2 people	No	No
Powerful Owl (Breeding)	*Ninox strenua*	Hollow-bearing tree search, call playback, spotlighting.	☒ Yes 3 August 2022 09:00-17:30	☐ No	2 hours by 2 people	No	No
Eastern Osprey (Breeding)	*Pandion cristatus*	Nest tree survey.	☒ Yes 3 August 2022 09:00-17:30	☐ No	1 hour by 2 people	No	No
Greater Glider	*Petauroides volans*	2 x spotlighting nights.	☒ Yes 3 August 2022 09:00-17:30 6 September 2022 09:00-17:30	☐ No	2 hours by 3 people 1 hour by 2 people	No	No
Koala	*Phascolarctos cinereus*	2 x SAT surveys 4 call playback, and 2 x spotlighting nights.	☒ Yes 3 August 2022 09:00-17:30 6 September 2022 09:00-17:30	☐ No	2 hours by 3 people 1 hour by 2 people	No	No
Grey-headed Flying-fox (Breeding)	*Pteropus poliocephalus*	Breeding camping search, spotlighting.	☒ Yes 3 August 2022 09:00-17:30 6 September 2022 09:00-17:30	☐ No	2 hours by 2 people 1 hour by 2 people	No	No
Masked Owl (Breeding)	*Tyto novaehollandiae*	Hollow-bearing tree search, call playback, spotlighting.	☒ Yes 3 August 2022 09:00-17:30	☐ No	1 hours by 2 people	No	No
Mahony's Toadlet	*Uperoleia mahonyi*	Spotlighting.	☐ Yes	☒ No 3 August 2022 09:00-17:30	1 hours by 2 people	No	Yes

5.4.3 More appropriate local data (where relevant)

Local data suggested one species, *Genoplesium insigne* (Variable Midge Orchid) was flowering and would be detectable in August, and not limited to September–November as required in BAM-C as shown in Table 5.9. This species requires diagnostic flowering material that is variable depending on recent rainfall and is approximately limited to a two-week period (DPE, 2022h). Survey should be undertaken when a nearby reference population is in flower in September to early October. If not located, a survey should be completed and undertaken during mid-October to November (DPE, 2022h).

Table 5.9 Use of more appropriate local data for habitat suitability

Species	Amendments to species data	Local data source/s
Genoplesium insigne Variable Midge Orchid	Email: Dated – 3 August 2022 "There has been some early flowering of *Genoplesium insignie* this year, with some plants in already flower. The information we have is that the species is not peak flower yet (may be only 20%), but that peak flowering is expected to be earlier this year than in some other seasons."	**Danielle Allen** Senior Ecologist Development Assessment Pre Lodgement **Central Coast Council** PO Box 20 Wyong, NSW 2259 **t:** 02 4325 8217 **m:** 0438 464 239 **e:** Danielle.Allen@centralcoast.nsw.gov.au
Genoplesium insigne Variable Midge Orchid	Reference site inspection: 6 September 2022 Several specimen were observed flowered at a reference site in close proximity the Subject land (near Chain Valley Bay). This ensured that the species was still in flower.	GHD ecologist target reference site inspection near Chain Valley Bay – A Smith

5.4.4 Area or count, and location of suitable habitat for a species credit species (a species polygon)

Confirmed candidate threatened flora and fauna species are identified in Table 5.10. One confirmed candidate threatened flora species, *Angophora inopina* was confirmed present during surveys within mapped PCT 1636 as shown by its habitat extent in Figure 5.1. This species polygon is isolated from other patches due to surrounding cleared and denuded areas and has been produced based on these considerations. The extent of *Angophora inopina* habitat is measured by area and therefore, equates to 0.16 ha. *Angophora inopina* is also listed as vulnerable under the EPBC Act as detailed in Table 5.11.

No *Callistemon linearifolius* (Netted Bottle Brush) were detected during the field survey. However, as this species was not surveyed during the required period and is a count species, a number was derived for their presumed presence. As the potential for the occurrence was small (0.10 ha), it was estimated that five specimens occur. However, this is considered to be conservative as no potential specimens were detected within the patch of suitable habitat.

With respect to threatened fauna, Swift Parrot habitat was previously mapped within the site under the Biodiversity Values Map and Threshold tool. Updates to the Biodiversity Values Map include targeted reviews of specific data which can result in the inclusion or removal of some lands from the map (DPE, 2022c). The most recent edition to the Biodiversity Values Map (edition 14) removed the Swift Parrot habitat from the project site.

Table 5.10 Results for present species (recorded within the subject land)

Common name	Scientific name	Biodiversity risk weighting (BAM-C & TBDC*)	SAII entity** (BAM-C & TBDC)	Habitat constraints / microhabitats present on the subject land / vegetation zone	Abundance – No. individual plants present on subject land (flora with unit of measure of count)	Extent (ha) of suitable habitat present on site (flora or fauna with unit of measure of area)	Species specific recommendations	Habitat condition (vegetation integrity score for each vegetation zone in the polygon – area species only)
Charmhaven Apple	*Angophora inopina*	High (2)	No	Limited to PCT 1636	1 specimen	0.16 ha	All areas of PCT 1636 within the subject land were included in the buffer zone.	The area of PCT 1636 had an integrity score of 55.1
Trailing Woodruff	*Asperula asthenes*	High (2)	No	Habitat present on the subject land: – PCT 1636 – PCT 1724	-	0.26 ha	Species assumed present as surveys could not be conducted. the species is frost sensitive and may disappear above ground until both soil moisture (after about 25 mm of rain) and warmer weather return (TBDC).	PCT 1636: 55.1 PCT 1724: 52.7
Netted Bottle Brush	*Callistemon linearifolius*	High (2)	No	Limited to PCT 1636	5 specimens	-	Species assumed present as the survey period is October – January. If the species is not observed in flower, it is recommended to return to site for re-survey during the survey period (DPIE, 2020e).	PCT 1636: 55.1
Eastern Pygmy-possum	*Cercartetus nanus*	Moderate (1.5)	No	Limited to PCT 1636	-	0.16 ha	Species assumed present as surveys could not be conducted.	PCT 1636: 55.1

Common name	Scientific name	Biodiversity risk weighting (BAM-C & TBDC*)	SAII entity** (BAM-C & TBDC)	Habitat constraints / microhabitats present on the subject land / vegetation zone	Abundance – No. individual plants present on subject land (flora with unit of measure of count)	Extent (ha) of suitable habitat present on site (flora or fauna with unit of measure of area)	Species specific recommendations	Habitat condition (vegetation integrity score for each vegetation zone in the polygon – area species only)
Large-eared Pied Bat	*Chalinolobus dwyeri*	High (2)	Yes	Habitat present on the subject land: – PCT 1636 – PCT 1724	-	0.26 ha	Species assumed present as surveys could not be conducted during the survey period November - January either via acoustic detection or Harp trap (OEH, 2018a).	PCT 1636: 55.1 PCT 1724: 52.7
-	*Corunastylis* sp. Charmhaven NSW896673)	Very High (3)	Yes	Limited to PCT 1636	-	0.16 ha	Species assumed present as surveys could not be conducted. This species requires flowering material to identify. Flowering time is variable depending on rainfall and is limited to about 2 weeks. Survey when a nearby reference population is in flower, somewhere between Nov - Apr. Survey in Nov - Dec. If not found survey again in Jan – Feb (DPIE, 2020e).	PCT 1636: 55.1
Wallum Froglet	*Crinia tinnula*	Very High (3)	No	Habitat present on the subject land: – PCT 1636 – PCT 1724	-	0.26 ha	Species assumed present as surveys could not be conducted. Survey requires 480 minutes of survey effort over a 500 m transect repeated 4 times (DPIE, 2020d).	PCT 1636: 55.1 PCT 1724: 52.7

Common name	Scientific name	Biodiversity risk weighting (BAM-C & TBDC*)	SAII entity** (BAM-C & TBDC)	Habitat constraints / microhabitats present on the subject land / vegetation zone	Abundance – No. individual plants present on subject land (flora with unit of measure of count)	Extent (ha) of suitable habitat present on site (flora or fauna with unit of measure of area)	Species specific recommendations	Habitat condition (vegetation integrity score for each vegetation zone in the polygon – area species only)
Leafless Tongue Orchid	*Cryptostylis hunteriana*	Moderate (1.5)	No	Limited to PCT 1636	-	0.16 ha	Species assumed present as surveys could not be conducted during the survey period November – December. The species will not flower under dense vegetation (DPIE, 2020e).	PCT 1636: 55.1
Giant Burrowing Frog	*Heleioporus australiacus*	Moderate (1.5)	No	Limited to PCT 1636	-	0.16 ha	Species assumed present as surveys could not be conducted. Survey requires 960 minutes of survey effort over a 500 m transect repeated 8 times during September – May (DPIE, 2020d).	PCT 1636: 55.1
Pale-headed Snake	*Hoplocephalus bitorquatus*	Moderate (1.5)	No	Habitat present on the subject land: – PCT 1636 – PCT 1724	-	0.26 ha	Species assumed present as surveys could not be conducted.	PCT 1636: 55.1 PCT 1724: 52.7
Green and Golden Bell Frog	*Litoria aurea*	High (2)	No	Habitat present on the subject land: – PCT 1636 – PCT 1724	-	0.26 ha	Species assumed present as surveys could not be conducted. Survey requires 480 minutes of survey effort over a 500 m transect repeated 8 times during November - March (DPIE, 2020d).	PCT 1636: 55.1 PCT 1724: 52.7

Common name	Scientific name	Biodiversity risk weighting (BAM-C & TBDC*)	SAII entity** (BAM-C & TBDC)	Habitat constraints / microhabitats present on the subject land / vegetation zone	Abundance – No. individual plants present on subject land (flora with unit of measure of count)	Extent (ha) of suitable habitat present on site (flora or fauna with unit of measure of area)	Species specific recommendations	Habitat condition (vegetation integrity score for each vegetation zone in the polygon – area species only)
Green-thighed Frog	*Litoria brevipalmata*	High (2)	No	Habitat present on the subject land: – PCT 1636 – PCT 1724	-	0.26 ha	Species assumed present as surveys could not be conducted. Survey requires 240 minutes of survey effort over a 500 m transect repeated 2 times during Spring – Autumn (DPIE, 2020d).	PCT 1636: 55.1 PCT 1724: 52.7
-	*Maundia triglochinoides*	Moderate (1.5)	No	Limited to PCT 1724	-	0.10 ha	Species assumed present as surveys could not be conducted.	PCT 1724: 52.7
Tall Knotweed	*Persicaria elatior*	High (2)	No	Limited to PCT 1724	-	0.10 ha	Species assumed present as surveys could not be conducted during December – May.	PCT 1724: 52.7
Squirrel Glider	*Petaurus norfolcensis*	High (2)	No	Habitat present on the subject land: – PCT 1636 – PCT 1724	-	0.26 ha	Species assumed present as surveys could not be conducted.	PCT 1636: 55.1 PCT 1724: 52.7
Brush-tailed Phascogale	*Phascogale tapoatafa*	High (2)	No	Habitat present on the subject land: – PCT 1636 – PCT 1724	-	0.26 ha	Species assumed present as surveys could not be conducted.	PCT 1636: 55.1 PCT 1724: 52.7
Common Planigale	*Planigale maculata*	High (2)	No	Habitat present on the subject land: – PCT 1636 – PCT 1724	-	0.26 ha	Species assumed present as surveys could not be conducted.	PCT 1636: 55.1 PCT 1724: 52.7

Common name	Scientific name	Biodiversity risk weighting (BAM-C & TBDC*)	SAII entity** (BAM-C & TBDC)	Habitat constraints / microhabitats present on the subject land / vegetation zone	Abundance – No. individual plants present on subject land (flora with unit of measure of count)	Extent (ha) of suitable habitat present on site (flora or fauna with unit of measure of area)	Species specific recommendations	Habitat condition (vegetation integrity score for each vegetation zone in the polygon – area species only)
Mahony's Toadlet	*Uperoleia mahonyi*	High (2)	No	Habitat present on the subject land: – PCT 1636 – PCT 1724	-	0.26 ha	Species assumed present as surveys could not be conducted. Survey requires 480 minutes of survey effort over a 500 m transect repeated 4 times during October – March (DPIE, 2020d).	PCT 1636: 55.1 PCT 1724: 52.7

Table 5.11 Results for EPBC Act listed species present (recorded within the subject land) or assumed present

Common name	Scientific name	Abundance – No. individual plants present on subject land (flora with unit of measure as count)	Extent (ha) of suitable habitat present on site (flora or fauna with unit of measure as area)
Charmhaven Apple	*Angophora inopina*	1 specimen	0.16 ha in PCT 1636
Trailing Woodruff	*Asperula asthenes*	Assumed present	0.26 ha in PCT 1636 and PCT 1724
Large-eared Pied Bat	*Chalinolobus dwyeri*	Assumed present	0.26 ha in PCT 1636 and PCT 1724
-	*Corunastylis* sp. Charmhaven NSW896673)	Assumed present	0.16 ha in PCT 1636
Leafless Tongue Orchid	*Cryptostylis hunteriana*	Assumed present	0.16 ha in PCT 1636
Giant Burrowing Frog	*Heleioporus australiacus*	Assumed present	0.16 ha in PCT 1636
Green and Golden Bell Frog	*Litoria aurea*	Assumed present	0.26 ha in PCT 1636 and PCT 1724
Tall Knotweed	*Persicaria elatior*	Assumed present	0.10 ha PCT 1724

Paper Size ISO A4

0 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

EnergyCo
Waratah Super Battery - BDAR

Candidate species credit species records and species polygons

Project No. **12582669**
Revision No. **0**
Date **26/10/2022**

FIGURE 5.1

\\ghdnet\ghd\AU\Newcastle\Projects\21\12582669\GIS\Maps\Deliverables\12582669_BDAR.aprx
12582669_BDAR_009_Fig5_1_CandidateSpecies
Print date: 26 Oct 2022 - 10:39

Data source: Imagery, captured by Energy Co on September 2022; Metromap Tile Service: . Created by: mfredle

5.5 Migratory species listed under the EPBC Act

5.5.1 Migratory shorebird species

A critical consideration in assessing the significance of potential impacts on listed migratory shorebird species is whether or not a proposed action is likely to affect 'important habitat' (DotE, 2015). Important habitat mapping by DPE (2022c) maps areas that support bird numbers exceeding the international and national significance thresholds as defined above and in the Wildlife Conservation Plan for Migratory Shorebirds (DotE, 2015). Important habitat boundaries were based on the DPIE estuary ecosystems shapefile and refined based on expert opinion and aerial imagery. Land areas critical for the birds feeding and roosting were included. Important habitat is mapped for the Red Knot (*Calidris canutus*) throughout Tuggerah Lakes, including Lake Munmorah. The project site does not intersect any important habitat for this species.

In addition, opportunistic diurnal bird surveys were undertaken in the project site which consists of non-tidal areas only and no migratory shorebird species were identified. Habitat conditions on the site are not suitable for migratory shorebirds as there is no waterbodies present with a minimally vegetation, exposed margin.

5.5.2 Migratory terrestrial species

Referral guidelines have been published for 14 migratory terrestrial species, such as the Rufous Fantail (*Rhipidura rufifrons*) and Satin Flycatcher (*Myiagra cyanoleuca*) (DotE, 2015). Important habitat for these species generally relates to breeding habitat. While these species may occur on occasion in the area, the subject land does not provide important breeding habitat for these species.

6. Identifying prescribed impacts

6.1 Introduction

The *Biodiversity Conservation Regulation 2017* (BC Regulation) (clause 6.1) identifies additional biodiversity impacts to which the BOS applies. 'Prescribed impacts' are impacts to features present within a site that are not related to, or are in addition to, native vegetation clearing and habitat loss.

In accordance with Section 1 and Section 3.2 of this BDAR, prescribed impacts have been determined as present within the subject land. Table 6.1 describes these features, their characteristics and the threatened entities that may use the feature. Justifications for features determined as not present are presented below.

Karst, caves, crevices, cliffs, rocks or other geological features of significance were not present within the project site and do not form part of this assessment. Previous ecological survey undertaken in January 2021 identified that Hammond Canal located approximately 270 m north-west of the subject land was used as foraging habitat for microbat species (Niche, 2020). The survey results suggest the likelihood of a roost within the riparian area further up Hammond Canal to the north-west towards Colongra Lake >500m from the subject land. This area is wholly located outside the subject land and does not constitute a prescribed impact.

Wind turbines do not form part of this proposal and are not included in the assessment.

Table 6.1 Prescribed impacts identified

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature. Where relevant, threatened species or fauna that are part of a TEC or EC, that are at risk of vehicle strike
Karst, caves, crevices, cliffs, rocks or other geological features of significance	☐Yes / ☒No	There are no areas of karst, caves, crevices or cliffs in the development footprint. However, there is a known microbat roost site within a canal approximately 270 m north-west of the subject land.	N/A
Human-made structures	☐Yes / ☒No	The subject land is located within the now decommissioned Lake Munmorah Power Station facility. All human-made structures have been removed from the development footprint as part of pre-existing demolition conditions.	N/A
Non-native vegetation	☒Yes / ☐No	There are large areas of non-native vegetation within the subject land. These areas are clearly identified on Figure 4.1. The areas are heavily degraded containing a mixture of hardstand, deconstruction material and exotic weed species. The areas are cleared due to the removal of infrastructure associated with the decommissioned Lake Munmorah Power Station facility.	– Bush Stone-curlew – Swift Parrot – Regent Honeyeater – Gang-gang Cockatoo – Glossy Black-cockatoo – White-bellied Sea-Eagle – Little Eagle – Square-tailed Kite – Barking Owl – Powerful Owl – Eastern Osprey – Masked Owl – Southern Myotis – Large Bent-winged Bat – Little Bent-winged Bat – Large-eared Pied Bat

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature. Where relevant, threatened species or fauna that are part of a TEC or EC, that are at risk of vehicle strike
Habitat connectivity	☒Yes / ☐No	Whilst the subject land occurs adjacent to a large area of native vegetation, due to the area being highly disturbed and surrounded by wire fencing, wildlife movement is limited to highly mobile bird and bat species. However, these species would likely to pass over the area to more suitable habitat found in the locality and would not be impacted by the proposed development.	– Grey-headed Flying-fox – Eastern Pygmy-possum – Common Planigale – Greater Glider – Squirrel Glider – Brush-tailed Phascogale – Pale-headed Snake – Bush Stone-curlew – Swift Parrot – Regent Honeyeater – Gang-gang Cockatoo – Glossy Black-cockatoo – White-bellied Sea-Eagle – Little Eagle – Square-tailed Kite – Barking Owl – Powerful Owl – Eastern Osprey – Masked Owl – Southern Myotis – Large Bent-winged Bat – Little Bent-winged Bat – Large-eared Pied Bat
Waterbodies, water quality and hydrological processes	☒Yes / ☐No	There are two small water bodies and un-named ephemeral drainage lines within the subject land identified in Figure 1.1 and Figure 1.2. These features are human-made, degraded and consist of a mixture of exotic and native species.	– Wallum Froglet – Giant Burrowing Frog – Green and Golden Bell Frog – Green-thighed Frog – Mahony's Toadlet – Southern Myotis
Wind turbine strikes (wind farm development only)	☐Yes / ☒No	N/A	N/A

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature. Where relevant, threatened species or fauna that are part of a TEC or EC, that are at risk of vehicle strike
Vehicle strikes	☒Yes / ☐No	The subject land would be fenced off from the adjacent areas of vegetation which would prevent fauna movement. All roads within the subject land are shown on Figure 1.2. All roads within the subject land are shown on Figure 1.2.	– Grey-headed Flying-fox – Eastern Pygmy-possum – Common Planigale – Greater Glider – Squirrel Glider – Brush-tailed Phascogale – Pale-headed Snake – Bush Stone-curlew – Swift Parrot – Regent Honeyeater – Gang-gang Cockatoo – Glossy Black-cockatoo – White-bellied Sea-Eagle – Little Eagle – Square-tailed Kite – Barking Owl – Powerful Owl – Eastern Osprey – Masked Owl – Southern Myotis – Large Bent-winged Bat – Little Bent-winged Bat – Large-eared Pied Bat

6.2 Description of prescribed impacts relevant to the project site

6.2.1 Non-native vegetation

Non-native vegetation accounts for the majority of the project site. Non-native vegetation within the subject land was determined in accordance with Section 2.2.2 and comprises areas of exotic species and denuded areas. The total area includes bare earth associated with the decommissioned facility and other human disturbance of soils. Conditions associated with the facility include weed maintenance which occurs regularly on the project site.

Some non-native vegetation areas occur along the boundary of the project site. This is mown/slashed and will act as an asset protection zone for bushfire safety purposes.

The species listed in Table 6.1 may utilise non-native vegetation areas transiently as they are highly mobile. Raptors and large forest owls may hunt in the area if suitable prey species are present, as well as threatened microbats who may forage over the area on occasion. No mammals or arboreal mammals are anticipated to be able to move freely through the area due to existing fencing surrounding the project site.

Areas of non-native vegetation and cleared areas support limited shelter, roosting or breeding habitat for the species that could potentially occur. Given the lack of shelter and other resources of relevance for threatened fauna species, the areas of non-native vegetation and cleared land have minimal value for these species. They are all wide-ranging mobile species capable of travelling throughout the landscape, and would not be limited to, or reliant on, the habitats present within the development footprint for any stage of their life cycle.

6.2.2 Habitat connectivity

The project site provides little to no habitat connectivity and this is clearly demonstrated on Figure 1.1 and Figure 1.2. The project site is predominantly void of continuous vegetation and does not provide fauna movement corridors because of security fencing topped with barbed wire surrounding the property. The development layout shown in Figure 1.3 identifies the area does not contribute to connectivity to the surrounding landscape and provides limited opportunities for highly mobile fauna that would fly over the site to adjacent higher quality habitat.

6.2.3 Waterbodies, water quality and hydrological processes

Two small water bodies would be removed as part of the development. These human-made dams are of low ecological value due to historical clearing and other disturbance and do not provide important habitat for the species listed in Table 6.1.

The Wallum Froglet, and Green and Golden Bell Frog species typically occur in sedgelands and wet heathlands and those containing bullrushes (*Typha* spp.) (DPE, 2022j). Mahoney's toadlet requires intact vegetation adjacent to and within water bodies (DPE, 2022j). The Southern Myotis forages over streams and pools catching insects and small fish by raking their feet across the water surface (DPE, 2022j). As such, this species has the potential to use the small dams, at least on an intermittent basis. However, the low condition of the water from disturbance would likely mean that this habitat would have low ecological value for these species.

6.2.4 Vehicle strikes

There is no major risk to threatened fauna due to vehicle collision due to barriers to fauna movement surrounding the site. Highly mobile species may be at risk, however, vehicle speed limits are likely to be implemented as part of new facility operations. Further, the existing risk the project site presents to fauna would not be exacerbated as a result of the proposal. There are currently unsealed, tracks throughout the site; it is not known how frequently they are used.

Stage 2: Impact assessment (biodiversity values and prescribed impacts)

7. Avoid and minimise impacts

The proposal would result in direct impacts on native biota and their habitats as shown in Figure 8.1. There is also the potential for indirect impacts on areas of native vegetation adjacent to the subject land, both during construction and from the operational facility.

Specific mitigation measures are recommended to minimise likely impacts on biodiversity values. These measures are presented according to the hierarchy of avoidance and mitigation of impacts, and the provision of offsets to counter residual impacts of the proposal that cannot be avoided or mitigated.

7.1 Avoid and minimise direct and indirect impacts

7.1.1 Project location

The project location was selected after a detailed environmental constraints assessment was carried out GHD (2022). The site was selected as it was considered to relatively low ecological value due to past use of the site. The project location was chosen to minimise direct and indirect impacts on native vegetation, TECs, threatened species and their habitat as well as prescribed impacts listed in Table 6.1 by siting the development within the previously disturbed Munmorah Power Facility. Detailed environmental investigations were conducted for the project including an assessment of a broader subject area to identify key constraints during the feasibility and design phases. Investigations identified that the nature of the site and its existing barriers to fauna movement presented an opportunity to redevelop an already degraded area. Due to the development suitability of the site, alternative project locations were not investigated.

7.1.2 Project design

The proposal has aimed to avoid impacts to native vegetation and habitat values by amending the original development layout and project design in response to detailed understanding of the site's biodiversity values and offset requirements.

Considering the degraded nature of the site and the isolation of existing patches of native vegetation, measures to avoid and minimise impacts focused on ensuring adequate buffer distances from the higher quality habitat defined as vegetation zone 1 and 2. The subject land boundary and development layout was reduced to retain 0.06 ha of PCT 1636 (vegetation zone 1) in the south-west corner of the project site. The design also utilised existing access tracks reducing construction impacts on native vegetation retained in proximity to the access.

The project design has established an appropriate buffer of 20 m from the boundary ensuring vegetation along the interface of the subject land is protected from ground disturbance and proposed hardstand areas. Some habitat resources for native biota would also be retained in vegetation and soil profiles outside of infrastructure footprints. Post construction, the development would be expected to have a reduced potential for indirect impacts such as noise and light generation, vehicle collisions and edge effects due to the reduction in gross floor area implemented during design.

The proposal also utilises existing tacks that provide access from Hammond Canal crossing to the subject land, protecting all vegetation and NSW PCT mapped areas outside the subject land. This includes avoiding impacts to NSW PCT mapped areas located directly adjacent Hammond Canal and instead focuses development within the cleared portions in the east and south-east of project site.

In addition, the project design and layout has been assessed against the Rural Fire Service (RFS) *Planning for Bushfire Protection* (RFS, 2019) Guidelines. The proposal was modified to improve compliance with the guidelines

through the provision of an asset protection zone and inclusion of additional vehicular access points. The asset protection zone allows for the retention of some canopy trees in accordance with the guidelines.

Prescribed impacts are identified and discussed in Section 6 and Table 6.1. Impacts to Non-native vegetation, habitat connectivity, waterbodies and vehicle strike are minimal due to existing conditions within the subject land described in Section 6. The project design also avoids areas in the western portion of the site outside the subject land that contain non-native vegetation and waterbodies that could provide some form of habitat for common species and highly mobile threatened species.

Avoidance and minimisation measures for direct, indirect and prescribed impacts are identified in Table 7.1 and Section 8.4.

Further mitigation measures and procedures for the construction and operations of the proposed facility are outlined in Table 7.1.

7.1.3 Summary of measures to avoid and minimise impacts

A summary of measures undertaken to avoid and minimise impacts is provided in Table 7.1.

Table 7.1 Avoidance and minimisation measures for direct, indirect and prescribed impacts

Action	Outcome	Timing	Responsibility
Concentrating development in the existing cleared and denuded areas in the western portion of the subject land.	Avoiding and minimising the amount of native vegetation clearing required.	Design	Proponent
Avoidance of areas of native vegetation in the western portion of the site mapped as PCT 3583 -Hunter Coast Lowland Scribbly Gum Forest	Avoiding and minimising the amount of native vegetation clearing required.	Design	Proponent
Minimising impacts on mapped PCT 1636 - Scribbly Gum - Red Bloodwood - *Angophora inopina* heathy woodland on lowlands of the Central Coast identified in Figure 4.3.	Avoiding and minimising the amount of native vegetation clearing required.	Design	Proponent
Avoidance of impacts to vegetation through the proposed use of existing access to the subject land as shown on Figure 1.2.	Avoiding and minimising the amount of native vegetation clearing required.	Design	Proponent
Revising the shape of the development layout to reduce edge effects associated with developments immediately adjoining conservation lands as shown Figure 1.3.	Avoiding and minimising the amounts of indirect impacts to retained native vegetation.	Design	Proponent
Providing an adequate buffer to adjoining vegetation mapped as important habitat at the interface of the subject land ensuring root zones are protected as shown on Figure 1.2 and Figure 1.3.	Avoiding and minimising the amounts of indirect impacts to retained native vegetation.	Design	Proponent
Preparation of a construction environmental management plan	Minimising and managing direct and indirect impacts during construction	Construction	Construction contractor

8. Impact assessment

8.1 Direct impacts

8.1.1 Residual direct impacts

The proposal would result in residual direct impacts to a total of 0.26 ha of native vegetation in moderate condition. The direct impacts to include 0.16 ha of PCTs 1636 and 0.10 ha to PCT 1724, the latter being commensurate with Swamp Sclerophyll Forest TEC (Table 8.1). Outside of these mapped areas, the majority of the subject land is already cleared and denuded. The areas of native vegetation are fragmented providing minimal fauna habitat and connectivity in the context of the surrounding landscape. Vegetation clearing outside of mapped PCT 1636 and 1724 consists of the removal non-native plants including priority and HTW species. The removal of 0.26 ha of native vegetation is insignificant at the regional scale and is unlikely to threaten the persistence of populations of native plants and vegetation communities. 0.06 ha of PCT 1636 is being retained outside the subject land and is identified on Figure 1.3.

8.1.2 Change in vegetation integrity score

The proposal would result in the clearing of the entire area identified as the subject land. All future composition, structure and function scores have therefore, been entered as 0 for vegetation zones 1 and 2 as summarised in Table 8.2.

Table 8.1 Summary of residual direct impacts

Direct impact (Describe the impact on PCT/TEC/EC or threatened species and their habitat)	BC Act status	EPBC Act status	SAII entity	Project phase/timing of impact (e.g. construction, operation, rehabilitation)	Extent (ha, number of individuals)
PCT 1636: Scribbly Gum - Red Bloodwood - *Angophora inopina* heathy woodland on lowlands of the Central Coast	Not listed	Not listed	No	Construction	0.16 ha
PCT 1724: Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Does not meet condition criteria	No	Construction	0.10 ha
Total native vegetation					0.26 ha

Table 8.2 Impacts to vegetation integrity

Vegetation zone	PCT ID	Management zone	Area (ha)	Before development				After development				Change
				Composition	Structure	Function	VI score	Composition	Structure	Function	VI score	Change in VI score
Zone 1	1636	Zone 1	0.16	32.9	63.5	80.0	55.1	0.0	0.0	0.0	55.1	-55.1
Zone 2	1724	Zone 2	0.10	71.8	37.8	53.9	52.7	0.0	0.0	0.0	52.7	-52.7

8.1.3 Removal of TEC and threatened flora species

The development footprint requires the removal of TEC Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Vegetation Zone 1) and a single Charmhaven Apple specimen listed as vulnerable and located in Vegetation Zone 2. The TEC and threatened flora will be offset in accordance with the corresponding vegetation zone impact area identified in Table 8.1 above.

8.1.4 Removal of habitat and habitat resources

The 0.26 ha of vegetation that would be removed provides habitat resources for native fauna species, including threatened species. The proposal would result in direct impacts on habitat for the 18 threatened flora and fauna species that were recorded or assumed present within the subject land and assumed to use resources in the subject land. These species are summarised in Table 8.3.

The clearing of 0.26 has of native woodland and forest would include the removal of a relatively young forest with no large canopy trees harbouring hollows appropriate for fauna. The habitat is also fragmented and exists within a completely fenced site with limited fauna permeability. The removal constitutes a small proportion of available flora and fauna resources. Plot and transect data collected at the site corroborates this interpretation as no hollow bearing trees exist.

Table 8.3 Impacts to threatened species

Common name	Scientific name	BC Act status	EPBC Act status	Loss of habitat (ha) or individuals
Charmhaven Apple	*Angophora inopina*	V	V	0.16 ha
Trailing Woodruff	*Asperula asthenes*	V	V	0.26 ha
Netted Bottle Brush	*Callistemon linearifolius*	V	-	5 individuals
Eastern Pygmy-possum	*Cercartetus nanus*	V	-	0.16 ha
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	0.26 ha
-	*Corunastylis* sp. Charmhaven (NSW896673)	CE	CE	0.16 ha
Wallum Froglet	*Crinia tinnula*	V	-	0.26 ha
Leafless Tongue Orchid	*Cryptostylis hunteriana*	V	V	0.16 ha
Giant Burrowing Frog	*Heleioporus australiacus*	V	V	0.16 ha
Pale-headed Snake	*Hoplocephalus bitorquatus*	V	-	0.26 ha
Green and Golden Bell Frog	*Litoria aurea*	E	V	0.26 ha
Green-thighed Frog	*Litoria brevipalmata*	V	-	0.26 ha
-	*Maundia triglochinoides*	V	-	0.10 ha
Tall Knotweed	*Persicaria elatior*	V	V	0.10 ha
Squirrel Glider	*Petaurus norfolcensis*	V	-	0.26 ha
Brush-tailed Phascogale	*Phascogale tapoatafa*	V	-	0.26 ha
Common Planigale	*Planigale maculata*	V	-	0.26 ha
Mahony's Toadlet	*Uperoleia mahonyi*	E	-	0.26 ha

8.1.5 Impacts on MNES

The following threatened species are listed under the EPBC Act were either detected within the subject land or were presumed to be presence due to the lack of survey effort during the appropriate survey periods:

– *Angophora inopina* (Charmhaven Apple) – Vulnerable (recorded on within the subject land)

– *Asperula asthenes* (Trailing Woodruff) – Vulnerable
– *Chalinolobus dwyeri* (Large-eared Pied Bat) – Vulnerable
– *Corunastylis* sp. Charmhaven NSW896673) – Critically Endangered
– *Cryptostylis hunteriana* (Leafless Tongue Orchid) – Vulnerable
– *Heleioporus australiacus* (Giant Burrowing Frog) – Vulnerable
– *Litoria aurea* (Green and Golden Bell Frog) – Vulnerable
– *Persicaria elatior* (Tall Knotweed) – Vulnerable.

Detected species

One of these species, *Angophora inopina* (Charmhaven Apple) was the only species detected within the subject land. An assessment of significance is provided for this species (see Appendix B) As this species has been recorded in many locations surrounding the subject land (Niche, 2020; 2021) the loss of the one specimen is unlikely to result in a significant impact to an important population (DotE, 2013a).

Aquatic flora species assumed to be present

Asperula asthenes (Trailing Woodruff) is known from the Central Coast region, with all records restricted to west of the M1 Motoway in the Mandalong area (DPE, 2022f). As they are known to occur in damp sites, often along river banks (DPE, 2022j), the habitat within the subject land is considered to be sub-optimal with the species having a low likelihood of occurrence and potential to be impacted by the proposed development. As such, the proposed development is considered unlikely to have any significant impact to an important population of this species (DotE, 2013a).

Persicaria elatior (Tall Knotweed) is known from the Central Coast region, with all records restricted to west of the M1 Motoway (DPE, 2022f). This species normally grows in damp places, especially beside streams and lakes (DPE, 2022j). Occasionally they occur in swamp forest or associated with disturbance (DPE, 2022j). Whilst there is potential habitat for this species in the swamp forest vegetation, the patch is small and not considered to be particularly damp with any associated water bodies. In addition, as this species is not generally known from the locality, it is considered that the species has a low likelihood of occurrence and potential to be impacted by the Proposed development. As such, the proposed development is considered unlikely to have any significant impact to an important population of this species (DotE, 2013a).

Orchid species assumed to be present

Corunastylis sp. Charmhaven NSW896673) has been recorded to the north of subject land in recent time (Niche, 2020; 2021). This species is cryptic and was not able to be surveyed in accordance with the Commonwealth guidelines as it was not in flower at the time of the surveys (DotE, 2013b). Whilst this species has potential to occur within the subject land, the species is known to occur within low woodland to heathland with a shrubby understorey and ground layer. Dominants include Black She-oak (*Allocasuarina littoralis*), Prickly Tea-tree (*Leptospermum juniperinum*), Prickly-leaved Paperbark (*Melaleuca nodosa*), Narrow-leaved Bottlebrush (*Callistemon linearis*) and Zig-zag Bog-rush (*Schoenus brevifolius*) (DPE, 2022j). As this habitat did not occur within the subject land, the habitat within the subject land is likely to be sub-optimal with the species having a low likelihood of occurrence and potential to be impacted by the Proposed development. As such, the proposed development is considered unlikely to have any significant impact to a population of this species (DotE, 2013a).

Cryptostylis hunteriana (Leafless Tongue Orchid) is known from the Central Coast region, and the Scribbly Gum Woodland habitat within the subject land is potential habitat for the species (DPE, 2022j). This species is cryptic and was not able to be surveyed in accordance with the Commonwealth guidelines as it was not in flower at the time of the surveys (DotE, 2013b). However, the understory of this habitat within the Subject land is in low condition from recent and likely past disturbance include slashing. Large area of similar habitat would be retained in the areas surrounding the Subject land which have a higher potential for the species. As such, the proposed development is considered unlikely to have any significant impact to an important population of this species (DotE, 2013a).

Microbat species assumed to be present

The Large-eared Pied Bat (*Chalinolobus dwyeri*) is known from the Central Coast region and potential roosting site occurs in a canal approximately 270m north-west of the Subject land (Niche, 2020; 2021). Whilst this species typically is known to the occur along the escarpment areas to the west of the Subject land, they are known to occur more coastally with less frequency (DPE, 2022j). As this Proposed development would not be impacting any potential roost sites and only common potential foraging habitat would be removed, it is considered the project is unlikely to have any significant impact to an important population of this species (DotE, 2013a).

Frog species assumed to be present

The Giant Burrowing Frog (*Heleioporus australiacus*) is generally not known to occur east of Wyong (DPE, 2022f). Whilst there is potential habitat for the species in the Scribbly Gum Woodland (DPE, 2022j), it is marginal habitat due to past disturbance. Given the small area of impact and presence of marginal habitat only, the proposed development is considered unlikely to have any significant impact to an important population of this species (DotE, 2013a).

The Green and Golden Bell Frog (*Litoria aurea*) is known from the general locality, with scattered records across the Central Coast region (DPE, 2022f). The potential habitat for this species is limited to the small artificial dam and the habitat surrounding them (DEWHA, 2009). However, this habitat would be removed as part of the decommissioning process of the site and does not form part of this assessment. As such, the proposed development is considered unlikely to have any significant impact to an important population of this species (DEWHA, 2009).

Listed Migratory Species

There would be no impact on important habitat for migratory waders. Potential habitat within the subject land for migratory terrestrial species is either absent or highly degraded. If a migratory species was observed within the subject land, it would be most likely moving through the area between areas of higher quality habitats. As such, it is unlikely that the project would a have a significant impact on any migratory species listed under the EPBC Act as it would not (DotE, 2013):

– substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species
– result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or
– seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

8.2 Indirect impacts

Table 8.4 documents the residual indirect impacts (likely to occur on native vegetation, threatened entities and their habitat beyond the subject land) (Figure 8.1).

Table 8.4 Summary of residual indirect impacts

Indirect impact	Likelihood and consequences
Weed invasion and edge effects	'Edge effects' can include increased noise and light or erosion and sedimentation at the interface of intact vegetation and cleared areas. Edge effects may result in impacts such as changes to vegetation type and structure, increased growth of exotic plants, increased predation of native fauna or avoidance of habitat by native fauna. Edge effects would result from construction activities and then continue to affect vegetation and habitats retained outside the development footprint. Altered environmental conditions along new edges can allow invasion by pest animals specialising in edge habitats and/or change the behaviour of resident animals. Edge zones can be

Indirect impact	Likelihood and consequences
	subject to higher levels of predation by introduced mammalian predators and native avian predators. Due to adequate buffer distances between the development footprint and vegetated areas on adjacent properties, edge effects are expected to be limited.
Introduction and spread of weeds, pests and pathogens	Disturbance associated with vegetation clearing and vehicle traffic during construction increase the potential for the spread, introduction and establishment of weed and pest species, and diseases and pathogens. Weed species are effective competitors for food and habitat resources and have the potential to exclude native species and modify the composition and structure of vegetation communities and can decrease habitat values for native fauna. To further mitigate the risk of pathogens being brought onto and/or spread through the site all machinery brought to site will be washed down and inspected to be free of soils, seeds and other organic material in accordance with Section 7.1.3.
Noise and light impacts on fauna	Noise levels during the construction period would result in an increase above existing background levels for the duration of construction. Noise levels would vary during the construction period, with some activities being louder and producing higher levels of vibration than others. Noise, vibration, and light have been shown to have a variety of impacts on fauna, including changing foraging behaviour, impacting breeding success and changing species occurrences. Fauna most at risk would be those residing near the works area, and in particular any species that may be nesting, roosting or denning in the area. Some fauna may vacate areas in proximity to the subject land during construction. Hollow-bearing trees in adjacent areas may provide nesting habitat for species, including the threatened Squirrel Glider and a variety of threatened microbat and forest owl species. However, consequences are considered minimal due to the existing nature of the site and its previous use as a power facility where fauna in the area are likely to be accustomed to the noise. Given the temporary nature of the works, and the availability of alternate habitat in surrounding areas, it is unlikely the temporary increase in noise and light during construction would significantly impact on fauna that occur in the surrounding location.

Paper Size ISO A4

0 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

EnergyCo
Waratah Super Battery - BDAR

Final impacts likely to occur on the subject land

Project No. **12582669**
Revision No. **0**
Date **26/10/2022**

FIGURE 8.1

\\ghdnet\ghd\AU\Newcastle\Projects\21\12582669\GIS\Maps\Deliverables\12582669_BDAR.aprx
12582669_BDAR_010_Fig8_1_ImpactSubjectLand
Print date: 26 Oct 2022 - 10:41

Data source: Imagery, captured by Energy Co on September 2022; Roads, Railways - DCS, 2022; Metromap Tile Service: . Created by: mfredle

8.3 Prescribed impacts

Prescribed impacts are the impacts on biodiversity values which are not related to, or are in addition to, native vegetation clearing and habitat loss (Section 6.7 of the BAM). These types of impacts are used by the decision-maker to inform the determination and conditions of consent for developments. In general, these types of impacts affect habitat or features of the environment that are irreplaceable or otherwise important to the maintenance of biodiversity values.

The BC Regulation (clause 6.1) identifies actions that are prescribed as impacts to be assessed under the biodiversity offsets scheme. The likelihood, extent and magnitude of prescribed impacts must be assessed using the approach specified in the BAM Section 8.3. Those of relevance to this project are discussed in Table 8.4.

No offset liability is predicted to be required for this impact and does not form part of this assessment.

Table 8.5 Summary of residual prescribed impacts on the subject land

Prescribed impact	Likelihood and consequences
Non-native vegetation	**Nature** The majority of the subject land is comprised of cleared or non-native vegetation, including *Pinus pinaster* (Cluster Pine), exotic grassland and other weeds. These areas were actively managed during the time of the field survey to supress all vegetation growth as part of the sites decommissioning process. As such, these areas were not considered to be native vegetation for the purposes for this assessment. Much of the areas of non-native vegetation will be presently removed as part of the project. However, some areas will be retained, particularly near the boundaries of the subject land. These can provide habitat for highly mobile common fauna species. Mobile threatened species may also occur but are unlikely to rely on these areas for foraging and nesting habitat. **Extent** The extent of non-native vegetation within the subject land equates to 13.0 ha with which would be impacted by the proposed development. **Duration** This impact will be permanent. **Consequences** Threatened species that could use areas of cleared land and exotic grassland include microbat species, raptors and large forest owls who may forage in the area if suitable prey species are present. Arboreal and land mammals may cross cleared areas while traversing the wider locality however, no species were recorded during surveys and barbed wire fences surrounding the subject land prevent opportunities for fauna movement. Generally, the non-native vegetation within the development footprint provides limited habitat value for both common and threatened species and consequences of its removal are considered low, with having little to no impact.
Habitat connectivity	**Nature** Ground truthed PCTs 1724 and 1636 provide isolated pockets of potential fauna habitat, with little to no connections to the wider landscape. The impact summary shown in Figure 8.1 indicates these vegetated areas do not contribute to broader ecological corridors and provide limited opportunities for highly mobile fauna species that can fly over the site as they move between areas of higher quality habitat. **Extent** The extent of non-native vegetation within the subject land equates to 13.0 ha with which would be impacted by the proposed development. **Duration** This impact will be permanent. **Consequences** Section 6.2.2 identifies fauna that may fly over the site and would continue to do so if the proposal was approved. Less mobile species are more at risk of consequences associated with vegetation removal however, fauna access to the site is currently inhibited by fences. In this context, the subject land is unlikely to comprise a key link in a habitat corridor, or to be critical to the ongoing connectivity in the local area.

Prescribed impact	Likelihood and consequences	
Waterbodies, water quality and hydrological processes	**Nature** Two small artificial dams currently occur within the subject land and are to be removed as part of the decommissioning process of the site. These dams were created to be used as sediment basins. **Extent** Two small artificial dams (approximately 0.16 ha) within the subject land would be impacted the proposed development. **Duration** The dams are being removed as part of the decommissioning process and therefore, do not form part of this assessment. **Consequences** The dams are likely to provide limited ecological functionality and values due to surrounding disturbance from the decommissioned facility. Section 6.2.3 identifies species that may utilise waterbodies and the large areas of swamp habitat surrounding the subject land.	
Vehicle strike	**Species** – Grey-headed Flying-fox – Eastern Pygmy-possum – Common Planigale – Greater Glider – Squirrel Glider – Brush-tailed Phascogale – Pale-headed Snake – Bush Stone-curlew – Swift Parrot – Regent Honeyeater Gang-gang cockatoo	– Glossy Black-cockatoo – White-bellied Sea-Eagle – Little Eagle – Square tailed Kite – Barking Owl – Powerful Owl – Eastern Osprey – Masked Owl – Southern Myotis – Large Bent-winged Bat – Little Bent-winged Bat – Large-eared Pied Bat
	Likelihood Threatened species such as microbats, gliders, planigales, phascogales and owls are unlikely to experience a significant risk of vehicle strike during the construction phase as vehicle movements will occur during daylight hours when these species are inactive. Raptors and other woodland birds may be at risk of vehicle strike during the day however, considering the lack of habitat within the site and use of existing access to the development footprint, the overall likelihood is low. **Estimated rate of vehicle strike** During the operational phase the risk of vehicle strike will be equivalent to pre-construction levels. **Consequences** The vehicle strike rate would likely reduce during the operational phase and return to existing levels. Few threatened species are at particular risk from vehicle strike and as such consequences, are relatively minor.	

8.4 Mitigating residual impacts – management measures and implementation

A Construction Environmental Management Plan (CEMP) would be required for the construction and operational phases of the proposal. The CEMP would include, as a minimum, industry-standard measures for the management of soil, surface water, weeds and pollutants, as well as site-specific measures for the management of flora and fauna. The avoidance and minimisation measures for direct, indirect and prescribed impacts are detailed in Table 8.6 including timing, responsibility and outcomes.

Table 8.6 Summary of proposed mitigation and management measures for residual impacts (direct, indirect and prescribed)

Impact	Mitigation measures	Timing/ responsibility	Likely effectiveness	Justification
General biodiversity impacts	A Flora and Fauna Management Sub-plan would be prepared and implemented. It would include measures, processes, and responsibilities to minimise the potential for biodiversity impacts during construction; incorporating recommendations below and expanding on specific details where necessary.	Pre-construction/ Project ecologist	High	Measures meet best practice management of flora and fauna on construction projects
General	All workers are to be provided with an environmental induction prior to starting work on site. This would include information on the ecological values of the site, protection measures to be implemented to protect biodiversity and penalties for breaches.	Construction / Construction contractor and Project ecologist	High	Measures meet best practice management of flora and fauna on construction projects
Vegetation clearing	Plans would be prepared showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features, threatened plants and TECs in the vicinity of work areas and revegetation areas	Pre-construction / Project ecologist	High	Measures meet best practice management of flora and fauna on construction projects
Vegetation clearing	Prior to the commencement of any work in or adjoining areas of native vegetation, a survey would be carried out to mark the construction impact boundary. The perimeter of this area would be fenced using high visibility fencing and clearly marked as the limits of clearing. All vegetation outside this fence line would be clearly delineated as an exclusion zone to avoid unnecessary vegetation and habitat removal and the transmission of weeds or disease. Fencing and signage would be maintained for the duration of the construction period. Fencing would be designed to allow fauna to exit the site during clearing activities.	Pre-construction and construction / Project ecologist	High	Measures meet best practice management of flora and fauna on construction projects
Pathogen spread and establishment	All machinery entering the site would be appropriately washed down and disinfected prior to work on site to prevent the potential spread of weeds, Cinnamon Fungus and Myrtle Rust / Exotic Rust Fungi in accordance with the NSW best practice guidelines for Phytophthora, the Myrtle Rust, see the NSW hygiene guidelines for wildlife (DPIE, 2020c). Protocols to prevent introduction or spread of chytrid fungus would be implemented following the NSW hygiene guidelines for wildlife (DPIE, 2020c).	Construction / Construction contractor	High	Measures meet best practice management of flora and fauna on construction projects.

Impact	Mitigation measures	Timing/ responsibility	Likely effectiveness	Justification
Unexpected finds	An unexpected finds protocol would be prepared to detail measures to be undertaken if threatened flora and fauna not previously recorded on site are detected during clearing or construction activities. Or if additional occurrences of threatened species previously recorded in the broader area, but not previously recorded at a specific location, are recorded during clearing or construction activities. Any unexpected finds would need to be included in the offset strategy as required.	Construction / Project ecologist	High	Measures meet best practice management of flora and fauna on construction projects.
Fauna management	Protocols for the management of fauna and habitats would be included in the CEMP. These would include (if required): – a procedure for the felling of hollow-bearing trees to prevent or minimise mortality of fauna – salvage of hollows and logs where practicable – temporary frog-proof fencing should be installed where required such as roadside drains and detention ponds near the project site to be retained to prevent frogs from being injured or killed by equipment – management of any trenches or drill sites to prevent fauna from becoming trapped or injured.	Construction / Construction contractor and Project ecologist	High	Measures meet best practice management of flora and fauna on construction projects.
Pre-clearing surveys	Pre-clearing surveys would be undertaken prior to construction by a suitably qualified ecologist. The surveys and inspections, and any subsequent relocation of species, would be undertaken in accordance with the Flora and Fauna Management Sub-plan in the CEMP. Specific surveys include: – surveys for roosting microbats for any man-made structures to be removed – searches for nest trees in vegetation to be removed – identification of hollow-bearing trees and logs requiring fauna management during removal.	Construction / Construction contractor and Project ecologist	High	Measures meet best practice management of flora and fauna on construction projects.
Post-clearing surveys	A post-clearing report will be prepared documenting all animals that are handled, or otherwise managed, within the site. Data to be recorded includes: – date and time of the sighting and details of the observer – species – number of individuals recorded – adult/juvenile – condition of the animal (living/dead/injured/sick) – management action undertaken (e.g. captured, handled, taken to vet) – results of any management actions (e.g. released, placed in a nest box, euthanised, placed with carer) An inventory of hollows and fallen timber salvaged and relocated will be maintained.	Construction / Construction contractor and Project ecologist	High	Measures meet best practice management of flora and fauna on construction projects.

Impact	Mitigation measures	Timing/ responsibility	Likely effectiveness	Justification
Spread of weeds	Declared priority weeds would be managed according to requirements of the NSW *Biosecurity Act 2015* (DPI, 2022b). Soil material and stripped groundcover vegetation with the potential to contain priority weeds would not be removed from the project site. Soil disturbance would be avoided as much as possible to minimise the potential for spreading weeds. All machinery entering the site must be appropriately washed down and disinfected prior to work on site to prevent the potential spread of weeds, Cinnamon Fungus (*Phytophthora cinnamomi*) and Myrtle Rust (*Pucciniales fungi*) in accordance with the *Protocols to protect priority biodiversity areas in NSW from Phytophthora cinnamomi, myrtle rust, amphibian chytrid fungus and invasive plants* (DPIE, 2020c).	Construction / Construction contractor	High	Measures meet best practice management of flora and fauna on construction projects.
Managing site speed limits	Appropriate speeds for all construction and contractor vehicles are to be enforced to limit dust generation and minimise chances of highly mobile fauna mortality through vehicle strike during the construction phase of the project. Fencing surrounding the subject land is to be checked prior to construction and for its duration to ensure fauna exclusion.	Construction / Construction contractor	High	Measures meet best practice management of flora and fauna on construction projects.
Rehabilitation of vegetation subject to temporary disturbance	A rehabilitation strategy would be prepared to guide rehabilitation planning, implementation, monitoring and maintenance of disturbed areas outside of the operational footprint (such as compounds and temporary workforce accommodation). It would include clear objectives for rehabilitation of native vegetation in temporary disturbances areas.	Construction / Construction contractor	High	Measures meet best practice management of flora and fauna on construction projects.
Water quality, chemical and fuel impacts on flora and fauna	Erosion and sediment control plans would be prepared and established prior to the commencement of construction and be updated and managed throughout as relevant to the activities during the construction phase. Chemicals must be stored in bunded areas.	Pre-construction, Construction / Construction contractor	High	Measures meet best practice management of flora and fauna on construction projects.
Bushfire management	Appropriate management of bushfire asset protection zones (APZ) to prevent the spread of weeds and/or soil into adjacent areas of retained vegetation.	Post construction	High	Measures meet best practice management of flora and fauna on construction projects.

9. Serious and irreversible impacts

9.1 Assessment for serious and irreversible impacts on biodiversity values

Under the BC Act, Section 6.7 of the BC regulation sets out principles for determining whether an impact on a specific threatened species or ecological community is serious and irreversible. If an impact is likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct, this is deemed serious and irreversible. This likelihood is assessed based on the following four principles:

1. The impact will cause a further decline of a species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline
2. The impact will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size
3. The impact is made on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution
4. The impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity, and therefore its members are not replaceable.

A set of criteria have been developed and are included in the DPE Guidelines to assist a decision-maker to determine a SAII (DPIE, 2019c). Threatened biota that meet the criteria under one or more of the above principles have been identified as SAII entities. Each potential SAII entity has an impact threshold identified which can be used to help determine if a development will result in SAII.

Table 9.1 identifies SAII species within the Subject land, their presence and whether they require an SAII assessment. Flora species that were not recorded on site during targeted surveys in the appropriate season have not had an SAII assessment prepared.

Table 9.1 Review of species requiring an SAII assessment

Common name	Scientific name	Listing status		Method used to determine presence	Presence	SAII Assessment prepared
		BC Act	EPBC Act			
Trailing Woodruff	*Asperula asthenes*	V	V	Assumed present	Assumed present	No
Thick-leaf Star-hair	*Astrotricha crassifolia*	V	V	Targeted threatened species survey	No	No
Wyong Midge Orchid 2	*Corunastylis* sp. Charmhaven (NSW896673)	CE	CE	Assumed present	Assumed present	Yes
Variable Midge Orchid	*Genoplesium insigne*	CE	E	Targeted threatened species survey	No	No
Eastern Australian Underground Orchid	*Rhizanthella slateri*	V	E	Targeted threatened species survey	No	No
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	Assumed present	Assumed present	No

9.1.1 Threatened flora and fauna species

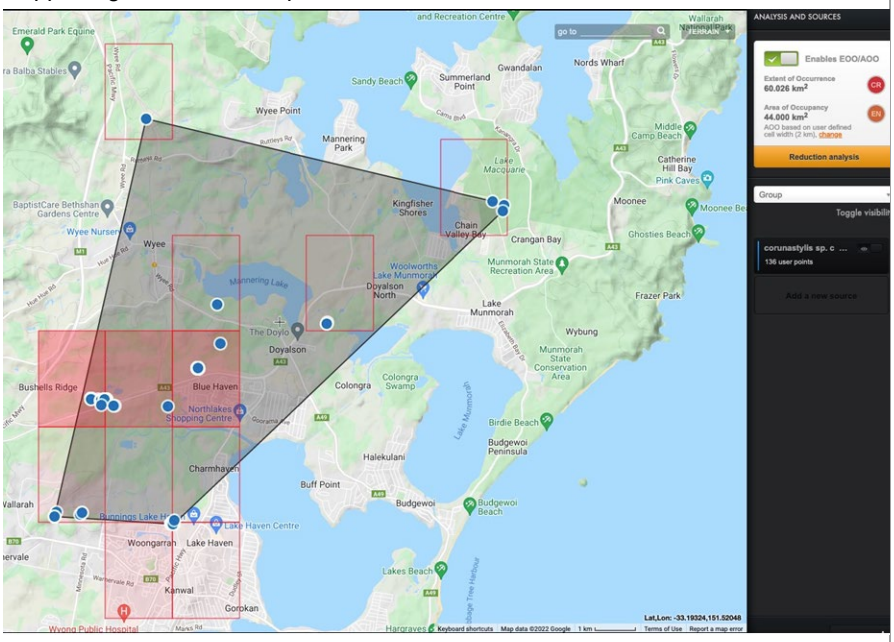
Entities at risk of an SAII are identified in Table 9.2 and have been assessed in accordance with the criteria set out in Subsection 9.1.2 of the BAM 2020. All criteria have been addressed for each threatened species within the sections below. An SAII assessment has been prepared for *Corunastylis* sp. Charmhaven (NSW896673) (Table 9.3).

Table 9.2 Need for assessments of serious and irreversible impacts for threatened species

Species	Discussion	SAII assessment prepared	Principle (see section 9.1 for detail)
Chalinolobus dwyeri (Large-eared Pied Bat)	The threatened species profile database identifies impacts on breeding habitat as identified during survey as the threshold for this species (DPE, 2022h). All habitat on the subject land where the subject land is within 2 km of caves, scarps, cliffs, rock overhangs and disused mines is to be mapped as the species polygon for this species. Potential breeding habitat is PCTs associated with the species within 100m of rocky areas containing caves, or overhangs or crevices, cliffs or escarpments, or old mines, tunnels, culverts, derelict concrete buildings (DPE, 2022h). Previous ecological survey identified this species forages along Hammond Canal and suggests there is a roost site located within riparian areas north-west of the subject land towards Colongra Lake. This area is >300 m from the subject land and is wholly outside of the impact area. While suitable breeding habitat is present within 2 km of the subject land, no breeding habitat would be impacted by the project.	No There is no suitable breeding habitat in the subject land including existing disused infrastructure with similar habitat suitability to disused mines.	4
Corunastylis sp. Charmhaven (NSW896673)		Yes	1 and 3

*Table 9.3 SAII assessment on **Corunastylis sp. Charmhaven (NSW896673)***

Assessment criteria	Response
Population of the species	
Current status	*Corunastylis* sp. Charmhaven (NSW896673) is listed as Critically Endangered under the BC Act and EPBC Act
Evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) presented by an estimate of the: – decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or – decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality;	When listed as threatened in NSW, *Corunastylis* sp. Charmhaven (NSW896673) was known to have a small population size of less than 20 individual mature plants and is only known to occur in the Wyong Shire of NSW specifically the Charmhaven, Warnervale and Tooheys Road (Bushells Ridge) areas (NSC, 2012). The species was known to have two small subpopulations 2–3 km west of the primary population (NSC, 2012). However, currently there are 136 BioNet Atlas records of the species from potentially three populations (DPE, 2022f). The BCD has stated that there has been a decline of >=80% (Pers. comm.). In addition, the species has had a reduction in geographic extent of ≥90% since 1750 or ≥80% since 1970. The decline of the population is thought to be a result of land clearance for agriculture and suburban development (Weston, 2014). As such, *Corunastylis* sp. Charmhaven (NSW896673) meets Principle 1 SAII.

Assessment criteria	Response
exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasites.	
Evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) presented by: – an estimate of the species' current population size in NSW, and – an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and – where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations	As stated above, there is evidence of a small population size within NSW (NSC, 2012). Currently there are 136 BioNet Atlas records of the species from potentially three populations (DPE, 2022f). The BCD has stated that the population is >263 mature individuals with no evidence of extreme fluctuations (Pers. comm.). Monitoring of Saving our Species sites between 2016–2017 and 2020–2021 has recorded up to 263 individual plants and did not include all known populations. As such, *Corunastylis* sp. Charmhaven (NSW896673) does not meet Principle 2 SAII.
Evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) presented by: – extent of occurrence – area of occupancy – number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences) – whether the species' population is likely to undergo extreme fluctuations	The species geographic distribution is considered to be very restricted (DotE, 2014a; DPE, 2022f). It occurs within the Hunter-Central Rivers Catchment Management Authority in the Sydney Basin Bioregion in both public and privately owned land within the Wyong Local Government Area (Branwhite, 2013). The species' primary population was estimated at less than 20 individual mature plants. However, currently there are 136 BioNet Atlas records and 263 monitoring records of the species from potentially three populations (DPE, 2022f). The BCD has stated that species is known from 1–10 locations, but is likely to form one population (Pers. comm.): - Estimated AOO = 44 km^2 - Estimated EOO = 60 km^2 (Source: 2022 Flora review (BioNet Atlas (no valid records in AVH), DPIE species profile, SoS plan, Le Breton 2019). The justification for the species EOO ≤100 km^2 - The Number of locations is unconfirmed. It could range from 1, because all occurrences are relatively close to each other, or up to 10. The species' profile suggests that a single location is feasible given the range of known and likely threats. Supporting information/maps =  As such, *Corunastylis* sp. Charmhaven (NSW896673) meets Principle 3 SAII.

Assessment criteria	Response
Evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation) because: – known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (eg species is clonal) on, a biodiversity stewardship site – the species is reliant on abiotic habitats which cannot be restored or replaced (eg karst systems) on a biodiversity stewardship site, or – life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (eg frogs severely impacted by chytrid fungus).	Information provided by BAM Support indicates that this SAII entity does not meet this criterion. There is no evidence to suggest that the *Corunastylis* sp. Charmhaven (NSW896673) is unlikely to respond to management. The BCD has stated 'Where ranges of numbers are given (e.g., in populations or distributions), the lower estimate should be used - this is the conservative or minimum estimate of the number of individuals or distribution of the TEC. Minimum estimates (indicated by ">" e.g., >5 individuals) should be used in a similar way. Calculations of decline made based on these numbers may therefore be considered "worst case scenario". Unfortunately, many estimates of population are maximum estimates (indicated by "<" e.g., "<250"), any calculations of decline based on these numbers are not precautionary, and should be considered a minimum decline, or "best case scenario "of decline' (Per. comm.). As such, *Corunastylis* sp. Charmhaven (NSW896673) does not meet Principle 4 SAII.
Impact assessment	
The impact on the species' population (Principles 1 and 2) presented by: – an estimate of the number of individuals (mature and immature) present in the subpopulation on the subject land (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population	*Corunastylis* sp. Charmhaven (NSW896673) is thought to be confined to a singular site at Charmhaven and two sites at Warnervale in the Shire of Wyong on the Central Coast of New South Wales (Payne, 2014). The total population has been estimated to consist of 40-60 mature plants (Gibson, 2014). There are currently 136 BioNet records of the species (DPE, 2022f). The total number of individuals that are associated with those records is uncertain, as many observations do not contain data on the number of individuals recorded. Due to report delivery deadlines, surveys of the species were not able to be undertaken in the appropriate season for the purposes of this BDAR, and the species is assumed to be present. Targeted flora and fauna surveys undertaken by Niche Environment and Heritage in May 2021 surveyed one specimen approximately 2.3 km north-west of the Subject land (Niche, 2021). Further surveys are proposed during November of this report to confirm either presence or absence. Given the species is assumed present, estimations on the number of individuals are based on threatened species to plant community type association data and its AO and EO. The species is associated with PCT 1636 Scribbly Gum – Red Bloodwood – *Angophora inopina* heathy woodland on lowlands of central coast according to BioNet threatened species to plant community types of association data. This PCT has been surveyed and stratified into a vegetation zone that is approximately 2000m^2. Taking into consideration the species restricted range and association with the PCT 1636 (Figure 9.1), potentially a small number (>10) of plants could be impacted.
– an estimate of the number of individuals (mature and immature) to be impacted by the project and as a percentage of the total NSW population, or	The species' unit of measurement is by area not stem count and as such, this section is not applicable.
– if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the project	Conservation advice by the Commonwealth Threatened Species Scientific Committee (TSSC) suggests the species (including both primary and secondary populations) has an estimated Extent of Occurrence (EO) of 5km^2 and an Area of Occupancy (AO) of 3km^2 (DotE, 2014a). The BAM-C identified the EO of <10 km^2 and an AO of <100km^2. Both estimates are considered very restricted. The BCD has stated that species is known from 1–10 locations, but is likely to form one population (Per. comm.): - Estimated AOO = 44 km^2 - Estimated EOO = 60 km^2

Assessment criteria	Response
	The impact from of the project represents approximately 0.2km2. the project itself does not fall in these mapped areas as they occur to the north and west of the subject land. If this species were to occur within the subject land, it would represent an expansion of the AOO and EOO for this species. As such, the potential impact from the project would not reduce the known AOO or EOO for this species.
Impact on geographic range (Principles 1 and 3) presented by: – the area of the species' geographic range to be impacted by the project in ha, and a percentage of the total AOO, or EOO within NSW	The project would result in the removal of potential *Corunastylis* sp. Charmhaven (NSW896673) habitat associated with 0.16 ha of Scribbly Gum - Red Bloodwood - *Angophora inopina* heathy woodland on lowlands of the Central Coast (PCT 1636) (Figure 9.1). This represents no reduction of the known AOO or EOO within NSW.
The impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted	The project would result in the removal of potential *Corunastylis* sp. Charmhaven (NSW896673) habitat associated with 0.16 ha of Scribbly Gum - Red Bloodwood - *Angophora inopina* heathy woodland on lowlands of the Central Coast (PCT 1636). No surveys have been undertaken in the appropriate seasons so the species is assumed present for the purposes of this assessment. The loss of 0.16 ha has the potential to remove a small population (if one is present).
To determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (eg seed dispersal) and pollination distance for the species	Many of the existing individuals in the broader area occur within private and public property including agricultural land and road reserve. The project will not result in the direct loss of any individuals from populations outside of the assumed present population within the mapped PCT 1636 (Figure 9.1). The population occurs within a patch that is already subject to fragmentation.
To determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens and parasites.	The assumed population of *Corunastylis* sp. Charmhaven (NSW896673) within the Subject land is unlikely to remain viable in the long-term due to being so heavily restricted with existing threats from weed invasion, land clearing, grazing by rabbits and over-collection (DotE, 2014a). However, the species is a perennial, shooting from dormant underground tuber following summer rain. There may be opportunities for dormant tubers to remain viable in the site. The proposed impact is unlikely to affect fire regimes (frequency, severity); hydrology, pollutants or species interactions (increased competition and effects on pollinators or dispersal).

9.1.2 Additional impact assessment provisions for TECs at risk of an SAII

The area of Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions TEC is not considered to be a potential SAII as the patch is small (0.10 ha), occurs in a disturbed state, and is isolated from other viable patches of similar vegetation (Table 9.1). As such, the ecological value is limited, and its removal would be unlikely to lead to a negligible reduction of the TEC's occurrence in the locality.

Paper Size ISO A4

0 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

EnergyCo
Waratah Super Battery - BDAR

Project No. **12582669**
Revision No. **0**
Date **26/10/2022**

Serious and irreversible impacts

FIGURE 9.1

\\ghdnet\ghd\AU\Newcastle\Projects\21\12582669\GIS\Maps\Deliverables\12582669_BDAR.aprx
12582669_BDAR_011_Fig9_1_SeriousImpacts
Print date: 26 Oct 2022 - 10:40

Data source: Imagery, captured by Energy Co on September 2022; Roads, Railways - DCS, 2022; Metromap Tile Service: . Created by: mfredle

10. Impact summary

10.1 Offset requirement for impacts under the BC Act

10.1.1 Impacts on native vegetation and TECs (ecosystem credits)

The impacts that require ecosystem offsets are summarised in Table 10.1 and illustrated in Figure 10.1.

Table 10.1 Impacts that require an offset – ecosystem credits

Vegetation zone	PCT name	TEC	Impact area (ha)	Current VI score	Future VI score	Change in VI score	Biodiversity risk weighting	Number of ecosystem credits required
Zone 1	PCT 1636: Scribbly Gum - Red Bloodwood - *Angophora inopina* heathy woodland on lowlands of the Central Coast	No	0.16	55.1	0	-55.1	1.75	4
Zone 2	PCT: 1724: Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.10	52.7	0	-52.7	2	3
Total credits								7

10.1.2 Impacts on threatened species and their habitat (species credits)

Table 10.2 identifies impacts on threatened species (species credits) that require an offset (as per BAM Subsection 9.2.2(2.)). Species have been assumed to occur throughout the entire vegetation zone of PCTs with which they are associated. Further surveys are proposed in the appropriate season to confirm presence or absence of species assumed present, and to accurately assess the impacts of the project.

Table 5.10 identifies the justifications for the inclusion of assumed present species. Table 10.2 below illustrates loss of habitat (ha) or individuals associated with each assumed present species and its associated habitat area or PCT. Each assumed present species is associated with either PCT 1636 and 1724.

Table 10.2 Impacts that require an offset – species credits

Common name	Scientific name	BC Act status	EPBC Act status	Loss of habitat (ha) or individuals	PCT	Biodiversity risk weighting	Number of species credits required
Charmhaven Apple	*Angophora inopina*	V	V	0.16 ha	PCT 1636	2	4
Trailing Woodruff	*Asperula asthenes*	V	V	0.26 ha	PCT 1636 PCT 1724	2	7
Netted Bottle Brush	*Callistemon linearifolius*	V	-	5 individuals	Limited to PCT 1636	1.5	8
Eastern Pygmy-possum	*Cercartetus nanus*	V	-	0.16 ha	PCT 1636	2	4
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	0.26 ha	PCT 1636 PCT 1724	3	11
-	*Corunastylis* sp. Charmhaven NSW896673)	CE	CE	0.16 ha	PCT 1636	3	7
Wallum Froglet	*Crinia tinnula*	V	-	0.26 ha	PCT 1636 PCT 1724	1.5	5
Leafless Tongue Orchid	*Cryptostylis hunteriana*	V	V	0.16 ha	PCT 1636	1.5	3
Giant Burrowing Frog	*Heleioporus australiacus*	V	V	0.16 ha	PCT 1636	1.5	3
Pale-headed Snake	*Hoplocephalus bitorquatus*	V	-	0.26 ha	PCT 1636 PCT 1724	2	7
Green and Golden Bell Frog	*Litoria aurea*	E	V	0.26 ha	PCT 1636 PCT 1724	2	7
Green-thighed Frog	*Litoria brevipalmata*	V	-	0.26 ha	PCT 1636 PCT 1724	1.5	5
-	*Maundia triglochinoides*	V	-	0.10 ha	PCT 1724	2	3

Common name	Scientific name	BC Act status	EPBC Act status	Loss of habitat (ha) or individuals	PCT	Biodiversity risk weighting	Number of species credits required
Tall Knotweed	*Persicaria elatior*	V	V	0.10 ha	PCT 1724	2	3
Squirrel Glider	*Petaurus norfolcensis*	V	-	0.26 ha	PCT 1636 PCT 1724	2	7
Brush-tailed Phascogale	*Phascogale tapoatafa*	V	-	0.26 ha	PCT 1636 PCT 1724	2	7
Common Planigale	*Planigale maculata*	V	-	0.26 ha	PCT 1636 PCT 1724	2	7
Mahony's Toadlet	*Uperoleia mahonyi*	E	-	0.26 ha	PCT 1636 PCT 1724	2	7
						Total credits	105

10.1.3 Indirect and prescribed impacts

Indirect and prescribed impacts that remain after measures to avoid, minimise and mitigate have been applied, have been offset using additional biodiversity credits. Table 10.3 summarises proposed conservation measures for residual, indirect and prescribed impacts.

Table 10.3 Summary of proposed conservation measures for residual indirect and prescribed impacts

Residual indirect or prescribed impact	Conservation measure description
Edge effects	'Edge effects' will be managed through appropriate construction and operation management regimes stipulated in a CEMP and FFMP as a subplan. can include increased noise and light or erosion and sedimentation at the interface of intact vegetation and cleared areas. Edge effects may result in impacts such as changes to vegetation type and structure, increased growth of exotic plants, increased predation of native fauna or avoidance of habitat by native fauna. Edge effects would result from construction activities and then continue to affect vegetation and habitats adjoining the subject land. Altered environmental conditions along new edges can allow invasion by pest animals specialising in edge habitats and/or change the behaviour of resident animals. Edge zones can be subject to higher levels of predation by introduced mammalian predators and native avian predators. Vegetation within and adjoining the subject land varies in condition. Weeds are prevalent around disturbed edges and tracks, and in cleared areas. There are high threat exotic species present throughout the subject land, including Pine Tree among others. There is a moderate to high risk of construction activities spreading new weeds into adjoining vegetation. Management measures including the development of a weed management sub-plan as part of the project CEMP would be implemented to mitigate these potential impacts as identified in Section 8.4. Other relevant mitigation measures to reduce the impacts of edge effects include lighting design to minimise light spill, dust suppression, and erosion and sediment measures during construction.
Introduction and spread of weeds, pests and pathogens	The potential for significant or new impacts as a result of the spread of weeds, pests and pathogens is relatively low, given the existing development presence and extent of human visitation across the subject land and surrounding study area. Construction personnel and vehicles would be excluded from native vegetation outside the subject land. To further mitigate the risk of pathogens being brought onto and/or spread through the site all machinery brought to site will be washed down and inspected to be free of soils, seeds and other organic material in accordance with in Section 8.4.
Noise and light impacts on fauna	Noise levels during the construction period would result in an increase above existing background levels for the duration of construction. Fauna most at risk would be those residing near the works area, and in particular any species that may be nesting, roosting or denning in the area. Some fauna may vacate areas in proximity to the subject land during construction. Hollow-bearing trees in adjacent areas may provide nesting habitat for species, including the threatened Squirrel Glider and a variety of threatened microbat species. Disturbance has the potential to interrupt breeding activities for some individuals. Other more resilient fauna species are likely to become accustomed to the noise, and this increased or novel impact is unlikely to result in a decrease in population numbers or diversity of these species. Given the sites history, and the availability of alternate habitat in surrounding areas, it is unlikely the temporary increase in noise during construction of the project would significantly impact on fauna that occur adjacent to the subject land.
Erosion and sedimentation	The project has the potential to result in erosion within the subject land through construction activities and exposure of soils and may, in general, result in sedimentation impacts on adjoining native vegetation and aquatic habitats. Sediment laden runoff to waterways can alter water quality and adversely affect aquatic life. Sediments may also smother terrestrial vegetation, introduce weed propagules or nutrients that promote weeds, or introduce disease. Construction of the project has the potential to result in the mobilisation of contaminated sediments into waterways, or chemical spills from vehicles or plant. The introduction of pollutants from the project into the surrounding environment, if uncontrolled, could potentially impact on water quality further downstream. Potential water quality impacts would be managed through the implementation of mitigation measures, including the provision of silt fences and other structures to intercept runoff as determined in Section 8.4. The residual risk of the impact is likely to be low.
Dust	Construction of the project may result in generation of dust. High dust levels could reduce habitat quality for flora and fauna species by reducing plant and animal health in adjacent areas of vegetation. Dust may affect photosynthesis, respiration and transpiration in plants and allow the penetration of gaseous pollutants. This then leads to decreased productivity, and in the long-term can alter community structure. Dust could also impact health of fauna, such as through respiratory disease, and

Residual indirect or prescribed impact	Conservation measure description
	the reduction in health of animals would be exacerbated by changes to plant health and community structure. Suppression of dust would be undertaken during construction and detailed in a CEMP.
Fire	Construction of the project presents a potential risk of fire, for example from storage of combustible fuels or ignition from works areas. Small fires can spread very quickly in unfavourable conditions to become large wildfires. In drought conditions, this risk would be increased due to the dry nature of the vegetation. Much of Australia's biodiversity is adapted to and relies upon bushfire as a natural ecosystem process. However, fires can lead to mortality of fauna, degradation of fire-sensitive communities or plants, and destruction of habitat resources, especially if too regular or intense. Bushfires of high to extreme intensity can result in significant modification of vegetation structure and composition such that the original vegetation type and condition is no longer identifiable. The risk of fires spreading to adjacent areas would be minimised through a fire hazard management plan and other measures to contain and control the outbreak of fire.

10.2 Impacts that do not need further assessment under the BC Act

Impacts that do not need further assessment for ecosystem credits are listed in Table 10.4 (as per BAM Section 9.3(1–2.).

Table 10.4 Impacts that do not need further assessment for ecosystem credits

Impact	Location within subject land	Justification why no further assessment is required
Removal of 13 ha of non-native vegetation.	Non-native vegetation areas constitute the balance area outside of the vegetation zones on Figure 4.4.	These areas have been historically cleared and denuded for use as a coal facility, are dominated by exotic species including HTW species and littered with deleterious matter from the demolition of the previous facility.

10.3 Offsets of MNES

No threatened or migratory species are likely to be significantly impacted by the project. No offsets area therefore required for MNES.

Paper Size ISO A4

0 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

EnergyCo
Waratah Super Battery - BDAR

Thresholds for assessing and offsetting impacts

Project No. **12582669**
Revision No. **0**
Date **26/10/2022**

FIGURE 10.1

Data source: : Imagery, captured by Energy Co on September 2022; Roads, Railways - DCS, 2022; Metromap Tile Service: . Created by: mfredle

11. Biodiversity credit report

The BAM-C credit report identifies the numbers and classes of biodiversity credits required to be retired in accordance with the like-for-like requirements of the offset rules and those that could be retired in accordance with the variation rules. This BDAR has been submitted to the decision-maker within 14 days of the date the BAM-C credit report was finalised (Report date: 4 November 2022).

11.1 Ecosystem credits

Table 11.1 Ecosystem credit class and matching credit profile

Ecosystem credit	Attributes shared with matching credits						
	PCT name	PCT vegetation class	PCT vegetation formation	Associated TEC or EC	Offset trading group (BAM Section 10.2, Tables 4 & 5)	Hollow bearing trees present ?	IBRA subregion (in which proposal is located)
4	PCT 1636: Scribbly Gum - Red Bloodwood – *Angophora inopina* heathy woodland on lowlands of the Central Coast	Sydney Coastal Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby sub-formation)	NA	Tier 3 or higher threat status	No	Wyong
3	PCT 1724: Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Forested Wetlands	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Tier 3 or higher threat status	No	Wyong

11.2 Species credits

Table 11.2 Species credit class and matching credit profile

Species credits	Attributes shared with matching credits				
	Name of threatened species	Kingdom	BC Act status	EPBC Act status	IBRA region
4	*Angophora inopina* (Charmhaven Apple)	Flora	V	V	Sydney Basin
7	*Asperula asthenes* (Trailing Woodruff)	Flora	V	V	Sydney Basin
4	*Callistemon linearifolius* (Netted Bottle Brush)	Flora	V	-	Sydney Basin
8	*Cercartetus nanus* (Eastern Pygmy-possum)	Fauna	V	-	Sydney Basin
11	*Chalinolobus dwyeri* (Large-eared Pied Bat)	Fauna	V	V	Sydney Basin
7	*Corunastylis* sp. Charmhaven NSW896673)	Flora	CE	CE	Sydney Basin
5	*Crinia tinnula* (Wallum Froglet)	Fauna	V	-	Sydney Basin
3	*Cryptostylis hunteriana* (Leafless Tongue Orchid)	Flora	V	V	Sydney Basin
3	*Heleioporus australiacus* (Giant Burrowing Frog)	Fauna	V	V	Sydney Basin
7	*Hoplocephalus bitorquatus* (Pale-headed Snake)	Fauna	V	-	Sydney Basin
7	*Litoria aurea* (Green and Golden Bell Frog)	Fauna	E	V	Sydney Basin
5	*Litoria brevipalmata* (Green-thighed Frog)	Fauna	V	-	Sydney Basin
3	*Maundia triglochinoides*	Flora	V	-	Sydney Basin
3	*Persicaria elatior* (Tall Knotweed)	Flora	V	V	Sydney Basin
7	*Petaurus norfolcensis* (Squirrel Glider)	Fauna	V	-	Sydney Basin
7	*Phascogale tapoatafa* (Brush-tailed Phascogale)	Fauna	V	-	Sydney Basin
7	*Planigale maculata* (Common Planigale)	Fauna	V	-	Sydney Basin
7	*Uperoleia mahonyi* (Mahony's Toadlet)	Fauna	E	-	Sydney Basin

12. Conclusion

The project location was chosen to minimise direct and indirect impacts on native vegetation, TECs, threatened species and their habitat as well as prescribed impacts listed in Table 6.1 by siting the development within the previously disturbed Munmorah Power Facility. Detailed environmental investigations were conducted for the project including an assessment of a broader subject area to identify key constraints during the feasibility and design phases. Investigations identified that the nature of the site and its existing barriers to fauna movement presented an opportunity to redevelop an already degraded area. Due to the development suitability of the site, alternative project locations were not investigated.

The proposal would result in residual direct impacts to a total of 0.26 ha of native vegetation in moderate condition. The direct impacts to include 0.16 ha of PCT 1636, and 0.10 ha of PCT 1724 (commensurate with Swamp Sclerophyll Forest TEC). Outside of these mapped areas, the majority of the subject land is already cleared and denuded. The areas of native vegetation are fragmented providing minimal fauna habitat and connectivity in the context of the surrounding landscape. Vegetation clearing outside of the mapped PCT 1636 and 1724 consists of the removal non-native plants including priority and HTW species. The removal of 0.26 ha of native vegetation is insignificant at the regional scale and is unlikely to threaten the persistence of populations of native plants and vegetation communities.

The vegetation that would be removed provides habitat resources for native fauna species, including threatened species. The proposal would result in direct impacts for one threatened flora species recorded within the project site, Charmhaven Apple (*Angophora inopina*). Seventeen additional threatened flora and fauna species were assumed present within the project site as the seasonal timing of surveys did not allow for the presence or absence of these species to be confirmed. If present, the proposal would remove up to 0.26 ha of habitat resources for these species.

The clearing of 0.26 ha of native woodland and forest would include the removal of a relatively young forest with no large canopy trees harbouring hollows appropriate for fauna. The habitat is also fragmented and exists within a completely fenced site with limited fauna permeability. The removal constitutes a small proportion of available flora and fauna resources. Plot and transect data collected at the site corroborates this interpretation as no hollow bearing trees exist.

Potential indirect impacts are considered limited are as they would have a low likelihood and consequence due to a range a mitigation measures that would be implemented. No prescribed impacts are considered of high relevance to the proposal.

Corunastylis sp. Charmhaven (NSW896673) is listed as Critically Endangered under the BC Act and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Whilst this species was not recorded within the subject land, surveys where not undertaken during the correct time period and the species has been presumed to be present. However, the proposed impact to the potential habitat is considered small in extent (0.16 ha) and is also limited by the degraded nature of this habitat.

A range of proposed mitigation and management measures have been proposed for residual impacts. These include measures that would be undertaken during the construction and operation of the proposed development. Further surveys are proposed in the appropriate season to confirm presence or absence of species assumed present, and to accurately assess the impacts of the project.

13. References

Branwhite, B. (2013). Personal communication by email, October 2013. Wyong Terrestrial Orchid Researcher.

BoM (Bureau of Methodology) (2022a). Daily Weather Observations. Gosford, New South Wales. Accessed at: **Gosford, NSW - August 2022 - Daily Weather Observations (bom.gov.au)**

BoM (2022b). Atlas of Groundwater Dependent Ecosystems mapping. Accessed at: **GDE Atlas Home: Water Information: Bureau of Meteorology (bom.gov.au)**

DAWE (Commonwealth Department of Agriculture, Water and the Environment) (2012). Interim Biogeographic Regionalisation for Australia (IBRA), Version 7 (Subregions). Accessed at: **Interim Biogeographic Regionalisation for Australia (IBRA), Version 7 (Subregions) | Dataset | SEED (nsw.gov.au)**

DAWE (2020). EPBC Act Condition-setting Policy. Department of Agriculture, Water and the Environment. Accessed at: **EPBC Act Condition-setting Policy - DCCEEW**

DAWE (2021). Conservation advice for the Coastal swamp sclerophyll forest of New South Wales and south east Queensland. December 2021. Accessed at: **Conservation advice for the Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland (environment.gov.au)**

DCCEEW (Commonwealth Department of Climate Change, Energy, the Environment and Water) (2022a). National Flying-fox monitoring viewer. Accessed at: **Monitoring Flying-Fox Populations - DCCEEW**

DCCEEW (2022b). Protected Matters Search Tool. Accessed at: **Protected Matters Search Tool - DCCEEW**

DCCEEW (2022c). SPRAT Species Profile and Threats Database. Accessed at: **Species Profiles (SPRAT) (environment.gov.au)**

DEC (NSW Department of Conservation) (2004). Threatened biodiversity survey and assessment: Guidelines for developments and activities (2004 working draft). Department of Environment and Conservation. Accessed at: **Threatened biodiversity survey and assessment | NSW Environment and Heritage**

DECC (NSW Department of Environment and Climate Change) (2007). Acid Sulfate Soils Remediation Guidelines for Coastal Floodplains in New South Wales. Accessed at: **Acid Sulfate Soils Remediation Guidelines for Coastal Floodplains in NSW**

DECC (2008a). Descriptions for NSW (Mitchell) Landscapes - version 2. Accessed at: **NSW (Mitchell) Landscapes - version 3.1 | Dataset | SEED**

DECC (2008b). Managing Urban Stormwater – Soils and Construction. Volume 2D – Main road construction. NSW Department of Environment and Climate Change. Accessed at: **Managing Urban Stormwater Soils and construction Volume 2A Installation of services | NSW Environment and Heritage**

DEWHA (Commonwealth Department of the Environment, Water, Heritage and the Arts) (2008). Approved Conservation Advice for *Angophora inopina*. March 2008. Accessed at: **64832 - Approved Conservation Advice for Angophora inopina (environment.gov.au)**

DEWHA (2009). Significant impact guidelines for the vulnerable green and golden bell frog (*Litoria aurea*). Nationally threatened species and ecological communities. EPBC Act policy statement 3.19. Accessed at: **Significant impact guidelines for the vulnerable green and golden bell frog (Litoria aurea) (dcceew.gov.au)**

DotE (Commonwealth Department of the Environment) (2013a). Significant Impact Guidelines 1.1 - Matters of National Environmental Significance. Accessed at: **Matters of National Environmental Significance: Significant Impact Guidelines 1.1 (dcceew.gov.au)**

DotE (2013b). Draft survey guidelines for Australia's threatened orchids. Accessed at: **Draft survey guidelines for Australia's threatened orchids - DCCEEW**

DotE (2014). Conservation Advice *Corunastylis* sp. Charmhaven (NSW896673) Wyong midge orchid 2. Accessed at: **Conservation Advice - Corunastylis sp. Charmhaven (NSW896673) - Wyong midge orchid 2 (environment.gov.au)**

DotE (2015). Referral guideline for 14 birds listed as migratory species under the EPBC Act. September 2015. Accessed at: **Referral guideline for 14 birds listed as migratory species under the EPBC Act (dcceew.gov.au)**

DPE (NSW Department of Planning and Environment) (2022a). Biodiversity Assessment Method 2020 Operational Manual – Stage 1. Accessed at: **Biodiversity Assessment Method 2020 Operational Manual – Stage 1 | NSW Environment and Heritage**

DPE (2022b). Biodiversity Assessment Method Calculator Version 1.4.0.00. Accessed at: **BAM Calculator (nsw.gov.au)**

DPE (2022c). Biodiversity values map and threshold tool. Accessed at: **Biodiversity Values Map and Threshold tool (nsw.gov.au)**

DPE (2022d). Guidance for the Biodiversity Development Assessment Report Template. Accessed at: **Guidance for the Biodiversity Development Assessment Report Template | NSW Environment and Heritage**

DPE (2022e). Koala (*Phascolarctos cinereus*): Biodiversity Assessment Method Survey Guide. Accessed at: **Koala (Phascolarctos cinereus): Biodiversity Assessment Method Survey Guide | NSW Environment and Heritage**

DPE (2022f). NSW BioNet Atlas. Registered user. Accessed at: **NSW BioNet | NSW Environment and Heritage**

DPE (2022g). NSW BioNet Vegetation Classification. Accessed at: **About BioNet Vegetation Classification | NSW Environment and Heritage**

DPE (2022h). NSW BioNet - Threatened Biodiversity Data Collection (TBDC). Accessed at: **ASMS login : ASMS | Environment & Heritage (nsw.gov.au)**

DPE (2022i). NSW State Vegetation Type Map – version C1.1. Accessed at: **NSW State Vegetation Type Map | Dataset | SEED**

DPE (2022j). Threatened biodiversity profile search. Accessed at: **Threatened biodiversity profile search | NSW Environment, Energy and Science**

DPI (NSW Department of Primary Industries) (2022a). Fisheries Spatial Data Portal mapping. Accessed at: **Fisheries Spatial Data Portal (nsw.gov.au)**

DPI (2022b). NSW WeedWise. Priority weeds for the Greater Sydney. Access at: **https://weeds.dpi.nsw.gov.au/WeedBiosecurities?AreaId=39**

DPIE (NSW Department of Planning, Industry and Environment) (2019a). Biodiversity Assessment Method Operational Manual Stage 2. Accessed at: **Biodiversity Assessment Method Operational Manual – Stage 2 (nsw.gov.au)**

DPIE (2019b). Biodiversity Offsets Payment Calculator – BTD: Methodology Note. Accessed at: **Biodiversity Offsets Payment Calculator Methodology note | NSW Environment and Heritage**

DPIE (2019c). Guidance to assist a decisionmaker to determine a serious and irreversible impact. Accessed at: **https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/biodiversity-offsets-scheme/serious-and-irreversible-impacts**

DPIE (2020a). Biodiversity Assessment Method 2020. Accessed at: **Biodiversity Assessment Method 2020 | NSW Environment and Heritage**

DPIE (2020b). Guidance for assessors and decision-makers in applying modified benchmarks to assessments of vegetation integrity. Accessed at: **Guidance for assessors and decision-makers in applying modified benchmarks to assessments of vegetation integrity | NSW Environment and Heritage**

DPIE (2020c). Hygiene guidelines for wildlife. Protocols to protect priority biodiversity areas in NSW from *Phytophthora cinnamomi*, myrtle rust, amphibian chytrid fungus and invasive plants. Accessed at: **Hygiene guidelines | NSW Environment and Heritage**

DPIE (2020d). NSW Survey Guide for Threatened Frogs. A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method. Accessed at: **NSW Survey Guide for Threatened Frogs | NSW Environment and Heritage**

DPIE (2020e). Surveying threatened plants and their habitats. NSW survey guide for the Biodiversity Assessment Method. Accessed at: **Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method**

DPIE (2022f). eSPADE. Accessed at: **eSPADE v2.2 (nsw.gov.au)**

ELA (Eco Logical Australia) (2008). NSW (Mitchell) Landscapes - version 3.1. Accessed at: **NSW (Mitchell) Landscapes - version 3.1 | Dataset | SEED**

ELA (2017). Assignment of IBRA sub-regions and %-cleared estimates to NSW PCTS.

ELA (2022). Swift Parrot Assessment. Letter report prepared for Generator Property Management Pty Ltd. August 2022.

GHD (2022). Waratah Super Battery Project. Munmorah Power Station – Site Suitability. Report prepared for the NSW Department of Planning & Environment. June 2022.

Gibson, R. (2014). Personal communication by email, 31 January 2014, Regional Biodiversity Conservation Officer NSW Office of Environment and Heritage.

Niche (Niche Environment and Heritage) (2020). Targeted flora and fauna surveys. Munmorah Power Station. Prepared for Generator Property Management Pty Ltd. July 2020.

Niche (2021). Targeted flora and fauna survey of conservation areas. Munmorah Power Station. Prepared for Generator Property Management Pty Ltd. May 2021.

NSC (NSW Scientific Committee) (2012). *Corunastylis* sp. Charmhaven (NSW896673) - Critically Endangered species determination – final determination. Accessed at: **Corunastylus sp Charmhaven (nsw.gov.au)**

OEH (NSW Office of Environment and Heritages) (2018a). Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method. Office of Environment and Heritage. Accessed at: **'Species credit' threatened bats and their habitats: NSW survey guide for the Biodiversity Assessment Method**

OEH (2018b). Biodiversity Assessment Methods (BAM) Calculator. User Guide. Accessed at: **Biodiversity Assessment Method (BAM) Calculator - User guide | NSW Environment and Heritage**

Payne, R. (2014). Personal communication by email, 15 January 2014, Botanist-Wildlife Ecologist, Ecological Surveys Management.

Prendagast, K.Tomlinson, S., Dixon, K.W., Bateman, P. and Menz, M.H.M. (2022) Urban native vegetation remnants support more diverse bee communities than residential gardens in Australia's southwest biodiversity hotspot. Accessed at: **Urban native vegetation remnants support more diverse native bee communities than residential gardens in Australia's southwest biodiversity hotspot - ScienceDirect**

RFS (Rural Fire Service) (2019). Planning for Bush Fire Protection. Accessed at: **Planning for Bush Fire Protection - NSW Rural Fire Service**

RBGDT (Royal Botanic Gardens & Domain Trust) (2022). PlantNet. NSW Flora Online. Accessed at: **PlantNET Home Page - National Herbarium of New South Wales (nsw.gov.au)**

SEWPaC (Commonwealth Department of Sustainability, Environment, Water, Population and Communities) (2012). Environment Protection and Biodiversity Conservation Act 1999. Environmental Offsets Policy. October 2012. Accessed at: **Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy (dcceew.gov.au)**

Tierney, D.A. (2004). Towards an understanding of population change for the long-lived resprouting tree *Angophora inopina* (Myrtaceae). *Australian Journal of Botany* **52**: 31–38.

Weston, P. (2014). Personal communication by email, 31 January 2014, Senior Principle Research Scientist, The Royal Botanic Gardens and Domain Trust.

Appendix A

BDAR requirements compliance

Assessment of compliance with BDAR minimum information requirements is identified in Table A.1.

Table A.1 Minimum information requirements for the Biodiversity Development Assessment Report and the Biodiversity Certification Assessment Report – Stage 1 and 2.

BDAR section	BAM ref.	BAM requirement	Section reference in the BDAR
Introduction	Chapters 2 and 3	**Information**	
		Introduction to the biodiversity assessment including:	1
		☒ brief description of the proposal	1.1.1
		☒ identification of subject land boundary, including:	1.1.2 1.1.3 Figure 1.2 Figure 1.3
		☒ operational footprint	
		☒ construction footprint indicating clearing associated with temporary/ancillary construction facilities and infrastructure	
		☒ general description of the subject land	1.1.3
		☒ sources of information used in the assessment, including reports and spatial data	1.4
		☒ identification and justification for entering the BOS	1.2
		Maps and tables	
		☒ Map of the subject land boundary showing the final proposal footprint, including the construction footprint for any clearing associated with temporary/ancillary construction facilities and infrastructure	Figure 1.2 Figure 1.3
Landscape	Sections 3.1 and 3.2, Appendix E	**Information**	
		Identification of site context components and landscape features, including:	2.1 3
		☒ general description of subject land topographic and hydrological setting, geology and soils	2.1.1 3.2 3.2.8
		☒ per cent native vegetation cover in the assessment area (as described in BAM Section 3.2)	2.1.2 2.2 4.1
		☒ IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.))	3.2.1

BDAR section	BAM ref.	BAM requirement	Section reference in the BDAR
		☒ rivers and streams classified according to stream order (as described in BAM Subsection 3.1.3(3.) and Appendix E)	3.2.2
		☒ wetlands within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(3.))	3.2.2
		☒ connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6.))	3.2.3
		☒ karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(12.))	3.2.4
		☒ areas of outstanding biodiversity value occurring on the subject land and assessment area (as described in BAM Subsection 3.1.3(8–9.))	3.2.5
		☒ any additional landscape features identified in any SEARs for the proposal	3.2.7
		☒ NSW (Mitchell) landscape on which the subject land occurs	3.2.6
		☒ details of field reconnaissance undertaken to confirm the extent and condition of landscape features and native vegetation cover (as described in Operational Manual Stage 1 Section 2.4)	2.2.2 2.2.6
		Maps and tables	
		☒ Site Map ☒ Property boundary ☒ Boundary of subject land ☒ Cadastre of subject land (including labelling of Lot and DP or section plan if relevant) ☒ Landscape features identified in BAM Subsection 3.1.3	Figure 1.1 Figure 1.2 Figure 1.3 Table 3.1 Table 3.2
		☒ Location Map ☒ Digital aerial photography at 1:1,000 scale or finer ☒ Boundary of subject land ☒ Assessment area (i.e. the subject land and either 1500 m buffer area or 500 m buffer for linear development) ☒ Landscape features identified in BAM Subsection 3.1.3 ☒ Additional detail (e.g. local government area boundaries) relevant at this scale	Figure 1.1 Figure 1.2 Figure 1.3 Table 3.1 Table 3.2
		Landscape features identified in BAM Subsection 3.1.3 and to be shown on the Site Map and/or Location Map include:	
			Figure 1.1

BDAR section	BAM ref.	BAM requirement	Section reference in the BDAR
		☒ IBRA bioregions and subregions ☒ rivers, streams and estuaries ☒ wetlands and important wetlands ☒ connectivity of different areas of habitat ☒ karst, caves, crevices, cliffs, rocks and other geological features of significance and if required, soil hazard features ☒ areas of outstanding biodiversity value occurring on the subject land and assessment area ☒ any additional landscape features identified in any SEARs for the proposal ☒ NSW (Mitchell) landscape on which the subject land occurs	Figure 1.2 Figure 1.3 Table 3.1 Table 3.2
		Data	
		☒ All report maps as separate jpeg files	All figures submitted
		Individual digital shape files of:	
		☒ subject land boundary	
		☒ assessment area (i.e. subject land and 1500 m buffer area) boundary	
		☒ cadastral boundary of subject land	
		☒ areas of native vegetation cover	
		☒ landscape features	
Native vegetation	Chapter 4, Appendix A and Appendix H	**Information**	
		☒ Identify native vegetation extent within the subject land, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery (as described in BAM Section 4.1(1–3.) and Subsection 4.1.1)	4.1 4.1.1 4.1.3
		☒ Provide justification for all parts of the subject land that do not contain native vegetation (as described in BAM Subsection 4.1.2)	4.1.2 Figure 4.1

BDAR section	BAM ref.	BAM requirement	Section reference in the BDAR
		☒ Review of existing information on native vegetation including references to previous vegetation maps of the subject land and assessment area (described in BAM Section 4.1(3.) and Subsection 4.1.1)	2.2.1 3.3
		☒ Describe the systematic field-based floristic vegetation survey undertaken in accordance with BAM Section 4.2	2.2.6
		☐ Where relevant, describe the use of more appropriate local data, provide reasons that support the use of more appropriate local data and include the written confirmation from the decision-maker that they support the use of more appropriate local data (as described in BAM Subsection 1.4.2 and Appendix A)	NA
		For each PCT within the subject land, describe:	
		☒ PCT name and ID	4.2 4.2.1 4.2.2 4.2.3
		☒ vegetation class	4.2.4
		☒ extent (ha) within subject land	
		☒ evidence used to identify a PCT including any analyses undertaken, references/sources, existing vegetation maps (BAM Section 4.2(1–3.))	4.2.2 4.2.3 4.2.4
		☒ plant species relied upon for identification of the PCT and relative abundance of each species	4.2.2 4.2.3 4.2.4 Appendix E
		☒ if relevant, TEC status including evidence used to determine vegetation is the TEC (BAM Subsection 4.2.2(1–2.))	4.2.4
		☒ estimate of per cent cleared value of PCT (BAM Subsection 4.2.1(5.))	4.1.1 4.1.2
		Describe the vegetation integrity assessment of the subject land, including:	
		☒ identification and mapping of vegetation zones (as described in BAM Subsection 4.3.1)	4.4 Figure 4.4
		☒ description of vegetation zones within the subject land (as described in Operational Manual Stage 1 Table 2 and Subsection 3.3.2)	4.4

BDAR section	BAM ref.	BAM requirement	Section reference in the BDAR
		☒ area (ha) of each vegetation zone	Table 4.9
		☒ assessment of patch size (as described in BAM Subsection 4.3.2)	4.4.1
		☒ survey effort (i.e. number of vegetation integrity survey plots) as described in BAM Subsection 4.3.4(1–2.)	4.4.1
		☐ use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM Subsection 4.3.3(5.))	N/A
		Where use of more appropriate local benchmark data is proposed (as described in BAM Subsection 1.4.2, BAM Subsection 4.3.3(5.) and BAM Appendix A):	N/A
		☐ identify the PCT or vegetation class for which local benchmark data will be applied	N/A
		☐ identify published sources of local benchmark data (if benchmarks obtained from published sources)	
		☐ describe methods of local benchmark data collection (if reference plots used to determine local benchmark data)	
		☐ provide justification for use of local data rather than BioNet Vegetation Classification benchmark values	N/A
		☐ provide written confirmation from the decision-maker that they support the use of local benchmark data	N/A
		Maps and tables	
		☒ Map of native vegetation extent within the subject land at scale not greater than 1:10,000 including identification of all areas of native vegetation including areas that are ground cover only, cleared areas (as described in BAM Section 4.1(1–3.)) and all parts of the subject land that do not contain native vegetation (BAM Subsection 4.1.2)	Figure 4.1
		☒ Map of PCTs within the subject land (as described in BAM Section 4.2(1.))	Figure 4.2
		☒ Map of vegetation zones within the subject land (as described in BAM Subsection 4.3.1)	Figure 4.4
		☒ Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCT boundaries	Figure 2.1 Figure 2.2
		☒ Map of TEC distribution on the subject land and table of TEC listing, status and area (ha)	Figure 5.1
		☒ Map of patch size locations for each native vegetation zone and table of patch size areas (as described in BAM Subsection 4.3.2)	Figure 4.4
		Table of current vegetation integrity scores for each vegetation zone within the site and including:	
		☒ composition condition score	Table 4.10

BDAR section	BAM ref.	BAM requirement	Section reference in the BDAR
		☒ structure condition score	
		☒ function condition score	
		☒ presence of hollow bearing trees	
		Data	
		☒ All report maps as separate jpeg files	All data submitted
		☒ Plot field data (MS Excel format)	
		☒ Plot field datasheets	
		Digital shape files of:	
		☒ PCT boundaries within subject land	
		☒ TEC boundaries within subject land	
		☒ vegetation zone boundaries within subject land	
		☒ floristic vegetation survey and vegetation integrity plot locations	
Threatened species	Chapter 5	**Information**	
		Identify ecosystem credit species likely to occur on the subject land, including:	
		☒ list of ecosystem credit species derived from the BAM-C (as described in BAM Subsection 5.1.1 and Section 5.2(1.))	5.1.1
		☒ justification and supporting evidence for exclusion of any ecosystem credit species based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2)	5.1.1
		☒ justification for addition of any ecosystem credit species to the list	5.1.1
		Identify species credit species likely to occur on the subject land, including:	
		☒ list of species credit species derived from the BAM-C (as described in BAM Subsection 5.1.1)	5.1.2
		☒ justification and supporting evidence for exclusions based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2)	5.1.2
		☒ justification and supporting evidence for exclusions based on degraded habitat constraints and/or microhabitats on which the species depends (as described in BAM Subsection 5.2.2)	5.1.2 5.4.4

BDAR section	BAM ref.	BAM requirement	Section reference in the BDAR
		☒ justification for addition of any species credit species to the list	5.1.2
		From the list of candidate species credit species, identify:	
		☒ species assumed present within the subject land (if relevant) (as described in BAM Subsection 5.2.4(2.a.))	5.2
		☒ species present within the subject land on the basis of being identified on an important habitat map for a species (as described in BAM Subsection 5.2.4(2.d.))	
		☒ species for which targeted surveys are to be completed to determine species presence (BAM Subsection 5.2.4(2.b.))	
		☒ species for which an expert report is to be used to determine species presence (BAM Subsection 5.2.4(2.c.))	
		Present the outcomes of species credit species assessments from:	
		☒ threatened species survey (as described in BAM Section 5.2.4)	5.2.1 5.4.1 5.4.2
		☒ expert reports (if relevant) including justification for presence of the species and information used to make this determination (as described in BAM Subsection 5.2.4, Section 5.3, Box 3)	5.4
		Where survey has been undertaken include detailed information on:	
		☒ survey method and effort (as described in BAM Section 5.3)	2.2.3 2.2.4 2.2.6 2.2.7
		☒ justification of survey method and effort (e.g. citation of peer-reviewed literature) if approach differs from the department's taxa-specific survey guides or where no relevant guideline has been published	5
		☒ timing of survey in relation to requirements in the TBDC or the department's taxa-specific survey guides. Where survey was undertaken outside these guides include justification for the timing of surveys	5.1
		☒ survey personnel and relevant experience	Declarations
		☒ describe any limitations to surveys and how these were addressed/overcome	2.4
		Where an expert report has been used in place of survey (as described in BAM Section 5.3, Box 3), include:	
		☐ justification of the use of an expert report	N/A
		☐ identify the expert, provide evidence of their expert credentials and departmental approval of expert status	

BDAR section	BAM ref.	BAM requirement	Section reference in the BDAR
		☐ all requirements of Box 3 have been addressed in the expert report	
		Where use of local data is proposed (BAM Subsection 1.4.2):	
		☒ identify relevant species	5.4.3
		☒ identify data to be amended	
		☒ identify source of information for local data, e.g. published literature, additional survey data, etc.	
		☒ justify use of local data in preference to VIS Classification or TBDC data	
		☒ provide written confirmation from the decision-maker that they support the use of local data	5.4.3
		Species polygon completed for species credit species present within the subject land (assumed present or determined on the basis of survey, expert report or important habitat map) ensuring that:	
		☒ the unit of measure for each species is documented	5.4.4
		for species assessed by area:	5.4.4
		☒ the polygon includes the extent of suitable habitat for the target species within the subject land (as described in BAM Subsection 5.2.5)	5.4.4 Figure 5.1
		☒ a description of, and evidence-based justification for, the habitat constraints, features or microhabitats used to map the species polygon including reference to information in the TBDC for that species and any buffers applied	5
		for species assessed by counts of individuals:	
		☒ the number of individual plants present on the subject land (as described in BAM Subsection 5.2.5(3.))	4.4.1
		☒ the method used to derive this number (i.e. threatened species survey or expert report) and evidence-based justification for the approach taken	4.4.1
		☒ the polygon includes all individuals located on the subject land with a buffer of 30 m around the individuals or groups of individuals on the subject land	5.4.4
		☒ Identify the biodiversity risk weighting for each species credit species identified as present within the subject land (as described in BAM Section 5.4)	5.4.4
		Maps and tables	
		☒ Table showing ecosystem credit species in accordance with BAM Subsection 5.1.1, and identifying:	
		☒ the ecosystem credit species removed from the list	Table 5.1
		☒ the sensitivity to gain class of each species	Table 5.1

BDAR section	BAM ref.	BAM requirement	Section reference in the BDAR
		☒ Table detailing species credit species in accordance with BAM Section 5.2 and identifying:	Table 5.2 Table 5.3
		☒ the species credit species removed from the list of species because the species is considered vagrant, out of geographic range or the habitat or microhabitat features are not present	Table 5.4 Table 5.5
		☒ the candidate species credit species not recorded on the subject land as determined by targeted survey, expert report or important habitat map	Table 5.4 Table 5.5 Table 5.7 Table 5.8
		☒ Table detailing species credit species recorded or assumed as present within the subject land, habitat constraints or microhabitats associated with the species, counts of individuals (flora)/extent of suitable habitat (flora and fauna) (as described in BAM Subsection 5.2.6) and biodiversity risk weighting (BAM Section 5.4)	Table 5.4 Table 5.5 Table 5.7 Table 5.8 Table 5.10 Table 5.11
		☒ Map indicating the GPS coordinates of all individuals of each species recorded within the subject land and the species polygon for each species (as described in BAM Subsection 5.2.5)	Figure 5.1
		Data	
		☒ Digital shape files of suitable habitat identified for survey for each candidate species credit species	All data submitted
		☒ Survey locations including GPS coordinates of any plots, transects, grids	
		☒ Digital shape files of each species polygon including GPS coordinates of located individuals	
		☒ Species polygon map in jpeg format	
		☒ Expert reports and any supporting data used to support conclusions of the expert report	
		☒ Field datasheets detailing survey information including prevailing conditions, date, time, equipment used, etc.	
Prescribed impacts	Chapter 6	**Information**	
		Identify potential prescribed biodiversity impacts on threatened entities, including:	
		☒ karst, caves, crevices, cliffs, rocks and other geological features of significance (as described in BAM Subsection 6.1.1)	6
		☒ occurrences of human-made structures and non-native vegetation (as described in BAM Subsection 6.1.2)	

BDAR section	BAM ref.	BAM requirement	Section reference in the BDAR
		☒ corridors or other areas of connectivity linking habitat for threatened entities (as described in BAM Subsection 6.1.3) ☒ waterbodies or any hydrological processes that sustain threatened entities (as described in BAM Subsection 6.1.4)	
		☐ protected animals that may use the proposed wind farm development site as a flyway or migration route (as described in BAM Subsection 6.1.5)	N/A
		☒ where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community (as described in BAM Subsection 6.1.6)	6.2.4
		☒ Identify a list of threatened entities that may be dependent upon or may use habitat features associated with any of the prescribed impacts	6 8.3
		☒ Describe the importance of habitat features to the species including, where relevant, impacts on life cycle or movement patterns (e.g. Subsection 6.1.3)	6 8.3
		Where the proposed development is for a wind farm:	N/A
		☒ identify a candidate list of protected animals that may use the development site as a flyway or migration route, including: resident threatened aerial species, resident raptor species and nomadic and migratory species that are likely to fly over the proposal area (as described in BAM Subsection 6.1.5)	N/A
		☐ provide details of targeted survey for candidate species of wind farm developments undertaken in accordance with BAM Subsection 6.1.5(2–3.)	N/A
		☐ predict the habitual flight paths for nomadic and migratory species likely to fly over the subject land and map the likely habitat for resident threatened aerial and raptor species (BAM Subsection 6.1.5(4.))	N/A
		Where the proposal may result in vehicle strike:	
		☒ identify a list of threatened fauna or protected fauna species that are part of a TEC and at risk of vehicle strike due to the proposal	6.2.4 8.4
		Maps and tables	
		☐ Map showing location of any prescribed impact features (i.e. karst, caves, crevices, cliffs, rocks, human-made structures, etc.)	N/A
		☐ Maps of habitual flight paths for nomadic and migratory species likely to fly over the site and maps of likely habitat for threatened aerial species resident on the site (for wind farm developments only)	N/A
		Data	

BDAR section	BAM ref.	BAM requirement	Section reference in the BDAR
		☒ Digital shape files of prescribed impact feature locations	All data submitted
		☒ Prescribed impact features map in jpeg format	
Avoid and minimise impacts	Chapter 7	**Information**	
		Demonstration of efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with Chapter 7, including an analysis of alternative:	
		☒ modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology	7.1.3 7.1.38.4 10.1.3
		☒ routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route	7.1
		☒ alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location	7.1
		☒ alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site	7.1.1 7.1.3
		☒ Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design (as described in BAM Sections 7.1 and 7.2)	7.1.2 7.1.3
		☒ Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal (as described in BAM Subsection 7.2.1(3.))	
		Maps and tables	
		☒ Table of measures to be implemented to avoid and minimise the impacts of the proposal, including action, outcome, timing and responsibility	Table 8.6
		☐ Map of alternative footprints considered to avoid or minimise impacts on biodiversity values; and of the final proposal footprint, including construction and operation	
		☒ Maps demonstrating indirect impact zones where applicable	Figure 8.1
		Data	
		Digital shape files of:	
		☐ alternative and final proposal footprint	N/A

BDAR section	BAM ref.	BAM requirement	Section reference in the BDAR
		☒ direct and indirect impact zones	All data submitted
		☒ Maps in jpeg format	
Assessment of impacts	Chapter 8, Sections 8.1 and 8.2	**Information**	
		☒ Determine the impacts on native vegetation and threatened species habitat, including a description of direct impacts of clearing of native vegetation, threatened ecological communities and threatened species habitat (as described in BAM Section 8.1)	8
		Assessment of indirect impacts on vegetation and threatened species and their habitat including (as described in BAM Section 8.2):	
		☒ description of the nature, extent, frequency, duration and timing of indirect impacts of the proposal	8.1
		☒ documenting the consequences to vegetation and threatened species and their habitat including evidence-based justifications	8.1.2 8.1.4
		☒ reporting any limitations or assumptions, etc. made during the assessment	8.1
		☒ identification of the threatened entities and their habitat likely to be affected	8.1.3
		Assessment of prescribed biodiversity impacts (as described in BAM Section 8.3) including:	
		assessment of the nature, extent frequency, duration and timing of impacts on the habitat of threatened species or ecological communities associated with:	8.2 8.3
		☐ karst, caves, crevices, cliffs, rocks and other features of geological significance	N/A
		☐ human-made structures	N/A
		☒ non-native vegetation	8.3
		☒ connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	8.3
		☒ movement of threatened species that maintains their life cycle	8.3
		☒ water quality, waterbodies and hydrological processes that sustain threatened species and threatened ecological communities	8.3
		☐ assessment of the impacts of wind turbine strikes on protected animals	N/A

BDAR section	BAM ref.	BAM requirement	Section reference in the BDAR
		☐ assessment of the impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC	8.3
		Maps and tables	
		☒ Table showing change in vegetation integrity score for each vegetation zone as a result of identified impacts	Table 8.6
		Data	
		N/A	
Mitigation and management of impacts	Chapter 8, Sections 8.4 and 8.5	**Information**	
		Identification of measures to mitigate or manage impacts in accordance with the recommendations in BAM Sections 8.4 and 8.5 including:	
		☒ techniques, timing, frequency and responsibility	Table 8.6
		☒ identify measures for which there is risk of failure	
		☒ evaluate the risk and consequence of any residual impacts	
		☒ document any adaptive management strategy proposed	Table 8.6
		Identification of measures for mitigating impacts related to:	
		☒ displacement of resident fauna (as described in BAM Subsection 8.4.1(2.))	Table 8.6
		☒ indirect impacts on native vegetation and habitat (as described in BAM Subsection 8.4.1(3.))	
		☒ mitigating prescribed biodiversity impacts (as described in BAM Subsection 8.4.2)	
		☒ Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (BAM Section 8.5)	Table 8.6
		Maps and tables	
		☐ Table of measures to be implemented before, during and after construction to mitigate and manage impacts of the proposal, including action, outcome, timing and responsibility	Table 8.2
		Data	
		N/A	
Impact summary	Chapter 9	**Information**	

BDAR section	BAM ref.	BAM requirement	Section reference in the BDAR
		Identification and assessment of impacts on TECs and threatened species that are at risk of a serious and irreversible impacts (SAII, in accordance with BAM Section 9.1) including:	
		☒ addressing all criteria in Subsection 9.1.1 for each TEC listed as at risk of an SAII present on the subject land	9 9.1
		☒ for each TEC, report the extent of the TEC in NSW	9.1.2
		☒ addressing all criteria in Subsection 9.1.2 for each threatened species at risk of an SAII present on the subject land	9.1.1
		☒ for each threatened species, report the population size in NSW	9.1.1
		☒ documenting assumptions made and/or limitations to information	9
		☒ documenting all sources of data, information, references used or consulted	
		☒ clearly justifying why any criteria could not be addressed	
		☒ Identification of impacts requiring offset in accordance with BAM Section 9.2	10
		☐ Identification of impacts not requiring offset in accordance with BAM Subsection 9.2.1(3.)	NA
		☒ Identification of areas not requiring assessment in accordance with BAM Section 9.3	10.2
		Maps and tables	
		☒ Map showing the extent of TECs at risk of an SAII within the subject land	Figure 5.1
		☒ Map showing location of threatened species at risk of an SAII within the subject land	Figure 9.1
		Map showing location of:	
		☒ impacts requiring offset	Figure 8.1
		☒ impacts not requiring offset	Figure 8.1
		☒ areas not requiring assessment	Figure 8.1
		Data	
		Digital shape files of:	
		☒ extent of TECs at risk of an SAII within the subject land	All data submitted
		☒ location of threatened species at risk of an SAII within the subject land	

BDAR section	BAM ref.	BAM requirement	Section reference in the BDAR
		☒ boundary of impacts requiring offset	
		☒ boundary of impacts not requiring offset	
		☒ boundary of areas not requiring assessment	
		☒ Maps in jpeg format	
Impact summary	Chapter 10	**Information**	
		Ecosystem credits and species credits that measure the impact of the development on biodiversity values, including:	
		☒ future vegetation integrity score for each vegetation zone within the subject land (Equation 25 and Equation 26 in BAM Appendix H) ☒ change in vegetation integrity score (BAM Subsection 8.1.1) ☒ number of required ecosystem credits for the direct impacts of the proposal on each vegetation zone within the subject land (BAM Subsection 10.1.2)	11
		☒ biodiversity risk weighting for each	11.1 11.2
		☒ number of required species credits for each candidate threatened species that is directly impacted on by the proposal (BAM Subsection 10.1.3)	11.1 11.2
		Maps and tables	
		☒ Table of PCTs requiring offset and the number of ecosystem credits required	Table 10.1
		☒ Table of threatened species requiring offset and the number of species credits required	Table 10.2
		Data	
		☒ Submitted proposal in the BAM Calculator	Appendix F
Biodiversity credit report	Chapter 10	**Information**	
		☐ Description of credit classes for ecosystem credits and species credits at the development or clearing site or land to be biodiversity certified (BAM Section 10.2)	N/A
		☒ BAM credit report in pdf format	Appendix G
		Maps and tables	

BDAR section	BAM ref.	BAM requirement	Section reference in the BDAR
		☒ Table of credit class and matching credit profile	Table 10.1 Table 10.2
		Data	
		☒ BAM credit report in pdf format	Appendix G

Appendix B

BioNet Atlas search results

Table B.2 BioNet Atlas search results (10 km)

Family Name	Scientific Name	Common Name	BC Act	EPBC Act	Records
Frogs					
Myobatrachidae	*Crinia tinnula*	Wallum Froglet	V	-	176
	Uperoleia mahonyi	Mahony's Toadlet	E	-	45
Elapidae	*Hoplocephalus stephensii*	Stephens' Banded Snake	V	-	1
Birds					
Columbidae	*Ptilinopus regina*	Rose-crowned Fruit-Dove	V	-	2
	Ptilinopus superbus	Superb Fruit-Dove	V	-	3
Apodidae	*Hirundapus caudacutus*	White-throated Needletail	-	V, C,J,K	45
Ciconiidae	*Ephippiorhynchus asiaticus*	Black-necked Stork	E	-	7
Ardeidae	*Botaurus poiciloptilus*	Australasian Bittern	E	E	1
	Ixobrychus flavicollis	Black Bittern	V	-	4
Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	V	-	92
	Hieraaetus morphnoides	Little Eagle	V	-	3
	Lophoictinia isura	Square-tailed Kite	V	-	3
	Pandion cristatus	Eastern Osprey	V	-	15
Haematopodidae	*Haematopus fuliginosus*	Sooty Oystercatcher	V	-	35
	Haematopus longirostris	Pied Oystercatcher	E	-	16
Charadriidae	*Charadrius mongolus*	Lesser Sand-plover	V	E, C,J,K	2
Scolopacidae	*Calidris alba*	Sanderling	V	C,J,K	4
	Calidris canutus	Red Knot	-	E, C,J,K	4
	Calidris ferruginea	Curlew Sandpiper	E	CE, C,J,K	10
	Calidris tenuirostris	Great Knot	V	CE, C,J,K	2
	Limicola falcinellus	Broad-billed Sandpiper	V	C,J,K	2
	Limosa limosa	Black-tailed Godwit	V	C,J,K	1
	Numenius madagascariensis	Eastern Curlew	-	CE, C,J,K	2
Laridae	*Gygis alba*	White Tern	V	-	2
	Sternula albifrons	Little Tern	E	C,J,K	13
Cacatuidae	*Callocephalon fimbriatum*	Gang-gang Cockatoo	V	E	1
	Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-	29
Psittacidae	*Glossopsitta pusilla*	Little Lorikeet	V	-	41
	Lathamus discolor	Swift Parrot	E	CE	144
	Neophema pulchella	Turquoise Parrot	V	-	2
Strigidae	*Ninox connivens*	Barking Owl	V	-	4
	Ninox strenua	Powerful Owl	V	-	70
Tytonidae	*Tyto novaehollandiae*	Masked Owl	V	-	23

Family Name	Scientific Name	Common Name	BC Act	EPBC Act	Records
	Tyto tenebricosa	Sooty Owl	V	-	8
Climacteridae	*Climacteris picumnus victoriae*	Brown Treecreeper (eastern subspecies)	V	-	2
Meliphagidae	*Anthochaera phrygia*	Regent Honeyeater	CE	CE	15
	Epthianura albifrons	White-fronted Chat	V	-	1
Pomatostomidae	*Pomatostomus temporalis temporalis*	Grey-crowned Babbler (eastern subspecies)	V	-	1
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	V	-	39
Artamidae	*Artamus cyanopterus cyanopterus*	Dusky Woodswallow	V	-	20
Petroicidae	*Petroica boodang*	Scarlet Robin	V	-	1
Estrildidae	*Stagonopleura guttata*	Diamond Firetail	V	-	1
Mammals					
Dasyuridae	*Dasyurus maculatus*	Spotted-tailed Quoll	V	E	9
Phascolarctidae	*Phascolarctos cinereus*	Koala	E	E	12
Burramyidae	*Cercartetus nanus*	Eastern Pygmy-possum	V	-	8
Petauridae	*Petaurus australis*	Yellow-bellied Glider	V	V	3
	Petaurus norfolcensis	Squirrel Glider	V	-	181
Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	V	V	130
Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	V	-	11
Molossidae	*Micronomus norfolkensis*	Eastern Coastal Free-tailed Bat	V	-	84
Vespertilionidae	*Chalinolobus dwyeri*	Large-eared Pied Bat	V	V	6
	Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	28
	Myotis macropus	Southern Myotis	V	-	60
	Phoniscus papuensis	Golden-tipped Bat	V	-	1
	Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	64
	Vespadelus troughtoni	Eastern Cave Bat	V	-	7
Miniopteridae	*Miniopterus australis*	Little Bent-winged Bat	V	-	106
	Miniopterus orianae oceanensis	Large Bent-winged Bat	V	-	83
Muridae	*Pseudomys gracilicaudatus*	Eastern Chestnut Mouse	V	-	2
	Pseudomys novaehollandiae	New Holland Mouse	P	V	363
Insects					
Petaluridae	*Petalura gigantea*	Giant Dragonfly	E	-	1
Flora					
Asteraceae	*Rutidosis heterogama*	Heath Wrinklewort	V	V	392
Elaeocarpaceae	*Tetratheca juncea*	Black-eyed Susan	V	V	973
Euphorbiaceae	*Chamaesyce psammogeton*	Sand Spurge	E	-	1
Fabaceae (Mimosoideae)	*Acacia bynoeana*	Bynoe's Wattle	E	V	49
Myrtaceae	*Angophora inopina*	Charmhaven Apple	V	V	3124
	Callistemon linearifolius	Netted Bottle Brush	V		12

Family Name	Scientific Name	Common Name	BC Act	EPBC Act	Records
	Eucalyptus camfieldii	Camfield's Stringybark	V	V	36
	Eucalyptus parramattensis subsp. *decadens*	-	V	V	1
	Eucalyptus parramattensis subsp. *parramattensis*	*Eucalyptus parramattensis* C. Hall. subsp. *parramattensis* in Wyong and Lake Macquarie local government areas	EP	-	115
	Melaleuca biconvexa	Biconvex Paperbark	V	V	65
	Rhodamnia rubescens	Scrub Turpentine	CE	CE	5
	Rhodomyrtus psidioides	Native Guava	CE	CE	6
	Syzygium paniculatum	Magenta Lilly Pilly	E1	V	42
Orchidaceae	*Caladenia tessellata*	Thick Lip Spider Orchid	E	V	4
	Corunastylis sp. Charmhaven (NSW896673)	-	CE	CE	135
	Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	41
	Diuris praecox	Rough Doubletail	V	V	213
	Genoplesium insigne	Variable Midge Orchid	CE	CE	102
	Thelymitra adorata	Wyong Sun Orchid	CE	CE	9
Proteaceae	*Grevillea parviflora* subsp. *parviflora*	Small-flower Grevillea	V	V	29
	Macadamia integrifolia	Macadamia Nut	-	V	3

Key: V = Vulnerable, E = Endangered, CE = Critically Endangered, EP = Endangered Population, C = CAMBA, J = JAMBA, K = RKAMBA.

Appendix C

Protected matters search tool results

Australian Government
Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 26-Oct-2022

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	95
Listed Migratory Species:	79

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	13
Commonwealth Heritage Places:	None
Listed Marine Species:	103
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	5
Regional Forest Agreements:	1
Nationally Important Wetlands:	3
EPBC Act Referrals:	18
Key Ecological Features (Marine):	None
Biologically Important Areas:	6
Bioregional Assessments:	1
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area	In feature area
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	Endangered	Community likely to occur within area	In feature area
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	Community likely to occur within area	In buffer area only
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	Critically Endangered	Community likely to occur within area	In feature area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area	In buffer area only

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area	In buffer area only
Callocephalon fimbriatum Gang-gang Cockatoo [768]	Endangered	Species or species habitat known to occur within area	In feature area
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo [67036]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area	In buffer area only
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat may occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area	In buffer area only
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area	In buffer area only
Pycnoptilus floccosus Pilotbird [525]	Vulnerable	Species or species habitat known to occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche eremita			
Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour may occur within area	In buffer area only
Thalassarche impavida			
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche melanophris			
Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche salvini			
Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche steadi			
White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only
FISH			
Epinephelus daemelii			
Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Hippocampus whitei			
White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Prototroctes maraena			
Australian Grayling [26179]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Seriolella brama			
Blue Warehou [69374]	Conservation Dependent	Species or species habitat known to occur within area	In buffer area only
Thunnus maccoyii			
Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat likely to occur within area	In buffer area only
FROG			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Heleioporus australiacus			
Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Litoria aurea			
Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area	In feature area
Mixophyes balbus			
Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Uperoleia mahonyi			
Mahony's Toadlet [89189]	Endangered	Species or species habitat known to occur within area	In feature area
MAMMAL			
Balaenoptera musculus			
Blue Whale [36]	Endangered	Species or species habitat may occur within area	In buffer area only
Chalinolobus dwyeri			
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area	In feature area
Dasyurus maculatus maculatus (SE mainland population)			
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area	In feature area
Eubalaena australis			
Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Notamacropus parma			
Parma Wallaby [89289]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Petauroides volans			
Greater Glider (southern and central) [254]	Endangered	Species or species habitat likely to occur within area	In feature area
Petaurus australis australis			
Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Petrogale penicillata			
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area
Potorous tridactylus tridactylus			
Long-nosed Potoroo (northern) [66645]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pseudomys novaehollandiae			
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat known to occur within area	In feature area
Pteropus poliocephalus			
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
PLANT			
Acacia bynoeana			
Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat known to occur within area	In feature area
Angophora inopina			
Charmhaven Apple [64832]	Vulnerable	Species or species habitat known to occur within area	In feature area
Caladenia tessellata			
Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat known to occur within area	In feature area
Corunastylis insignis			
Wyong Midge Orchid 1, Variable Midge Orchid 1 [84692]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Corunastylis sp. Charmhaven (NSW 896673)			
Wyong Midge Orchid 2 [86263]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Cryptostylis hunteriana			
Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area	In feature area
Diuris praecox Newcastle Doubletail [55086]	Vulnerable	Species or species habitat known to occur within area	In feature area
Eucalyptus camfieldii Camfield's Stringybark [15460]	Vulnerable	Species or species habitat known to occur within area	In feature area
Eucalyptus parramattensis subsp. decadens Earp's Gum, Earp's Dirty Gum [56148]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Euphrasia arguta [4325]	Critically Endangered	Species or species habitat may occur within area	In feature area
Genoplesium baueri Yellow Gnat-orchid, Bauer's Midge Orchid, Brittle Midge Orchid [7528]	Endangered	Species or species habitat may occur within area	In buffer area only
Grevillea parviflora subsp. parviflora Small-flower Grevillea [64910]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Melaleuca biconvexa Biconvex Paperbark [5583]	Vulnerable	Species or species habitat known to occur within area	In feature area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Persoonia hirsuta Hairy Geebung, Hairy Persoonia [19006]	Endangered	Species or species habitat may occur within area	In buffer area only
Rhizanthella slateri Eastern Underground Orchid [11768]	Endangered	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Rhodamnia rubescens](#) Scrub Turpentine, Brown Malletwood [15763]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Rhodomyrtus psidioides](#) Native Guava [19162]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Rutidosis heterogama](#) Heath Wrinklewort [13132]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Syzygium paniculatum](#) Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Tetratheca juncea](#) Black-eyed Susan [21407]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Thelymitra adorata](#) Wyong Sun Orchid [84724]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
[Thesium australe](#) Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area	In feature area
REPTILE			
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Eretmochelys imbricata			
Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Natator depressus			
Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only
SHARK			
Carcharias taurus (east coast population)			
Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat likely to occur within area	In buffer area only
Carcharodon carcharias			
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Galeorhinus galeus			
School Shark, Eastern School Shark, Snapper Shark, Tope, Soupfin Shark [68453]	Conservation Dependent	Species or species habitat may occur within area	In buffer area only
Rhincodon typus			
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Sphyrna lewini			
Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area	In buffer area only

Listed Migratory Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Anous stolidus			
Common Noddy [825]		Species or species habitat likely to occur within area	In feature area
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Ardenna carneipes			
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Ardenna grisea Sooty Shearwater [82651]		Breeding known to occur within area	In buffer area only
Ardenna pacifica Wedge-tailed Shearwater [84292]		Breeding known to occur within area	In buffer area only
Ardenna tenuirostris Short-tailed Shearwater [82652]		Breeding known to occur within area	In buffer area only
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area	In buffer area only
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In buffer area only
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area	In buffer area only
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat known to occur within area	In buffer area only
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In buffer area only
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Sternula albifrons Little Tern [82849]		Breeding likely to occur within area	In buffer area only
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour may occur within area	In buffer area only
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Thalassarche salvini](#) Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
[Thalassarche steadi](#) White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Migratory Marine Species			
[Balaenoptera edeni](#) Bryde's Whale [35]		Species or species habitat may occur within area	In buffer area only
[Balaenoptera musculus](#) Blue Whale [36]	Endangered	Species or species habitat may occur within area	In buffer area only
[Caperea marginata](#) Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area	In buffer area only
[Carcharhinus longimanus](#) Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area	In buffer area only
[Carcharodon carcharias](#) White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Dugong dugon Dugong [28]		Species or species habitat may occur within area	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area	In buffer area only
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area	In buffer area only
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area	In buffer area only
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat may occur within area	In buffer area only
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat may occur within area	In buffer area only
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In buffer area only
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Migratory Terrestrial Species			

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Cuculus optatus](#) Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In feature area
[Hirundapus caudacutus](#) White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Monarcha melanopsis](#) Black-faced Monarch [609]		Species or species habitat known to occur within area	In feature area
[Motacilla flava](#) Yellow Wagtail [644]		Species or species habitat likely to occur within area	In feature area
[Myiagra cyanoleuca](#) Satin Flycatcher [612]		Species or species habitat known to occur within area	In feature area
[Rhipidura rufifrons](#) Rufous Fantail [592]		Species or species habitat known to occur within area	In feature area
[Symposiachrus trivirgatus as Monarcha trivirgatus](#) Spectacled Monarch [83946]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
[Actitis hypoleucos](#) Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
[Arenaria interpres](#) Ruddy Turnstone [872]		Roosting known to occur within area	In buffer area only
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Roosting known to occur within area	In feature area
[Calidris alba](#) Sanderling [875]		Roosting known to occur within area	In buffer area only
[Calidris canutus](#) Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat known to occur within area	In feature area
[Calidris ruficollis](#) Red-necked Stint [860]		Roosting known to occur within area	In buffer area only
[Calidris tenuirostris](#) Great Knot [862]	Critically Endangered	Roosting known to occur within area	In buffer area only
[Charadrius bicinctus](#) Double-banded Plover [895]		Roosting known to occur within area	In buffer area only
[Charadrius leschenaultii](#) Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Charadrius mongolus](#) Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area	In buffer area only
[Gallinago hardwickii](#) Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area	In feature area
[Gallinago megala](#) Swinhoe's Snipe [864]		Roosting likely to occur within area	In buffer area only
[Gallinago stenura](#) Pin-tailed Snipe [841]		Roosting likely to occur within area	In buffer area only
[Limosa lapponica](#) Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
[Limosa limosa](#) Black-tailed Godwit [845]		Roosting known to occur within area	In buffer area only
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area	In buffer area only
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area	In buffer area only
Pandion haliaetus Osprey [952]		Breeding known to occur within area	In feature area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area	In buffer area only
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area	In buffer area only
Tringa brevipes Grey-tailed Tattler [851]		Roosting known to occur within area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area	In feature area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area	In buffer area only
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status
Communications, Information Technology and the Arts - Australian Postal Corporation		
Commonwealth Land - Australian Postal Commission [16105]	NSW	In buffer area only
Communications, Information Technology and the Arts - Telstra Corporation Limited		
Commonwealth Land - Australian Telecommunications Commission [11715]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [11714]	NSW	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - Australian Telecommunications Commission [11718]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [11719]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [11716]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [11731]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [11757]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [12246]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [11713]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [11717]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [11749]	NSW	In buffer area only
Defence - Defence Housing Authority		
Commonwealth Land - Director of War Service Homes [11712]	NSW	In buffer area only

Listed Marine Species

[Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Ardenna grisea as Puffinus griseus Sooty Shearwater [82651]		Breeding known to occur within area	In buffer area only
Ardenna pacifica as Puffinus pacificus Wedge-tailed Shearwater [84292]		Breeding known to occur within area	In buffer area only
Ardenna tenuirostris as Puffinus tenuirostris Short-tailed Shearwater [82652]		Breeding known to occur within area	In buffer area only
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area	In buffer area only
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area	In feature area
Calidris alba Sanderling [875]		Roosting known to occur within area	In buffer area only
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area overfly marine area	In feature area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area overfly marine area	In buffer area only
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area overfly marine area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area	In buffer area only
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area overfly marine area	In buffer area only
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area	In buffer area only
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area overfly marine area	In buffer area only
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Diomedea antipodensis gibsoni as Diomedea gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In buffer area only
Eudyptula minor Little Penguin [1085]		Breeding known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area	In buffer area only
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat known to occur within area	In buffer area only
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area overfly marine area	In feature area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area overfly marine area	In buffer area only
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area overfly marine area	In buffer area only
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Roosting known to occur within area overfly marine area	In buffer area only
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area overfly marine area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area overfly marine area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]		Species or species habitat may occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area overfly marine area	In buffer area only
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area	In feature area
Pandion haliaetus Osprey [952]		Breeding known to occur within area	In feature area
Pelagodroma marina White-faced Storm-Petrel [1016]		Breeding known to occur within area	In buffer area only
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In buffer area only
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area	In buffer area only
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area overfly marine area	In buffer area only
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Stercorarius skua as Catharacta skua Great Skua [823]		Species or species habitat may occur within area	In buffer area only
Sternula albifrons as Sterna albifrons Little Tern [82849]		Breeding likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Symposiachrus trivirgatus as Monarcha trivirgatus			
Spectacled Monarch [83946]		Species or species habitat may occur within area overfly marine area	In feature area
Thalassarche bulleri			
Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche bulleri platei as Thalassarche sp. nov.			
Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche carteri			
Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Thalassarche cauta			
Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche eremita			
Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour may occur within area	In buffer area only
Thalassarche impavida			
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche melanophris			
Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche salvini			
Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche steadi			
White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Tringa brevipes as Heteroscelus brevipes](#) Grey-tailed Tattler [851]		Roosting known to occur within area	In buffer area only
[Tringa nebularia](#) Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area overfly marine area	In feature area
[Tringa stagnatilis](#) Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area overfly marine area	In buffer area only
[Xenus cinereus](#) Terek Sandpiper [59300]		Roosting known to occur within area overfly marine area	In buffer area only
Fish			
[Acentronura tentaculata](#) Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area	In buffer area only
[Festucalex cinctus](#) Girdled Pipefish [66214]		Species or species habitat may occur within area	In buffer area only
[Filicampus tigris](#) Tiger Pipefish [66217]		Species or species habitat may occur within area	In buffer area only
[Heraldia nocturna](#) Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area	In buffer area only
[Hippichthys penicillus](#) Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area	In buffer area only
[Hippocampus abdominalis](#) Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area	In buffer area only
[Hippocampus whitei](#) White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]	Endangered	Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area	In buffer area only
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area	In buffer area only
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area	In buffer area only
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area	In buffer area only
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area	In buffer area only
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area	In buffer area only
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area	In buffer area only
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area	In buffer area only
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area	In buffer area only
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area	In buffer area only
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Trachyrhamphus bicoarctatus](#) Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area	In buffer area only
[Urocampus carinirostris](#) Hairy Pipefish [66282]		Species or species habitat may occur within area	In buffer area only
[Vanacampus margaritifer](#) Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area	In buffer area only
Mammal			
[Arctocephalus forsteri](#) Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area	In buffer area only
[Arctocephalus pusillus](#) Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area	In buffer area only
[Dugong dugon](#) Dugong [28]		Species or species habitat may occur within area	In buffer area only
Reptile			
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
[Eretmochelys imbricata](#) Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area	In buffer area only

Whales and Other Cetaceans [Resource Information]

Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area	In buffer area only
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In buffer area only
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area	In buffer area only
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area	In buffer area only
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area	In buffer area only
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In buffer area only
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area	In buffer area only

Current Scientific Name	Status	Type of Presence	Buffer Status
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area	In buffer area only
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In buffer area only
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area	In buffer area only
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In buffer area only
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In buffer area only

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Bird Island	Nature Reserve	NSW	In buffer area only
Colongra Swamp	Nature Reserve	NSW	In buffer area only
Lake Macquarie	State Conservation Area	NSW	In buffer area only
Munmorah	State Conservation Area	NSW	In buffer area only
Wyrrabalong	National Park	NSW	In buffer area only

Regional Forest Agreements		[Resource Information]
Note that all areas with completed RFAs have been included.		
RFA Name	State	Buffer Status
North East NSW RFA	New South Wales	In feature area

Nationally Important Wetlands		[Resource Information]
Wetland Name	State	Buffer Status
Budgewoi Lake Sand Mass	NSW	In buffer area only
Colongra Swamp	NSW	In buffer area only

Wetland Name	State	Buffer Status
Tuggerah Lake	NSW	In buffer area only

EPBC Act Referrals				[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Residential subdivision	2007/3411	Controlled Action	Post-Approval	In buffer area only
Subdivide and Develop	2008/4419	Controlled Action	Post-Approval	In buffer area only
Subdivision and Urban Development at Gwandalan and Catherine Hill Bay	2012/6382	Controlled Action	Post-Approval	In buffer area only
Wallarah 2 Coal Project	2012/6388	Controlled Action	Post-Approval	In buffer area only
Wallarah 2 Coal Project	2007/3881	Controlled Action	Completed	In buffer area only
Not controlled action				
construction of additional coal handling facilities at the Wyee Rail Unloader	2004/1364	Not Controlled Action	Completed	In buffer area only
Demolition of Ablutions Block, Snapper Island, NSW	2018/8303	Not Controlled Action	Completed	In buffer area only
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
Magenta Shores Integrated Tourist Facility and golf course	2003/995	Not Controlled Action	Completed	In buffer area only
Mandalong Mine Power Line, Mandalong, NSW	2018/8321	Not Controlled Action	Completed	In buffer area only
Myuna Colliery extension of underground mining	2011/5956	Not Controlled Action	Completed	In buffer area only
Wallarah Peninsula Residential development	2004/1490	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
Magenta Shared Pathway Stage 2, NSW	2017/7926	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Multipurpose Centre Dora St Lot 122 DP 881828 Morisset	2003/1084	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action (particular manner)				
Residential Development Subdivision	2011/5953	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Referral decision				
Breeding program for Grey Nurse Sharks	2007/3245	Referral Decision	Completed	In buffer area only
Mine Modification	2010/5442	Referral Decision	Completed	In buffer area only
Residential Subdivision Dickson Road Lots 231 & 233 DP755271	2003/1105	Referral Decision	Completed	In buffer area only

Biologically Important Areas

Scientific Name	Behaviour	Presence	Buffer Status
Dolphins			
Tursiops aduncus			
Indo-Pacific/Spotted Bottlenose Dolphin [68418]	Breeding	Likely to occur	In buffer area only
Seabirds			
Ardenna grisea			
Sooty Shearwater [82651]	Foraging	Likely to occur	In buffer area only
Ardenna pacifica			
Wedge-tailed Shearwater [84292]	Foraging	Likely to occur	In buffer area only
Ardenna tenuirostris			
Short-tailed Shearwater [82652]	Foraging	Likely to occur	In buffer area only
Sharks			
Carcharias taurus			
Grey Nurse Shark [64469]	Foraging	Known to occur	In buffer area only
Whales			
Megaptera novaeangliae			
Humpback Whale [38]	Foraging	Known to occur	In buffer area only

Bioregional Assessments

SubRegion	BioRegion	Website	Buffer Status
Hunter	Northern Sydney Basin	BA website	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

Department of Agriculture Water and the Environment
GPO Box 858
Canberra City ACT 2601 Australia
+61 2 6274 1111

Appendix D

Flora and fauna species list

Table D.3 Flora species within the study area

Family Name		Scientific Name	Common Name	Form	BC Act	EPBC Act	Bio Act
Apiaceae		*Hydrocotyle bonariensis*	-	Exotic	-	-	-
Asparagaceae		*Asparagus aethiopicus*	Asparagus Fern	HTW	-	-	Yes
Asteraceae		*Lagenophora stipitata*	Common Lagenophora	Forb (FG)	-	-	-
Asteraceae		*Chrysanthemoides monilifera*	Boneseed	HTW - Manageable	-	Yes	Yes
Asteraceae		*Senecio madagascariensis*	Fireweed	HTW	-	Yes	Yes
Campanulaceae		*Lobelia purpurascens*	Whiteroot	Forb (FG)	-	-	-
Casuarinaceae		*Allocasuarina littoralis*	Black She-Oak	Tree (TG)	-	-	-
Cyperaceae		*Carex* spp.	-	Grass & grasslike (GG)	-	-	-
Fabaceae (Mimosoideae)		*Acacia longifolia* subsp. *Sophorae*	Coastal Wattle	Shrub (SG)	-	-	-
Lauraceae		*Cinnamomum camphora*	Camphor Laurel	HTW - Manageable	-	-	-
Lomandraceae		*Lomandra filiformis*	Wattle Matt-rush	Grass & grasslike (GG)	-	-	-
Lomandraceae		*Lomandra longifolia*	Spiny-headed Mat-rush	Grass & grasslike (GG)	-	-	-
Myrtaceae		*Angophora costata*	Sydney Red Gum	Tree (TG)	-	-	-
Myrtaceae		*Angophora inopina*	Charmhaven Apple	Tree (TG)	V	V	-
Myrtaceae		*Corymbia gummifera*	Red Bloodwood	Tree (TG)	-	-	-
Myrtaceae		*Eucalyptus haemastoma*	Broad-leaved Scribbly Gum	Tree (TG)	-	-	-
Ochnaceae		*Ochna serrulate*	Micky Mouse plant	HTW - Manageable	-	-	-
Phormiaceae		*Dianella caerulea*	Blue Flax-lily	Forb (FG)	-	-	-
Phyllanthaceae		*Glochidion ferdinandi*	Cheese Tree	Tree (TG)	-	-	-
Pinaceae		*Pinus pinaster*	Cluster Pine	Exotic	-	-	-
Plantaginaceae		*Plantago lanceolata*	Lamb's Tongues	Exotic	-	-	-
Poaceae		*Andropogon virginicus*	Whisky Grass	HTW	-	-	-

Family Name		Scientific Name	Common Name	Form	BC Act	EPBC Act	Bio Act
Poaceae		*Capillipedium parviflorum*	Scented-top Grass	Grass & grasslike (GG)	-	-	-
Poaceae		*Chloris gayana*	Rhodes Grass	HTW	-	-	-
Poaceae		*Entolasia stricta*	Wiry Panic	Grass & grasslike (GG)	-	-	-
Poaceae		*Hyparrhenia hirta*	Coolatai Grass	HTW	-	-	-
Poaceae		*Imperata cylindrica*	Blady Grass	Grass & grasslike (GG)	-	-	-
Poaceae		*Melinis repens*	Red Natal Grass	Exotic	-	-	-
Poaceae		*Setaria parviflora*	-	Exotic	-	-	-
Primulaceae		*Lysimachia arvensis*	Scarlet Pimpernel	Exotic	-	-	-
Ranunculaceae		*Clematis glycinoides*	Headache Vine	Other (OG)	-	-	-
Sapindaceae		*Dodonaea triquetra*	Large-leaf Hop-bush	Shrub (SG)	-	-	-
Sapindaceae		*Cardiospermum grandiflorum*	Balloon vine	HTW - Manageable	-	-	-
Verbenaceae		*Lantana camara*	Lantana	HTW - Manageable	-	Yes	Yes
Verbenaceae		*Verbena bonariensis*	Purpletop	Exotic	-	-	-
Xanthorrhoeaceae		*Xanthorrhoea latifolia*	-	Other (OG)	-	-	-

Table D.4 Fauna species within the study area

Family	Scientific name	Common Name	BC Act	EPBC Act	Notes
Frogs					
Hylidae	*Litoria fallax*	Eastern Dwarf Tree Frog	-	-	
	Litoria peronii	Peron's Tree Frog	-	-	
Limnodynastidae	*Limnodynastes peronii*	Striped Marsh Frog	-	-	
Myobatrachidae	*Crinia signifera*	Common Eastern Froglet	-	-	
	Uperoleia laevigata	Smooth Toadlet	-	-	
Reptiles					
Elapidae	*Pseudechis porphyriacus*	Red-bellied Black Snake	-	-	
Lampropholis	*Lampropholis delicata*	Dark-flecked Garden Sunskink	-	-	
Birds					
Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-eagle	V	-	Fly north-west the subject land
Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra	-	-	

Family	Scientific name	Common Name	BC Act	EPBC Act	Notes
Artamidae	*Cracticus torquatus*	Grey Butcherbird	-	-	
	Gymnorhina tibicen	Australian Magpie	-	-	
	Strepera graculina	Pied Currawong	-	-	
Cacatuidae	*Eolophus roseicapilla*	Galah	-	-	
Charadriidae	*Vanellus miles*	Masked Plover	-	-	
Corcoracidae	*Corcorax melanorhamphos*	White-winged Chough	-	-	Outside of subject land
Corvidae	*Corvus coronoides*	Australian Raven	-	-	
Hirundinidae	*Hirundo neoxena*	Welcome Swallow	-	-	
Maluridae	*Malurus cyaneus*	Superb Fairy-wren	-	-	
	Malurus lamberti	Variegated Fairy-wren	-	-	
Meliphagidae	*Acanthorhynchus tenuirostris*	Eastern Spinebill	-	-	
	Manorina melanocephala	Noisy Miner	-	-	KTP
Monarchidae	*Grallina cyanoleuca*	Magpie-lark	-	-	
Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican	-	-	Flying over the subject land
Petroicidae	*Eopsaltria australis*	Eastern Yellow Robin			
Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant	-	-	Flying over the subject land
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail	-	-	
Psittacidae	*Platycercus eximius*	Eastern Rosella	-	-	
Psittaculidae	*Trichoglossus haematodus*	Rainbow Lorikeet	-	-	
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	-	-	
Strigidae	*Ninox strenua*	Powerful Owl	-	-	Heard at dusk west of the subject land
	Ninox novaeseelandiae	Southern Boobook	-	-	Heard at dusk south of the subject land
Sturnidae	*Sturnus vulgaris*	Common Starling	-	-	Introduced species
Tytonidae	*Tyto alba*	Barn Owl	-	-	Foraging within subject land
Zosteropidae	*Zosterops lateralis*	Silvereye	-	-	
Mammals					
Canidae	*Vulpes vulpes*	Red Fox	-	-	Introduced species, KTP
Bovidae	*Ovis aries*	Domestic sheep	-	-	Introduced species. Feral
Leporidae	*Oryctolagus cuniculus*	European rabbit	-	-	Introduced species, KTP
Macropodidae	*Wallabia bicolor*	Swamp Wallaby	-	-	
Petauridae	*Petaurus breviceps*	Sugar Glider	-	-	One in the southern corner

Family	Scientific name	Common Name	BC Act	EPBC Act	Notes
Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum	-	-	
Pseudocheiridae	*Pseudocheirus peregrinus*	Common Ringtail Possum	-	-	

Key: V = Vulnerable, KTP = Key Threatening Process

Appendix E

Matters of national environmental significance

The following is a summary of MNES from of the PMST 5km search from the Subject land (DCCEEW, 2022b):

– World Heritage Properties: None
– National Heritage Places: None
– Wetlands of International Importance (Ramsar): None
– Great Barrier Reef Marine Park: None
– Commonwealth Marine Area: None
– Listed Threatened Ecological Communities: 4
– Listed Threatened Species: 92
– Listed Migratory Species: 76

Listed Threatened Ecological Communities

None of these communities were detected within the Subject land. The potential occurrence of Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland as assessed in Section 4.2.9. This assessment of the Swamp Forest areas within the subject land found that as the patch of vegetation does not meet any of the patch size thresholds, the vegetation is not protected under the EPBC Act (DAWE, 2021).

Listed Threatened Species

One threatened species was recorded in the subject land: Chamhaven Apple (*Angophora inopina*), which is listed as vulnerable under the EPBC Act. While a number of additional threatened species are assumed present for the purposes of the BAM, assessments of significance are not considered necessary due to the generally degraded nature of the Subject land and the small area of vegetation removal.

– **Chamhaven Apple** (*Angophora inopina*).

Distribution

The Chamhaven Apple (*Angophora inopina*) occurs within the Hunter−Central Rivers (NSW) Natural Resource Management Region. It has a patchy distribution, ranging from Lake Macquarie to north of the Hunter River (Tierney, 2004). The largest and most intact stands occur in the Wyong and Lake Macquarie local government areas, where approximately 1250 ha of occupied habitat have been mapped (DEWHA, 2008).

Habitat requirements

The Chamhaven Apple (*Angophora inopina*) is found in open dry sclerophyll woodland of *Eucalyptus haemastoma* and *Corymbia gummifera* with a dense shrub understorey. The woodland occurs on deep white sandy soils over sandstone, often with some gravelly laterite (DEWHA, 2008). This species produces lignotubers (swelling at the base of the stem or just under the soil). While this promotes vegetative growth following disturbance, it may suppress the production of fruits and seeds. (DEWHA, 2008).

Habitat in the subject land

One Chamhaven Apple (*Angophora inopina*) specimen was detected during targeted surveys of the subject land. The species was found in the southern section of the subject land within the scatted patches of PCT 1636: Scribbly Gum - Red Bloodwood - *Angophora inopina* heathy woodland on lowlands of the Central Coast (0.16 ha). In addition, there are numerous records of the species surrounding the subject land in patches of similar vegetation (Niche, 2020; 2021).

Table E.5 Assessment of significance for Chamhaven Apple (Angophora inopina)

Criteria	Discussion
According to the DotE (2013) 'significant impact criteria', an action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	An 'important population' of a threatened species is defined by Samuel (2020) as '…a population that is necessary for the species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: – key source populations either for breeding or dispersal – populations that are necessary for maintaining genetic diversity, and/or – populations that are near the limit of the species' range'. One *Angophora inopina* was detected during targeted surveys of the subject land. No other specimens of the species are likely to occur within the subject land due to extensive survey effort undertaken. This specimen is likely to form part of the wider population that occurs outside of the subject land. This population is near the eastern boundary of their distribution and is potentially part of an important population.
Lead to a long-term decrease in the size of an important population of a species	The impact from the proposed development (loss of one specimen) is considered small and there are numerous records of the species occurring in similar habitat surrounding the subject land. Therefore, the loss of one specimen is unlikely to lead to a long-term decrease in the size of an important population of the species.
Reduce the area of occupancy of an important population	The impact from the proposed development (loss of one specimen) is considered small and there are numerous records of the species occurring in similar habitat surrounding the subject land. Therefore, the proposed development is unlikely to reduce the area of occupancy of an important population in any significant way.
Fragment an existing important population into two or more populations	Fragmentation is already present throughout the subject land due to existing large-scale vegetation clearing for industrial development. It is not likely that the removal of small patches of suitable habitat for this species (0.16 ha in total) for the construction of the development would fragment a population, into two or more populations.
Adversely affect habitat critical to the survival of a species	There is no critical habitat listed for this species, however, the following vegetation type is associated to *Angophora inopina* in the contexts of the project: PCT 1636: Scribbly Gum - Red Bloodwood - *Angophora inopina* heathy woodland on lowlands of the Central Coast (0.16 ha). In total, approximately 0.16 ha of habitat would be impacted. However, this habitat is unlikely to be critical to the survival of the species given the highly fragmented and disturbed condition.
Disrupt the breeding cycle of an important population	One non-mature *Angophora inopina* specimen would be removed as part of the proposed development. Due to the extensive areas of potential better-quality habitat present in the surrounding landscape, it is considered that the project would not disrupt the breeding cycle of an important population of this species.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	In total, 0.16 ha of suitable habitat for this species would be impacted. Due to the presence of alternative potential habitat within the surrounding landscape and small areas of low-quality habitat to be removed, it is unlikely that the project would affect the habitat to the extent that this species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Weed species are present is the subject land and there is a possibility that more invasive or otherwise damaging environmental weeds may be introduced during construction. The project may result in an increase in weeds. However, weed control measures would minimise the potential for the introduction or spread of invasive weeds.
Introduce disease that may cause the species to decline	Construction activities have the potential to introduce the root-rot fungus *Phytophthora cinnamomi*, Exotic Rust Fungi of the order Pucciniales such as Myrtle Rust (*Austropuccinia psidii*), and other diseases to the subject land, which could lead to dieback of vegetation. The implementation of a Vegetation Management Plan is recommended to limit impacts on native vegetation. The implementation of this plan would minimise the likelihood of this disease entering and causing the species outside of the subject land to decline.
Interfere substantially with the recovery of the species	There is no recovery plan for *Angophora inopina.* It is considered unlikely that the proposed development would interfere substantially with the recovery of the species as the impact would be limited to one specimen. The Proposed development would not impact on the numerous other records of the species in the surrounding landscape where better-quality habitat occurs.

Criteria	Discussion
Conclusion	Based on consideration of the above criteria, the proposed development is unlikely to have a significant effect on an important population of *Angophora inopina* as: – The impact to this species would be limited to one non-mature specimen being removed as part of the proposed development. – The removal of 0.16 ha of suitable habitat represents a minor proportion of better-quality habitat available within the surrounding landscape. – The project is unlikely to further increase existing habitat fragmentation so as to isolate an existing population.

Migratory species

There would be no impact on important habitat for migratory species.

Conclusion

In conclusion, it is considered that no threatened species listed under the EPBC Act would be significantly impacted by the Proposed development and Referral for these MNES is unlikely to be needed.

Appendix F

BAM input data and plot datasheets

plot	pct	area	patchsize	condition class	zone	easting	northing	bearing	compTree	compShrub	compGrass	compForbs	compFerns	compOther	strucTree	strucShrub	strucGrass	strucForbs	strucFerns	strucOther	funLargeTrees	funHollowtrees	funLitterCover	funLenFallenLogs	funTreeStem5to9	funTreeStem10to19	funTreeStem20to29	funTreeStem30to49	funTreeStem50to79	funTreeRegen	funHighThreatExotic	Plot-based vegetation survey?	Vegetation integrity
Q3	1636	0.16	101	Mod	56	0364355	6323741	365	6	2	6	3	0	2	49	21	50.7	0.3	0	5.1	3	0	72	1	Y	Y	Y	Y	-	Pres	13.3	☐ Yes ☐ ~~No~~	☐ Yes ☐ ~~No~~
Q4	1724	0.10	101	Mod	56	0364147	6324062	240	4	3	5	5	1	5	38.1	10.2	4.2	1.4	0.1	25.3	0	0	44	20	Y	Y	Y	-	-	Pres	2.2	☐ Yes ☐ ~~No~~	☐ Yes ☐ ~~No~~

Appendix G

Credit reports

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00034356/BAAS19007/22/00034357

Proposal Name
Waratah Super Battery

BAM data last updated *
14/10/2022

Assessor Name
Andrew Charles Michael Smith

Assessor Number
BAAS19007

BAM Data version *
55

Proponent Names
Niall Madden

Report Created
04/11/2022

BAM Case Status
Finalised

Assessment Revision
6

Assessment Type
Part 4 Developments (General)

Date Finalised
04/11/2022

BOS entry trigger
BOS Threshold: Biodiversity Values Map

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

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Chalinolobus dwyeri / Large-eared Pied Bat
Corunastylis sp. Charmhaven (NSW896673) / Corunastylis sp. Charmhaven (NSW896673)

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Grantiella picta / Painted Honeyeater
Petaurus australis / Yellow-bellied Glider
Ephippiorhynchus asiaticus / Black-necked Stork
Ixobrychus flavicollis / Black Bittern

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

BAM Biodiversity Credit Report (Like for like)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast	Not a TEC	0.2	0	4	4
1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.1	0	3	3

1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Sydney Coastal Dry Sclerophyll Forests This includes PCT's: 1138, 1253, 1625, 1636, 1638, 1776, 1778, 1782, 1786	Sydney Coastal Dry Sclerophyll Forests >=50% and <70%	1636_Moderate	No	4	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 837, 839, 926, 971, 1064, 1092, 1227, 1230, 1231, 1232, 1235, 1649, 1715, 1716, 1717, 1718, 1719, 1721, 1722, 1723, 1724, 1725, 1730, 1795, 1798	-	1724_Moderate	No	3	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Angophora inopina / Charmhaven Apple	**1636_Moderate**	0.2	4.00

Asperula asthenes / Trailing Woodruff	**1636_Moderate, 1724_Moderate**	0.3	7.00
Callistemon linearifolius / Netted Bottle Brush	**1636_Moderate**	5.0	8.00
Cercartetus nanus / Eastern Pygmy-possum	**1636_Moderate**	0.2	4.00
Chalinolobus dwyeri / Large-eared Pied Bat	**1636_Moderate, 1724_Moderate**	0.3	11.00
Corunastylis sp. Charmhaven (NSW896673) / Corunastylis sp. Charmhaven (NSW896673)	**1636_Moderate**	0.2	7.00
Crinia tinnula / Wallum Froglet	**1636_Moderate, 1724_Moderate**	0.3	5.00
Cryptostylis hunteriana / Leafless Tongue Orchid	**1636_Moderate**	0.2	3.00
Heleioporus australiacus / Giant Burrowing Frog	**1636_Moderate**	0.2	3.00
Hoplocephalus bitorquatus / Pale-headed Snake	**1636_Moderate, 1724_Moderate**	0.3	7.00
Litoria aurea / Green and Golden Bell Frog	**1636_Moderate, 1724_Moderate**	0.3	7.00
Litoria brevipalmata / Green-thighed Frog	**1636_Moderate, 1724_Moderate**	0.3	5.00
Maundia triglochinoides / Maundia triglochinoides	**1724_Moderate**	0.1	3.00
Persicaria elatior / Tall Knotweed	**1724_Moderate**	0.1	3.00
Petaurus norfolcensis / Squirrel Glider	**1636_Moderate, 1724_Moderate**	0.3	7.00

Phascogale tapoatafa / Brush-tailed Phascogale	**1636_Moderate, 1724_Moderate**	0.3	7.00
Planigale maculata / Common Planigale	**1636_Moderate, 1724_Moderate**	0.3	7.00
Uperoleia mahonyi / Mahony's Toadlet	**1636_Moderate, 1724_Moderate**	0.3	7.00

Credit Retirement Options

Like-for-like credit retirement options

Angophora inopina / Charmhaven Apple	Spp	IBRA subregion
	Angophora inopina / Charmhaven Apple	Any in NSW
Asperula asthenes / Trailing Woodruff	Spp	IBRA subregion
	Asperula asthenes / Trailing Woodruff	Any in NSW
Callistemon linearifolius / Netted Bottle Brush	Spp	IBRA subregion
	Callistemon linearifolius / Netted Bottle Brush	Any in NSW
Cercartetus nanus / Eastern Pygmy-possum	Spp	IBRA subregion
	Cercartetus nanus / Eastern Pygmy-possum	Any in NSW

Chalinolobus dwyeri / Large-eared Pied Bat	Spp	IBRA subregion
	Chalinolobus dwyeri / Large-eared Pied Bat	Any in NSW
Corunastylis sp. Charmhaven (NSW896673) / Corunastylis sp. Charmhaven (NSW896673)	Spp	IBRA subregion
	Corunastylis sp. Charmhaven (NSW896673) / Corunastylis sp. Charmhaven (NSW896673)	Any in NSW
Crinia tinnula / Wallum Froglet	Spp	IBRA subregion
	Crinia tinnula / Wallum Froglet	Any in NSW
Cryptostylis hunteriana / Leafless Tongue Orchid	Spp	IBRA subregion
	Cryptostylis hunteriana / Leafless Tongue Orchid	Any in NSW
Heleioporus australiacus / Giant Burrowing Frog	Spp	IBRA subregion
	Heleioporus australiacus / Giant Burrowing Frog	Any in NSW
Hoplocephalus bitorquatus / Pale-headed Snake	Spp	IBRA subregion
	Hoplocephalus bitorquatus / Pale-headed Snake	Any in NSW

Litoria aurea / Green and Golden Bell Frog	Spp	IBRA subregion
	Litoria aurea / Green and Golden Bell Frog	Any in NSW
Litoria brevipalmata / Green-thighed Frog	Spp	IBRA subregion
	Litoria brevipalmata / Green-thighed Frog	Any in NSW
Maundia triglochinoides / Maundia triglochinoides	Spp	IBRA subregion
	Maundia triglochinoides / Maundia triglochinoides	Any in NSW
Persicaria elatior / Tall Knotweed	Spp	IBRA subregion
	Persicaria elatior / Tall Knotweed	Any in NSW
Petaurus norfolcensis / Squirrel Glider	Spp	IBRA subregion
	Petaurus norfolcensis / Squirrel Glider	Any in NSW
Phascogale tapoatafa / Brush-tailed Phascogale	Spp	IBRA subregion
	Phascogale tapoatafa / Brush-tailed Phascogale	Any in NSW
Planigale maculata / Common Planigale	Spp	IBRA subregion

	Planigale maculata / Common Planigale	Any in NSW
Uperoleia mahonyi / Mahony's Toadlet	Spp	IBRA subregion
	Uperoleia mahonyi / Mahony's Toadlet	Any in NSW

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id
00034356/BAAS19007/22/00034357

Proposal Name
Waratah Super Battery

BAM data last updated *
14/10/2022

Assessor Name
Andrew Charles Michael Smith

Assessor Number
BAAS19007

BAM Data version *
55

Proponent Name(s)
Niall Madden

Report Created
04/11/2022

BAM Case Status
Finalised

Assessment Revision
6

Assessment Type
Part 4 Developments (General)

Date Finalised
04/11/2022

BOS entry trigger
BOS Threshold: Biodiversity Values Map

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

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		
Species		
Chalinolobus dwyeri / Large-eared Pied Bat		
Corunastylis sp. Charmhaven (NSW896673) / Corunastylis sp. Charmhaven (NSW896673)		

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Grantiella picta / Painted Honeyeater
Petaurus australis / Yellow-bellied Glider
Ephippiorhynchus asiaticus / Black-necked Stork
Ixobrychus flavicollis / Black Bittern

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
1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast	Not a TEC	0.2	0	4	4.00
1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.1	0	3	3.00

1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region

	Sydney Coastal Dry Sclerophyll Forests This includes PCT's: 1138, 1253, 1625, 1636, 1638, 1776, 1778, 1782, 1786	Sydney Coastal Dry Sclerophyll Forests >=50% and <70%	1636_Moderate	No	4	Wyong,Hunter, Pittwater 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
	Dry Sclerophyll Forests (Shrubby sub-formation)	Tier 3 or higher threat status	1636_Moderate	No	4	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 837, 839, 926, 971, 1064, 1092, 1227, 1230, 1231, 1232, 1235, 1649, 1715, 1716, 1717, 1718, 1719, 1721, 1722, 1723, 1724, 1725, 1730, 1795, 1798	-	1724_Moderate	No	3	Wyong,Hunter, Pittwater 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
	Forested Wetlands	Tier 3 or higher threat status	1724_Moderate	No	3	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Angophora inopina / Charmhaven Apple	**1636_Moderate**	0.2	4.00
Asperula asthenes / Trailing Woodruff	**1636_Moderate, 1724_Moderate**	0.3	7.00
Callistemon linearifolius / Netted Bottle Brush	**1636_Moderate**	5.0	8.00
Cercartetus nanus / Eastern Pygmy-possum	**1636_Moderate**	0.2	4.00
Chalinolobus dwyeri / Large-eared Pied Bat	**1636_Moderate, 1724_Moderate**	0.3	11.00
Corunastylis sp. Charmhaven (NSW896673) / Corunastylis sp. Charmhaven (NSW896673)	**1636_Moderate**	0.2	7.00
Crinia tinnula / Wallum Froglet	**1636_Moderate, 1724_Moderate**	0.3	5.00
Cryptostylis hunteriana / Leafless Tongue Orchid	**1636_Moderate**	0.2	3.00
Heleioporus australiacus / Giant Burrowing Frog	**1636_Moderate**	0.2	3.00
Hoplocephalus bitorquatus / Pale-headed Snake	**1636_Moderate, 1724_Moderate**	0.3	7.00
Litoria aurea / Green and Golden Bell Frog	**1636_Moderate, 1724_Moderate**	0.3	7.00
Litoria brevipalmata / Green-thighed Frog	**1636_Moderate, 1724_Moderate**	0.3	5.00
Maundia triglochinoides / Maundia triglochinoides	**1724_Moderate**	0.1	3.00
Persicaria elatior / Tall Knotweed	**1724_Moderate**	0.1	3.00
Petaurus norfolcensis / Squirrel Glider	**1636_Moderate, 1724_Moderate**	0.3	7.00
Phascogale tapoatafa / Brush-tailed Phascogale	**1636_Moderate, 1724_Moderate**	0.3	7.00

Planigale maculata / Common Planigale	**1636_Moderate, 1724_Moderate**	0.3	7.00
Uperoleia mahonyi / Mahony's Toadlet	**1636_Moderate, 1724_Moderate**	0.3	7.00

Credit Retirement Options

Like-for-like options

Angophora inopina/ Charmhaven Apple	Spp	IBRA region	
	Angophora inopina/Charmhaven Apple	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Flora	Vulnerable	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Asperula asthenes/ Trailing Woodruff	Spp	IBRA region	
	Asperula asthenes/Trailing Woodruff	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

	Flora	Vulnerable	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Callistemon linearifolius/ Netted Bottle Brush	Spp	IBRA region	
	Callistemon linearifolius/Netted Bottle Brush	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Flora	Vulnerable	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Cercartetus nanus/ Eastern Pygmy-possum	Spp	IBRA region	
	Cercartetus nanus/Eastern Pygmy-possum	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

	Fauna	Vulnerable	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Chalinolobus dwyeri/ Large-eared Pied Bat	Spp	IBRA region	
	Chalinolobus dwyeri/Large-eared Pied Bat	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Corunastylis sp. Charmhaven (NSW896673)/ Corunastylis sp. Charmhaven (NSW896673)	Spp	IBRA region	
	Corunastylis sp. Charmhaven (NSW896673)/Corunastylis sp. Charmhaven (NSW896673) *Note: Variation rules do not apply for Critically Endangered species and impacts on Commonwealth listed entities that are a controlled action.*	Any in NSW	
Crinia tinnula/ Wallum Froglet	Spp	IBRA region	

	Crinia tinnula/Wallum Froglet	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Cryptostylis hunteriana/ Leafless Tongue Orchid	Spp	IBRA region	
	Cryptostylis hunteriana/Leafless Tongue Orchid	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Flora	Vulnerable	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Heleioporus australiacus/ Giant Burrowing Frog	Spp	IBRA region	

	Heleioporus australiacus/Giant Burrowing Frog	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Hoplocephalus bitorquatus/ Pale-headed Snake	Spp	IBRA region	
	Hoplocephalus bitorquatus/Pale-headed Snake	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Litoria aurea/ Green and Golden Bell Frog	Spp	IBRA region	

	Litoria aurea/Green and Golden Bell Frog	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Endangered	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Litoria brevipalmata/ Green-thighed Frog	Spp	IBRA region	
	Litoria brevipalmata/Green-thighed Frog	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Maundia triglochinoides/ Maundia triglochinoides	Spp	IBRA region	

	Maundia triglochinoides/Maundia triglochinoides	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Flora	Vulnerable	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Persicaria elatior/ Tall Knotweed	Spp	IBRA region	
	Persicaria elatior/Tall Knotweed	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Flora	Vulnerable	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Petaurus norfolcensis/ Squirrel Glider	Spp	IBRA region	

	Petaurus norfolcensis/Squirrel Glider	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Phascogale tapoatafa/ Brush-tailed Phascogale	Spp	IBRA region	
	Phascogale tapoatafa/Brush-tailed Phascogale	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Planigale maculata/ Common Planigale	Spp	IBRA region	

	Planigale maculata/Common Planigale	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Uperoleia mahonyi/ Mahony's Toadlet	Spp	IBRA region	
	Uperoleia mahonyi/Mahony's Toadlet	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Endangered	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Candidate Species Report

Proposal Details

Assessment Id 00034356/BAAS19007/22/00034357	Proposal Name Waratah Super Battery	BAM data last updated * 14/10/2022
Assessor Name Andrew Charles Michael Smith	Report Created 04/11/2022	BAM Data version * 55
Assessor Number BAAS19007	Assessment Type Part 4 Developments (General)	BAM Case Status Finalised
Assessment Revision 6	Date Finalised 04/11/2022	BOS entry trigger BOS Threshold: Biodiversity Values Map

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

List of Species Requiring Survey

Name	Presence	Survey Months
Acacia bynoeana Bynoe's Wattle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Angophora inopina Charmhaven Apple	Yes (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Asperula asthenes Trailing Woodruff	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Astrotricha crassifolia Thick-leaf Star-hair	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Burhinus grallarius Bush Stone-curlew	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Callistemon linearifolius Netted Bottle Brush	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Cercartetus nanus Eastern Pygmy-possum	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Chalinolobus dwyeri Large-eared Pied Bat	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Corunastylis sp. Charmhaven (NSW896673) Corunastylis sp. Charmhaven (NSW896673)	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Crinia tinnula Wallum Froglet	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Cryptostylis hunteriana Leafless Tongue Orchid	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Eucalyptus camfieldii Camfield's Stringybark	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Eucalyptus parramattensis subsp. decadens Eucalyptus parramattensis subsp. decadens	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Eucalyptus parramattensis subsp. parramattensis - endangered population Eucalyptus parramattensis C. Hall. subsp. parramattensis in Wyong and Lake Macquarie local government areas	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Genoplesium insigne Variable Midge Orchid	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Grevillea parviflora subsp. parviflora Small-flower Grevillea	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Heleioporus australiacus Giant Burrowing Frog	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Hoplocephalus bitorquatus Pale-headed Snake	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Litoria aurea Green and Golden Bell Frog	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Litoria brevipalmata Green-thighed Frog	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Maundia triglochinoides Maundia triglochinoides	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Melaleuca biconvexa Biconvex Paperbark	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Melaleuca groveana Grove's Paperbark	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Persicaria elatior Tall Knotweed	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Petauroides volans Greater Glider	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Petaurus norfolcensis Squirrel Glider	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Phascogale tapoatafa Brush-tailed Phascogale	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Planigale maculata Common Planigale	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Rhizanthella slateri Eastern Australian Underground Orchid	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Rutidosis heterogama Heath Wrinklewort	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Tetratheca glandulosa Tetratheca glandulosa	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Tetratheca juncea Black-eyed Susan	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Uperoleia mahonyi Mahony's Toadlet	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

BAM Candidate Species Report

Threatened species Manually Added

None added

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Barking Owl	Ninox connivens	Habitat constraints
Brush-tailed Rock-wallaby	Petrogale penicillata	Habitat constraints
Eastern Osprey	Pandion cristatus	Habitat constraints
Gang-gang Cockatoo	Callocephalon fimbriatum	Habitat constraints
Giant Dragonfly	Petalura gigantea	Habitat constraints
Glossy Black-Cockatoo	Calyptorhynchus lathami	Habitat constraints
Grey-headed Flying-fox	Pteropus poliocephalus	Habitat constraints
Koala	Phascolarctos cinereus	Habitat constraints
Large Bent-winged Bat	Miniopterus orianae oceanensis	Habitat constraints
Little Bent-winged Bat	Miniopterus australis	Habitat constraints
Little Eagle	Hieraaetus morphnoides	Habitat constraints
Long-nosed Potoroo	Potorous tridactylus	Habitat constraints
Masked Owl	Tyto novaehollandiae	Habitat constraints
Powerful Owl	Ninox strenua	Habitat constraints
Regent Honeyeater	Anthochaera phrygia	Habitat constraints
Rough Doubletail	Diuris praecox	Refer to BAR
Southern Myotis	Myotis macropus	Habitat constraints
Square-tailed Kite	Lophoictinia isura	Habitat constraints
Swift Parrot	Lathamus discolor	Habitat constraints
Tranquility Mintbush	Prostanthera askania	Refer to BAR
White-bellied Sea-Eagle	Haliaeetus leucogaster	Habitat constraints

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00034356/BAAS19007/22/00034357	Waratah Super Battery	14/10/2022
Assessor Name	Report Created	BAM Data version *
Andrew Charles Michael Smith	04/11/2022	55
Assessor Number	BAM Case Status	Date Finalised
BAAS19007	Finalised	04/11/2022
Assessment Revision	Assessment Type	BOS entry trigger
6	Part 4 Developments (General)	BOS Threshold: Biodiversity Values Map

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

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

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

Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast												
2	1724_Moderate	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	52.7	52.7	0.1	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		3
											Subtotal	**3**
Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast												
1	1636_Moderate	Not a TEC	55.1	55.1	0.16	PCT Cleared - 58%	High Sensitivity to Gain			1.75		4
											Subtotal	**4**
											Total	**7**

Species credits for threatened species

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

Angophora inopina / Charmhaven Apple (Flora)									
1636_Moderate	55.1	55.1	0.16	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	4
								Subtotal	**4**
Asperula asthenes / Trailing Woodruff (Flora)									
1636_Moderate	55.1	55.1	0.16	Biodiversity Conservation Act listing status	Quantity class of viable seeds produced	Vulnerable	Vulnerable	False	4
1724_Moderate	52.7	52.7	0.1	Biodiversity Conservation Act listing status	Quantity class of viable seeds produced	Vulnerable	Vulnerable	False	3
								Subtotal	**7**
Callistemon linearifolius / Netted Bottle Brush (Flora)									
1636_Moderate	N/A	N/A	5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	8
								Subtotal	**8**

Cercartetus nanus / Eastern Pygmy-possum (Fauna)									
1636_Moderate	55.1	55.1	0.16	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	4
								Subtotal	**4**
Chalinolobus dwyeri / Large-eared Pied Bat (Fauna)									
1636_Moderate	55.1	55.1	0.16	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	True	7
1724_Moderate	52.7	52.7	0.1	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	True	4
								Subtotal	**11**
Corunastylis sp. Charmhaven (NSW896673) / Corunastylis sp. Charmhaven (NSW896673) (Flora)									
1636_Moderate	55.1	55.1	0.16	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Critically Endangered	Critically Endangered	True	7
								Subtotal	**7**

Crinia tinnula / Wallum Froglet (Fauna)									
1636_Moderate	55.1	55.1	0.16	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	3
1724_Moderate	52.7	52.7	0.1	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	2
								Subtotal	**5**
Cryptostylis hunteriana / Leafless Tongue Orchid (Flora)									
1636_Moderate	55.1	55.1	0.16	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	3
								Subtotal	**3**
Heleioporus australiacus / Giant Burrowing Frog (Fauna)									
1636_Moderate	55.1	55.1	0.16	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Vulnerable	False	3
								Subtotal	**3**

Hoplocephalus bitorquatus / Pale-headed Snake (Fauna)									
1636_Moderate	55.1	55.1	0.16	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	4
1724_Moderate	52.7	52.7	0.1	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	3
								Subtotal	**7**
Litoria aurea / Green and Golden Bell Frog (Fauna)									
1636_Moderate	55.1	55.1	0.16	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	4
1724_Moderate	52.7	52.7	0.1	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	3
								Subtotal	**7**
Litoria brevipalmata / Green-thighed Frog (Fauna)									
1636_Moderate	55.1	55.1	0.16	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	3

1724_Moderate	52.7	52.7	0.1	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	2
								Subtotal	**5**
Maundia triglochinoides / Maundia triglochinoides (Flora)									
1724_Moderate	52.7	52.7	0.1	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	3
								Subtotal	**3**
Persicaria elatior / Tall Knotweed (Flora)									
1724_Moderate	52.7	52.7	0.1	Geographic Distribution	Effectiveness of management in controlling threats	Vulnerable	Vulnerable	False	3
								Subtotal	**3**
Petaurus norfolcensis / Squirrel Glider (Fauna)									
1636_Moderate	55.1	55.1	0.16	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	4

1724_Moderate	52.7	52.7	0.1	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	3
								Subtotal	**7**
Phascogale tapoatafa / Brush-tailed Phascogale (Fauna)									
1636_Moderate	55.1	55.1	0.16	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	4
1724_Moderate	52.7	52.7	0.1	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	3
								Subtotal	**7**
Planigale maculata / Common Planigale (Fauna)									
1636_Moderate	55.1	55.1	0.16	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	4
1724_Moderate	52.7	52.7	0.1	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	3
								Subtotal	**7**

Uperoleia mahonyi / Mahony's Toadlet (Fauna)									
1636_Moderate	55.1	55.1	0.16	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Not Listed	False	4
1724_Moderate	52.7	52.7	0.1	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Not Listed	False	3
								Subtotal	**7**

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00034356/BAAS19007/22/00034357	Waratah Super Battery	14/10/2022
Assessor Name	Report Created	BAM Data version *
Andrew Charles Michael Smith	04/11/2022	55
Assessor Number	Assessment Type	BAM Case Status
BAAS19007	Part 4 Developments (General)	Finalised
Assessment Revision	BOS entry trigger	Date Finalised
6	BOS Threshold: Biodiversity Values Map	04/11/2022

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

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Barking Owl	Ninox connivens	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Eastern Chestnut Mouse	Pseudomys gracilicaudatus	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Eastern False Pipistrelle	Falsistrellus tasmaniensis	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast

Eastern Osprey	Pandion cristatus	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Gang-gang Cockatoo	Callocephalon fimbriatum	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Glossy Black-Cockatoo	Calyptorhynchus lathami	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Golden-tipped Bat	Phoniscus papuensis	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Greater Broad-nosed Bat	Scoteanax rueppellii	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Grey-headed Flying-fox	Pteropus poliocephalus	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Large Bent-winged Bat	Miniopterus orianae oceanensis	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Little Bent-winged Bat	Miniopterus australis	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast

Little Eagle	Hieraaetus morphnoides	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Little Lorikeet	Glossopsitta pusilla	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Masked Owl	Tyto novaehollandiae	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Powerful Owl	Ninox strenua	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Regent Honeyeater	Anthochaera phrygia	1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Scarlet Robin	Petroica boodang	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Speckled Warbler	Chthonicola sagittata	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Spotted-tailed Quoll	Dasyurus maculatus	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Square-tailed Kite	Lophoictinia isura	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Swift Parrot	Lathamus discolor	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Turquoise Parrot	Neophema pulchella	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Varied Sittella	Daphoenositta chrysoptera	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast

White-bellied Sea-Eagle	Haliaeetus leucogaster	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
White-throated Needletail	Hirundapus caudacutus	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast

Threatened species Manually Added

None added

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Common Name	Scientific Name	Plant Community Type(s)
Black Bittern	Ixobrychus flavicollis	1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Black-necked Stork	Ephippiorhynchus asiaticus	1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Painted Honeyeater	Grantiella picta	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Yellow-bellied Glider	Petaurus australis	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C
Black Bittern	Ixobrychus flavicollis	Habitat constraints
Black-necked Stork	Ephippiorhynchus asiaticus	Habitat constraints
Painted Honeyeater	Grantiella picta	Habitat constraints
Yellow-bellied Glider	Petaurus australis	Refer to BAR

BAM Vegetation Zones Report

Proposal Details

Assessment Id	Assessment name	BAM data last updated *
00034356/BAAS19007/22/00034357	Waratah Super Battery	14/10/2022
Assessor Name	**Report Created**	**BAM Data version ***
Andrew Charles Michael Smith	04/11/2022	55
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS19007	Part 4 Developments (General)	Finalised
Assessment Revision	**Date Finalised**	**BOS entry trigger**
6	04/11/2022	BOS Threshold: Biodiversity Values Map

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

Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones

1	1636_Moderate	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast	Moderate	0.16	1	Zone 1 (0.16 ha)
2	1724_Moderate	1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	Moderate	0.1	1	Zone 2 (0.1 ha)

EnergyCo

GPO Box 5469,
Sydney, NSW 2001.

E: contact@energyco.nsw.gov.au

W: www.energyco.nsw.gov.au

NSW GOVERNMENT