EPS

ECOLOGICAL ASSESSMENT
FOR ECO-TOURIST FACILITY

Prepared for Worimi Local Aboriginal Land Council
Prepared by EPS

Lot 227 DP 1097995
Lavis Lane Williamtown

EPS
11245
August 2018

Quality Assurance & Version Control Table				
Project: Ecological Assessment for WLALC Eco-tourist Facility				
Client:	Worimi Local Aboriginal Land Council			
Rev No.	**Date**	**Our Reference**	**Author**	**Reviewer**
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Checked by	31.08.2018			A. Midgley
Approved by	31.08.2018			T. Lambert

Hunter	Sydney
9 Yacaaba Street,	Level 33, 264 George Street,
Nelson Bay NSW 2315	Sydney NSW 2000
(02) 4981 1600	(02) 9258 1985

Website: www.enviroproperty.com.au

EXECUTIVE SUMMARY

EPS was engaged to prepare an Ecological Assessment report (EA) for WLALC. This report details the ecological assessment for a proposed eco-tourist facility within Lot 227 DP 1097995 at Williamtown, NSW.

Desktop assessments were undertaken in the first instance, which involved database searches, and stratification of predicted vegetation and fauna habitats. Detailed targeted field surveys were conducted to obtain an understanding of the biodiversity occurring within the study area. Flora surveys included BioBanking surveys, vegetation mapping and condition assessment and random meander surveys and targeted threatened flora surveys. Fauna surveys included trapping, camera surveys, bird surveys, herpetofauna searches, microbat surveys, nocturnal surveys, opportunistic surveys, hollow-bearing tree surveys and fauna habitat.

The study area is located in an area which has previously been disturbed by mineral sands dredging and contains regrowth native vegetation. Within the project area, the native vegetation consists of Coastal Sand Apple / Blackbutt Forest with the fringes of the site being mapped as 'supplementary' Koala habitat in the Port Stephens Koala Plan of Management (CKPoM). The site is adjacent to the National Parks and Wildlife Reserve 'Worimi State Conservation Area'.

The project layout has been influenced by the former sand mining lease area, which has significantly impacted the site topography and vegetation quality. The entire development footprint is contained within the former sand mining area. Specifically, as a result of the former mining operations, a ridgeline loops around the site and a low-point of approximately 7m is located in the south-west of the western portion of the site. The design is sensitive to the site topography and has placed the carpark and quadbike storage and maintenance facility towards the top of the western ridgeline, and amphitheatre and the multifunctional units in the depression.

As part of the environmental ethos of the project, vegetation condition mapping was undertaken in August 2017, with the purpose being to guide the design of the project to make use of existing disturbed areas and minimise impacts to better quality areas. The end design of the project makes use of the mostly disturbed (previously mined) central parts of the site, while protecting the older remnant forest areas that adjoin Worimi State Conservation Area in the south and that occur on the ridgetops in the north. Where practical, existing tracks are being reused in the design process and some existing tracks are to be closed and rehabilitated by the WLALC Green Team.

The site is vegetated to a varying degree. The eastern portion of the site is more densely re-vegetated than the western portion, hence the design has focused on the western portion. The sites low-point is predominately vegetated with exotic grassland with scattered shrubs.

The site layout has been selected to maintain a buffer between the National Park and the development, to avoid high-quality vegetation as far as practicable, and to avoid the removal of any Hollow Bearing Trees (HBTs).

The layout has been selected to prevent the different site elements from visually intruding on each other, to give the effect of minimal development and seclusion.

The WLALC Green Team have previously replanted some of the disturbed sand mine area with locally native species with the aim of regenerating the site. The WLALC Green Team will continue their work on regeneration and rehabilitation of Lot 227 within the wider site (i.e. outside the project areas). The WLALC Green Team will also conduct weed removal operations and environmental education as part of the WLALC ecotourism project.

Two (2) Plant Community Types (PCTs) and two (2) non-native vegetation communities were recorded within the study area and these included the following:

- Coast Tea Tree – Old Man Banksia Coastal Shrubland;
- Smooth-barked Apple – Blackbutt – Old Man Banksia Woodland;
- Exotic grassland with scattered shrubs; and
- Bitou Bush Shrubland.

The proposed eco-tourist facility will involve the removal of 9.55 ha of disturbed and native vegetation. Retention of mapped native vegetation within the study area will total approximately 25.88 ha, not including areas of native vegetation likely to be increased by WLALC Green Team restoration activities. The removal is comprised of:

- 4.86 ha of Coast Tea Tree – Old Man Banksia Coastal Shrubland;
- 0.71 ha of Smooth-barked Apple – Blackbutt – Old Man Banksia Woodland;
- 3.97 ha of Exotic grassland with scattered shrubs; and
- 0.01 ha of Bitou Bush Shrubland.

No threatened ecological communities (TECs) listed on the EPBC Act were recorded within the study area.

No TECs listed on the BC Act were recorded within the study area.

The two native PCTs listed above were assessed as being Groundwater Dependent Ecosystems. The project is unlikely to impact upon groundwater as no draw down of groundwater is required as part of the project.

No threatened flora species listed under the BC Act or the EPBC Act were recorded within the study area.

Five threatened species of flora listed on the BC Act and or the EPBC Act were identified as having potential habitat within the study area. Significance assessments for these threatened flora species was undertaken and no significant impacts were considered likely (Appendix 7).

No endangered populations were recorded within the study area. One endangered population of Emu population in the NSW North Coast Bioregion and Port Stephens LGA has the potential to occur and a significance assessment concluded that no significant impact would occur on this population.

Four (4) threatened species of fauna were recorded within the study area as follows:

- Powerful Owl (Vulnerable - BC Act Listed);
- White-bellied Sea Eagle (Vulnerable - BC Act);
- Grey-headed Flying Fox (Vulnerable - BC Act and EPBC Act listed); and
- Little Bent-wing-bat (Vulnerable - BC Act Listed).

A further 21 threatened fauna species have potential habitat within the study area (Appendix 5) though were not recorded. Significance assessments for these recorded and potential threatened fauna species was undertaken and no significant impacts were considered likely (Appendix 7).

One migratory species was recorded with potential habitat for additional two species to occur. An assessment of the impact of the project on these species was conducted and the study area is not classified as important habitat for any of the migratory species recorded or to have potential to occur within the study area.

88 hollow-bearing trees were recorded within the study area, all of these trees will be retained as part of the project, as a result of the sensitive project design.

No areas of outstanding biodiversity value listed on the BC Act (previously critical habitat under the TSC Act) occurred within the study area.

The project is unlikely to have a significant impact on the remaining recorded or predicted threatened, flora, fauna, migratory species, endangered populations or ecological communities, providing the mitigations measures outlined in this report are implemented.

Key mitigation measures to minimise the impact to biodiversity include the following:

- Flora and Fauna Management is prepared (FFMP);
- Pre-clearing surveys;
- Minimisation of the removal of vegetation;
- Vegetation clearing procedures;
- Retention of hollow-bearing trees; and
- Retention of White-bellied Sea Eagle nest.

In conclusion, the proposed eco-tourist facility is unlikely to have a significant impact on the threatened biodiversity and as such a Species Impact Statement or referral to the Commonwealth under the EPBC Act is not required.

STATEMENT OF CERTIFICATION

Contact Information and Declaration		
Declaration:	The declaration relates to the submission of this Ecological Assessment Report (EA) prepared for WLALC in respect of a proposed eco-tourist facility at Williamtown, NSW. The opinions and declarations in this EA are ascribed to EPS and are made in good faith and trust that such statements are neither false nor misleading. In preparing this EA, EPS has considered and relied upon information obtained from the public domain, supplemented by discussions between key EPS staff, representatives from WLALC and other consultants.	
Client Contact:	Andrew Smith Chief Executive Officer Worimi Local Aboriginal Land Council PO Box 56 Tanilba Bay NSW 2319	
Prepared by:	Toby Lambert Principal Ecologist EPS PO Box 348 NELSON BAY NSW 2315 Ph: 02 4981 1600	 ..... Toby Lambert
Application subject land address:	Lot 227 DP 1097995 Lavis Lane, Williamtown NSW	

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Abbreviations and Acronyms

Abbreviation	Description
AOBV	Areas of outstanding biodiversity value are areas listed on the BC Act.
API	Aerial Photographic Interpretation
BC Act	*Biodiversity Conservation Act 2016*
Biodiversity	Biodiversity is the genetic diversity, species diversity and ecosystem diversity. Biodiversity includes plants, animals, micro-organisms.
Bioregion	Division of Australia into bioregions based on dominant landscape attributes as defined by Thackway and Cresswell (1995)
Critical Habitat	Critical Habitat is an area containing threatened ecological communities, populations, species that is listed on the EPBC Act
CMA	Catchment Management Authority
DPI	Department of Primary Industries
DoEE	Commonwealth Department of Environment and Energy
DPE	NSW Department of Planning and Environment
EA	Ecological Assessment
Ecological Community	A set of species occupying a specific area
EEC	Endangered Ecological Community
EPS	Environmental Property Services
EIS	Environmental Impact Statement
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EP&A Act	*Environmental Planning and Assessment Act 1979*
GDE	Groundwater Dependent Ecosystems
IRBA	Interim Biogeographic Regionalisation of Australia
CKPoM	Port Stephens Comprehensive Koala Plan of Management
KTP	Key Threating Process as listed under the BC/TSC Act and/or the EPBC Act
LGA	Local Government Area
Likely	A chance of possibility of occurring within the study area (OEH, 2004)
Locality	The area within 10km of the study area
Local population	Population of plants or animals within the study area, or within continuous habitat or enables exchange of genes
Migratory Species	Listed migratory species under the EPBC Act
MNES	Matters of National Environmental Significance as listed under the EPBC Act
Noxious Weed	Plant species listed on the *Noxious Weed Act 1993* for the study areas control area
NPW Act	*National Parks and Wildlife Act 1974*
NW Act	*Noxious Weed Act 1993*

Abbreviation	Description
NVA	*Native Vegetation Conservation Act 1997*
OEH	Office of Environment and Heritage
PCT	Plant Community Type
Project	Wadalba East Urban Land Release Area Proposed Rezoning (Precincts 2A and 2B in the North Wyong Shire Structure Plan)
RAMSAR Wetland	Internationally Important Wetlands
Significant	Important as defined by the Threatened species Assessment Guidelines (DEEC, 2007)
Study Area	Includes the project area and the area where field surveys were conducted
SEPP Coastal Management	Replaces SEPP14 wetlands, SEPP 26 littoral rainforest and manages all coastal environments, hazards and coastal use areas.
SEPP44	State Environmental Planning Policy – Koala Habitat Protection
Threatened biodiversity	Species, populations, communities that are listed under the BC/TSC Act and/or the EPBC Act
TSC Act	*Threatened Species Conservation Act 1995*
Weed	Plant species that is not native to Australia and/or is a native species that is growing outside of its normal geographic range
WLALC	Worimi Local Aboriginal Land Council

1 BACKGROUND AND INTRODUCTION

1.1 Introduction

EPS was engaged to prepare an Ecological Assessment report (EA) for Worimi Local Aboriginal Land Council (WLALC). This report details the ecological assessment for a proposed eco-tourist facility within Lot 227 DP 1097995 at Williamtown, NSW (the project).

1.2 Project Description

1.2.1 Overview

It is proposed to develop Lot 227 in DP 1097995 with an Eco-tourist Facility. This facility is proposed to be both as an extension of the Murrook Cultural Centre, and as a stand-alone facility for services and activities including day visits or overnight lodging. The facility is proposed to include access to Aboriginal cultural education and performances, flora and fauna tours, and environmental education. The facility is targeted at school/other education groups, corporate groups, domestic and/or international tourist groups and individuals.

The project has been designed to be located in an area which has previously been disturbed by mineral sands dredging and now contains a mixture of regrowth native vegetation and disturbed environments include existing vehicular tracks. The project area is roughly bordered by the Stockton Bight Track to the north and west, National Parks and Wildlife Reserve 'Worimi State Conservation Area' to the south and Stockton Beach sand dunes to the east.

The eco-tourist facility investigation area, is referred to as the 'study area' in this report and is the focus of this assessment.

Figure 1-1 shows the location of the study area and Figure 1-2 shows the proposed layout for the eco-tourist facility, including aspects such as buildings, tracks and Asset Protection Zone (APZ) extents.

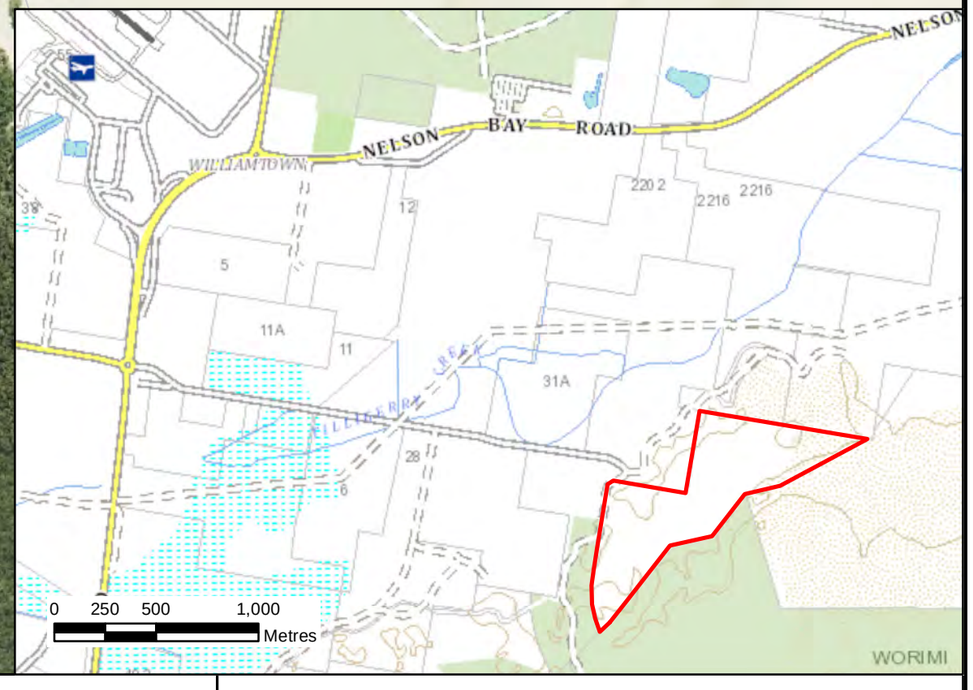
For a more detailed description of the project component refer to the Statement of Environmental Effects (EPS 2018) for the project.

LAVIS LANE (Sealed Public Road)

Stockton Bight Track

Stockton Bight Track

Lot 227
DP1097995



Legend

Study Area

Lot

Author:	S. Wilkin
Reviewer:	T. Lambert
A3 Scale:	1:5,000
Job Ref:	11245

N

0 50 100 200 300
Metres

Map Projection: MGA Zone 56

Figure 1-1

Study Area Location

WLALC Eco-tourism | Williamtown, NSW, Australia

21 August 2018

EPS
ENVIRONMENTAL PROPERTY SERVICES

Author:	S. Wilkin
Reviewer:	T. Lambert
A3 Scale:	1:5,000
Job Ref:	11245

N

0 50 100 200 300 Metres

Map Projection: MGA Zone 56

Figure 1-2

Proposed Layout of Ecotourism Facility

WLALC Eco-tourism | Williamtown, NSW, Australia

21 August 2018

EPS ENVIRONMENTAL PROPERTY SERVICES

1.2.2 Sensitive Design Process and WLALC Green Team

The project layout has been influenced by the former sand mining lease area, which has significantly impacted the site topography and vegetation quality. The entire development footprint is contained within the former sand mining area. Specifically, as a result of the former mining operations, a ridgeline loops around the site and a low-point of approximately 7m is located in the south-west of the western portion of the site. The design is sensitive to the site topography and has placed the carpark and quadbike storage and maintenance facility towards the top of the western ridgeline, and amphitheatre and the multifunctional units in the depression.

As part of the environmental ethos of the project, vegetation condition mapping was undertaken in August 2017, with the purpose being to guide the design of the project to make use of existing disturbed areas and minimise impacts to better quality areas. The end design of the project makes use of the mostly disturbed (previously mined) central parts of the site, while protecting the older remnant forest areas that adjoin Worimi State Conservation Area in the south and that occur on the ridgetops in the north. Where practical, existing tracks are being reused in the design process and some existing tracks are to be closed and rehabilitated by the WLALC Green Team.

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The WLALC Green Team have previously replanted some of the disturbed sand mine area with locally native species with the aim of regenerating the site. The WLALC Green Team will continue their work on regeneration and rehabilitation of Lot 227 within the wider site (i.e. outside the project areas). The WLALC Green Team will also conduct weed removal operations and environmental education as part of the WLALC ecotourism project.

1.2.3 Multifunctional Overnight Accommodation Units

A total of 44 multifunctional overnight accommodation units are proposed to be located on the site. The units have been designed with pull down beds which, when folded away, offer generous floor space of approximately 25m^2 that may then be utilised for functions, such as meetings for corporate groups, or an activity area for school groups or families.

1.2.4 Managers Residence

A manager's residence is proposed to be located on-site to oversee security of the premises and to manage the overnight accommodation aspects of the proposed development.

1.2.5 Quad-bike Cultural Tours

A key aspect of the proposed Eco-Tourist Facility is an extension of the Sand Dune Adventure quad-bike cultural tours run by the WLALC. The Sand Dune Adventures has a 5-star review rating on Trip Advisor, and was awarded gold 2017 Australian Tourism Awards in the Aboriginal and Torres Strait Islander Tourism category. Sand Dune Adventures is an iconic tourist attraction and major asset to the local area.

This proposal would improve the efficiency of operations through storage and maintenance of equipment nearby the operational area thus allowing more tours to be completed each day. Currently equipment has to be transported back and forth from the Murrook Centre to the operation area daily.

1.2.6 Quad-bike Storage and Maintenance Area

The quad bike storage and maintenance facility is proposed to the north of the development footprint. The facility includes sufficient area to store approximately 60 quad bikes in the 'storage area' and an additional approximate 21 quad bikes in the 'maintenance area'. This building will also include the reception for both day visits and overnight guests. Heavy duty tilt panel doors have been incorporated in the design for security purposes.

1.2.7 Commons

A Commons amphitheatre is proposed to be located adjacent to the multifunctional units. The Commons has been designed as a space for Aboriginal cultural presentations, education and performance. It is also proposed to serve as a Central Safe Refuge in the event of a bushfire. Access path leads to the Commons from the west to where it is sited nearby the lots natural low-point. The Commons is proposed to be constructed of reinforced rammed earth and concrete retaining walls with concrete columns, vertical operable weathering steel blades and weathering steel pivot entry doors.

1.2.8 Access and Parking

The proposed Eco-Tourist Facility is accessible via Stockton Bight Track, which is approximately 2.4km east of Nelson Bay Road. The proposal includes a total of 77 car parking spaces and two (2) bus/coach drop-off areas with a total of six (6) coach parking spaces. Of the 77 car parking spaces, three (3) are accessibility spaces (two are located the main carpark, and one at the northern coach parking). The car-park is proposed to be sealed, all-weather access.

A maintenance access road encircles the multifunctional units and the Commons and joins back to the main carpark near the southern coach drop off/parking. The maintenance loop-road is proposed to be sealed all-weather access and includes turning circles and pump-out bays.

The natural sand access tracks throughout the site are proposed to be consolidated into a single access track that extends from the east of the quadbike storage and maintenance facility through to the sand dunes at the east of Lot 227. The natural sand access track is proposed to be used by the Sand Dune Adventures quadbike operations.

1.2.9 Servicing

The proposed Eco-Tourist Facility does not seek to connect to the existing water main or public sewer. Instead, 6 x 65kL static reserve rainwater tanks are proposed along the access road south of the multifunctional units and 1 x 20kL and 1 x 80kL rainwater tanks located at the quad-bike storage and maintenance facility. Further, the proposal includes dry composting toilets for effluent disposal.

The proposed development includes an extension to the existing 11kV line transmission line, located approximately 600m north of the site. Discussions with Ausgrid have advised a pole mounted substation would be required to service the development.

The proposed Eco-Tourist Facility does not seek to connect to the existing Telstra network in order to promote the natural ambience; however, communications will be available via the mobile network.

1.2.10 Bushfire Protection

A Bushfire Assessment was conducted by Newcastle Bushfire Consulting (2018). The assessment directs a number of bushfire protection measures for the eco-tourist facility. Of most relevance to this EA is the requirement for APZ's, which have been considered as part of the impact assessment contain in this report.

1.3 Study Area Description

The study area is located at Williamtown near Newcastle, NSW and fringes an area between agricultural and natural landscapes. The study area is located within Port Stephens Local Government Area.

Previous land use across the study area was dedicated to mineral sands mining. The study area is currently being used for quad bike tours.

The study area is situated approximately 4 km to the south east of Williamtown. An operational sand mine occurs to the north, with Stockton beach to the east. Worimi State Conservation Area adjoins the study area to the south of the study area, with cleared agricultural lands to the west of the study area.

The topography of the site is undulating with the highest areas (~32m AHD) located around the north-north-west perimeters and the lowest areas (~4m AHD) located near the centre of the site. The topography of the site is heavily influenced by the former sand mining operations.

1.4 Aims and Objectives

The purpose of this EA is to describe the existing biodiversity values and to analyse the likely significance of the impact of the project on biodiversity within the study area.

This EA assesses the impact of the project under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The main aims of this report are as follows:

- Describe the existing biodiversity and existing environment;
- Identify and assess threatened biodiversity listed under *Biodiversity Conservation Act 2016* (BC Act), *Fisheries Management Act 1994* (FM Act) and/or *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- Assess the likely significance of impacts of the project; and
- Where warranted, to provide mitigation measures to reduce the impacts from the project upon biodiversity.

The *Biodiversity Conservation Act 2016* (BC Act) came into force on 25th August 2017 and now supersedes the *Threatened Species Conservation Act 1995* (TSC Act) in NSW. The BC Act requires all types of developments (Part 4 and Part 5 developments) to be assessed as to whether biodiversity offset scheme is to be applied.

Assessment under the BC Act is not currently required in Port Stephens Local Government Area, as this project is being assessed under the transitionary arrangements defined in the *Biodiversity Conservation (Savings and Transitional) Regulation 2017.* The Port Stephens Local Government Area is identified via this regulation as an Interim Designated Area (IDA), which means that if Part 4 development applications are submitted before the 24th November 2018 then the project is to be assessed under the previous legislation.

1.5 Personnel

The field surveys and reporting completed for this EA were conducted by a qualified biodiversity team familiar with the locality, as outlined in Table 1-1 below.

Table 1-1 Personnel

Personnel	Position	Qualifications	Role
Toby Lambert	Director – Ecology	BEnvSc Accredited Biobanking and BAM Assessor	Project Management Field Surveys Technical Review
Deborah Landenberger	Senior Ecologist	BSc (Hons) Accredited Biobanking Assessor	Field Surveys Reporting
Alan Midgley	Ecologist	PhD, BEnvSc, Dip C&LMgt Accredited BAM Assessor	Field Surveys Reporting
Alina Tipper	Senior Environmental Consultant	BEnvSc, MEnvMgt&S	Field Surveys
Kate Tierney	Environmental Consultant	BEnvSc, BLaws, GDLP Accredited BAM Assessor	Field Surveys
Sam Wilkin	Directory - Systems	DipGIS	GIS Mapping
Marina Budisavljevic	Environmental Consultant	BUbarnEnvPlan (UGrad)	GIS Mapping
Amanda Lo Cascio	Ecologist	BSc, MEnv	Bat Call Analysis

The field work component of this EA was conducted in accordance with a *National Parks and Wildlife Act 1974* ('NP&W Act') Section 132 (c) Scientific Licence (SL100772). The licence permits the undertaking of biodiversity assessments, Species Impact Statements, ecological surveys and abiotic sampling as part of flora and fauna survey work.

1.6 Definitions

The following definitions have been referred to within this EA:

- **The Project** – The proposed eco-tourist facility.

- **The Study Area** – the area studied as part of this EA, being defined as the boundary of the land owned by WLALC, which coincides with the boundary of Lot 227 DP 1097995.

- **Subject Site** – the extent of the maximum likely direct and indirect impacts as a result of the Project. The components of the project include but are not limited to:
    - Car parks;
    - All proposed buildings;
    - Access tracks;
    - Any other associated infrastructure;
    - Predicted cut and fill requirements; and
    - Asset Protection Zones.

To ensure the maximum extent of the likely direct and indirect impacts have been considered, a 5m impact buffer either side of the proposed/existing northern quad bike track has been included in the subject site. For the core aspects of the project the outer limit of the subject site is defined by the proposed extent of the APZ, or a 10m buffer around the proposed infrastructure and ground disturbance, whichever is the greater impact in individual areas. The entire maximum area of impact identified as the subject site has been incorporated into the vegetation clearing calculations, however it should be recognised that actual impacts are likely to be less than this maximum extent. For example, the northern quad bike track is already partly in existence (and will not be likely to require further clearing) and the new part to be constructed will likely not require 5 metres either side for construction purposes. This is because this track is to be a naturalistic track that will provide access through the site to the dunes for the quad bikes. Similarly, for the core infrastructure, a 10 metre work area is not likely to be required in all instances to enable construction of the project.

2 LEGISLATIVE CONTEXT

2.1 Commonwealth Legislation

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

The primary objective of the EPBC Act is to 'provide for the protection of the environment, especially those aspects of the environment that are Matters of National Environmental Significance' ('Matters of NES'). Environmental approvals under the EPBC Act may be required for an 'action' that is likely to have a significant impact on Matters of NES being:

- World Heritage Areas;
- National Heritage Places;
- Ramsar wetlands of international importance;
- Nationally listed threatened species and ecological communities;
- Listed migratory species;
- Commonwealth marine areas;
- Nuclear actions;
- Great Barrier Reef Marine Park; and
- A water resource in relation to coal seam gas development and large coal mining development.

Of potential relevance to the study area are Matters of NES which include nationally listed threatened species, ecological communities and listed migratory species. Where there is the potential for a project to have a significant impact on any Matter of NES, a Referral under the EPBC Act is required to be submitted to the Department of the Environment and Energy (DoEE) for approval.

2.2 NSW State Legislation

2.2.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* ('EP&A Act') is the principal planning legislation for NSW, providing a framework for the overall environmental planning and assessment of development proposals. Various legislative instruments, such as the NSW TSC Act, are integrated with EP&A Act and have been reviewed separately. Clause 5A of the EP&A Act provides an outline of the ecological matters that must be taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats.

2.2.2 Threatened Species Conservation Act 1995

The TSC Act aims to protect and encourage the recovery of threatened species, populations and communities listed under the Act. The TSC Act is integrated with the EP&A Act and requires consideration of whether a development (Part 4 of the EP&A Act) or an activity (Part 5 of the EP&A Act) is likely to significantly affect threatened species, populations and ecological communities or their habitat.

The potential impact of development of the study area on any threatened species, populations or communities is assessed using Assessments of Significance under Section 5A of the EP&A Act (also known as a seven-part test). If the impacts are found to be 'significant', a Species Impact Statement (SIS) and concurrence from the Director General of the Office of Environment and Heritage (OEH) is required.

2.2.3 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) came into force on 25th August 2017 and now supersedes the *Threatened Species Conservation Act 1995* (TSC Act). The BC Act requires all types of developments (Part 4 and Part 5 developments) to be assessed as to whether biodiversity offset scheme is to be applied. Assessment under the new *Biodiversity Conservation Act 2016* is not required as this project is being assessed under the transitionary arrangements defined in the *Biodiversity Conservation (Savings and Transitional) Regulation 2017*.

2.2.4 Biosecurity Act 2015

The *Biosecurity Act 2015* (BSA Act) has replaced the *Noxious Weed Act 1993* and all previously noxious weeds are now regulated by the BSA Act. Noxious weeds are renamed as priority weeds and are now regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. These weeds reduce diversity of native plant and animal species. The BSA Act is implemented and enforced by the Local Control Area for the Local Government Area (LGA).

2.2.5 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) aims to conserve, develop and share the fisheries resources for the benefit of the state. These include conserving of key fish habitats, threatened aquatic species, populations and communities listed on the FM Act including Marine vegetation. The aims also include to promote ecologically sustainable development, viable commercial and recreational fishing, share fish resources and provide social and economic benefits for the wider community.

If a project is likely to harm or damage threatened species, populations or ecological communities and its habitat or damage critical habitat a licence is required under Section 220ZW of the FM Act.

2.2.6 SEPP Coastal Management (2018)

This SEPP consolidates the previous SEPP 14 (Coastal Wetlands), SEPP 26 (Littoral Rainforest) and SEPP 71 (Coastal Protection) into one policy. The aim of this policy is to provide an integrated and coordinated approach to land use planning is promoted by the new SEPP. It defines the four coastal management areas through detailed mapping and specifies assessment criteria that are tailored for each coastal management area. Councils and other consent authorities must apply these criteria when assessing proposals for development that fall within one or more of the mapped areas.

The four coastal management areas are:

1. Coastal wetlands and littoral rainforests area; areas which display the characteristics of coastal wetlands or littoral rainforests that were previously protected by SEPP 14 and SEPP 26.
2. Coastal vulnerability area; areas subject to coastal hazards such as coastal erosion and tidal inundation.
3. Coastal environment area; areas that are characterised by natural coastal features such as beaches, rock platforms, coastal lakes and lagoons and undeveloped headlands. Marine and estuarine waters are also included.

4. Coastal use area; land adjacent to coastal waters, estuaries and coastal lakes and lagoons.

The SoEE (EPS 2018) considers this SEPP in detail.

2.2.7 SEPP 44 – Koala Habitat Protection

The Port Stephens Council Comprehensive Koala Plan of Management (CKPoM) has been prepared for the Port Stephens LGA in accordance with SEPP 44 – 'Koala Habitat Protection'. The principle aim of the Port Stephens CKPoM is to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and to reverse the current trend of Koala population decline.

The matters listed in the CKPoM have been designed to ensure future developments do not adversely impact on the existing habitats of koalas in Port Stephens, or their preferred vegetation species for consumption.

2.3 Port Stephens Council Comprehensive Koala Plan of Management

As the study area is located within the Port Stephens LGA, the CKPoM must be considered in relation to proposed works. The CKPoM is consistent with the National Koala Strategy and was prepared in accordance with State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44) and supersedes the requirements of SEPP 44 in the Port Stephens LGA. One of the key elements of the CKPoM is to find a balance between the conservation of natural resources and the ongoing community development of Port Stephens.

3 METHODS

3.1 Desktop Assessment

3.1.1 Database Searches

A list of threatened species, populations and ecological communities that had been previously reported or modelled to occur within a defined radius of the study area was obtained by undertaking a search of the following online and publicly accessible databases. Preliminary database searches were undertaken in January 2017 to inform survey design and updated in May 2018 for the purposes of the written assessment.

Table 3-1 Database Review

Database Reviewed	First Database Search Date	Updated Search	Search Extent
State			
NSW BioNet Atlas	31/01/2017	22/05/2018	10km
NSW PlantNet	31/01/2017	22/05/2018	10km
Threatened Species Database	31/01/2017	22/05/2018	-
OEH vegetation information system (VIS) database	31/01/2017	22/05/2018	-
NSW Department of Planning's SEPP (Coastal Management) spatial database	-	16/05/2018	5 km
NSW Department of Primary Industries Weed wise database	31/01/2017	22/05/2018	Port Stephens LGA
Department of Primary Industries database for aquatic biodiversity	31/01/2017	22/05/2018	All Listings
Federal			
Department of Environment's Protected Matters Search Tool	31/01/2017	22/05/2018	10km

Database Reviewed	First Database Search Date	Updated Search	Search Extent
The federal Bureau of Meteorology's Atlas of Groundwater Dependent Ecosystems (GDE)	-	16/05/2018	Study Area
Department of Environment Weeds of National Significance	31/01/2017	22/05/2018	All Listings

BioNet threatened species locations surrounding the study area are shown in Figure 3-1 and 3-2 for contextual purposes.

Note that in the general locality there are a large number of Koala records. Koala records are not included in Figure 3-2 due to their large number, but are shown on a separate map later in this EA (Figure 5-2) for Koala assessment purposes.

3.1.2 Literature Review

The following literature and reports were reviewed to inform this EA:

- Vegetation maps of the locality, including Lower Hunter and Central Coast Regional Environmental Management Strategy (House 2003);
- Vegetation of the Tomaree National Park (Bell, 1998);
- Vegetation community mapping for the Worimi Conservation Lands (Bell and Driscoll, 2010); and
- Port Stephens Comprehensive Koala Plan of Management.

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Reviewer:	T. Lambert
A3 Scale:	1:50,000
Job Ref:	11245

N

0 0.75 1.5 3 Km

Map Projection: GDA 1994 MGA Zone 56

Figure 3-1

Flora Database Search

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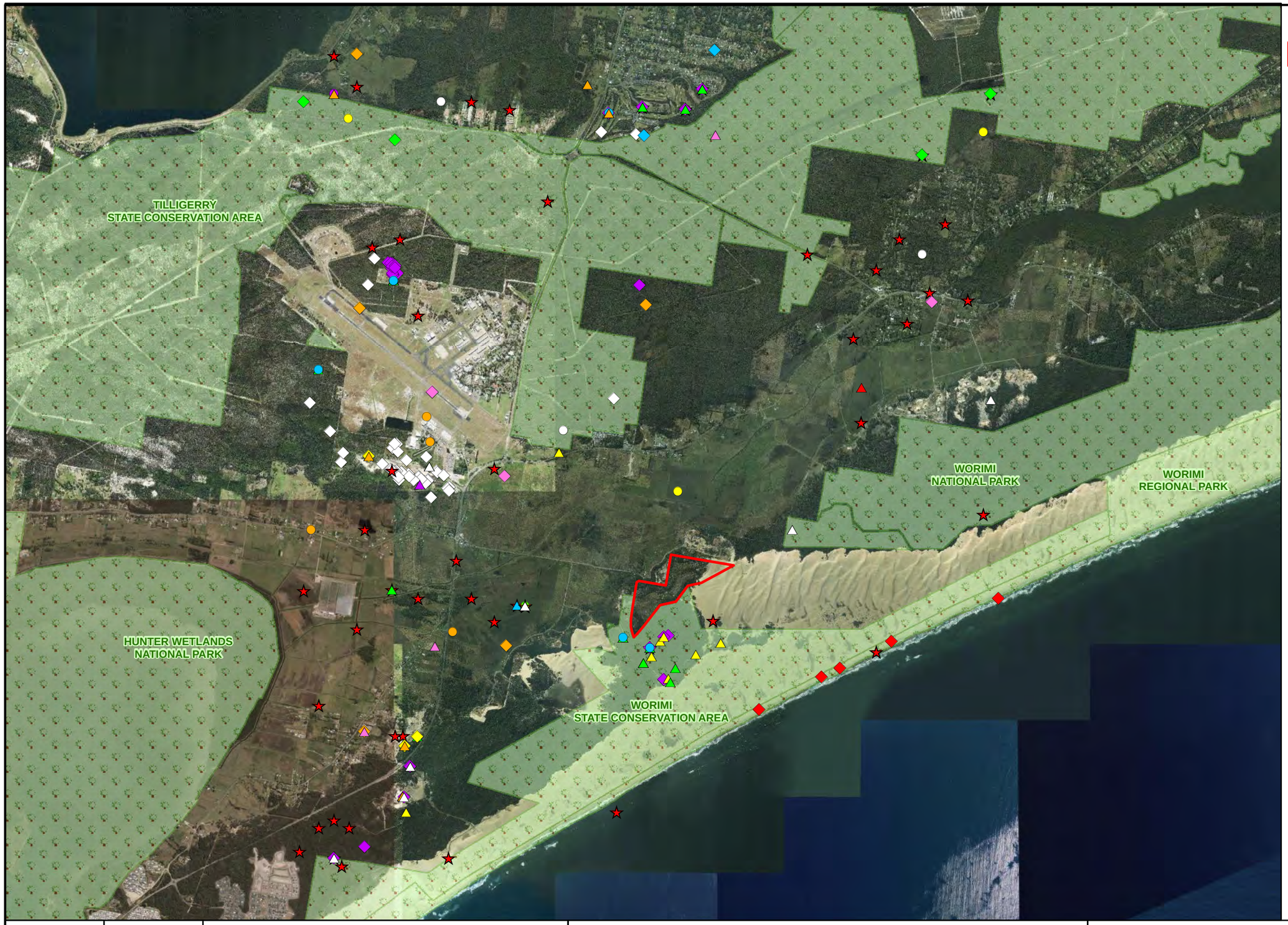

Legend:

- Study Area
- NPWS Reserve
- Black Bittern
- Black-necked Stork
- Brush-tailed Phascogale
- Dusky Woodswallow
- Eastern Bentwing-bat
- Eastern False Pipistrelle
- Eastern Freetail-bat
- Emu
- Glossy Black-Cockatoo
- Greater Broad-nosed Bat
- Grey-headed Flying-fox
- Little Bentwing-bat
- Little Lorikeet
- Long-nosed Potoroo
- Masked Owl
- New Holland Mouse
- Pied Oystercatcher
- Powerful Owl
- Southern Myotis
- Spotted-tailed Quoll
- Square-tailed Kite
- Squirrel Glider
- Swift Parrot
- Wallum Froglet
- White-bellied Sea-Eagle
- Yellow-bellied Sheathtail-bat

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0 0.75 1.5 3 Km

Map Projection: GDA 1994 MGA Zone 56

Figure 3-2

Fauna Database Search

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3.2 Survey Guidelines

The terrestrial field surveys consisted of a combination of habitat assessment and targeted field surveys to identify the flora and fauna habitat and/or recorded species within the study area.

Flora surveys included vegetation mapping, targeted threatened flora (including orchids) surveys, BioBanking floristic plot surveys and opportunistic surveys.

Fauna surveys included fauna habitat assessment, Elliott trapping, cage trapping, bird census, spotlighting, Anabat surveys, call playback, herpetofauna surveys, stationary camera surveys and opportunistic surveys. These surveys were generally conducted in accordance with the following guidelines:

1. Lower Hunter and Central Coast Region Flora and Fauna Guidelines (2002);
2. Survey Guidelines for Australia's Threatened Orchids: Guidelines for detecting orchids listed as threatened under the EPBC Act 1999 (Department of Environment 2014);
3. NSW Threatened Biodiversity Survey and Assessment Guidelines for Developments and Activities – Working Draft (Department of Environment and Conservation 2004);
4. Survey Guidelines for Australia's Threatened Birds (Department of Environment Water, Heritage and the Arts 2010a); and
5. Survey guidelines for Australia's threatened mammals (Department of Sustainablility, Environment, Water, Populations and Communities, 2011).

3.3 Field Survey Timeline

The field surveys were undertaken during four survey periods covering winter, spring, summer and autumn, as follows:

- 8th to 11th August 2017 – Baseline vegetation and opportunistic surveys;
- 13th to 15th September 2017 – *Diuris arenaria* and *Diuris praecox* targeted and opportunistic surveys;
- 27th to 28th February 2018 – *Cryptostylis hunteriana* targeted and opportunistic surveys;
- 30th April – 4th May 2018 – Fauna and opportunistic surveys; and
- 10th May 2018 – Hollow-bearing tree survey completion and opportunistic fauna surveys.

Surveys were distributed throughout the entire study area, focussing on the subject site when necessary and appropriate. As much of the subject site is situated within the previous mining area, some surveys were better suited to the more intact parts of the study area.

3.4 Flora Surveys

The flora surveys were conducted using several methodologies as outlined below:

- Random Meander surveys were conducted in accordance with Cropper (1993). These surveys consisted of walking in a random manner recording all plant species observed across the study area;
- Review of the LHCCREMS mapping. This review assisted in stratifying the study area into preliminary vegetation types to inform the field survey design;
- Review of aerial photographs to assist in stratifying the study area into vegetation types;
- BioBanking floristic plots in accordance with the BioBanking Assessment methodology (Office of Environment and Heritage 2014); and
- Assigning vegetation communities into Plant Community Types (PCTs) in accordance with the Office of Environment and Heritage VIS classification database Version 2.1.

More detailed information on these survey techniques is provided below.

3.4.1 Vegetation Zone Delineation and BioBanking Plots

The entire study area was initially inspected over one day via vehicle to provide a preliminary assessment of the vegetation types and the potential number of vegetation zones and their condition in accordance with the BioBanking Assessment Methodology (Office of Environment and Heritage 2014). The vegetation was then mapped into type and condition, with each community assigned to PCTs in accordance with the VIS Classification database (2015).

Table 3-2 below summarises the BioBanking plot, random meanders and opportunistic survey effort. Three BioBanking plots were conducted within the Exotic Grassland with Scattered Shrubs community to assess whether they were to be considered as derived grassland from the surrounding PCTs. The locations of the BioBanking plots are shown over each PCT later in this EA in Figure 4-3.

Table 3-2 Flora Survey Effort

Date	Flora survey Type	Approximate Person hours	Orientation of plot (degrees)	Eastings GDA56	Northings GDA56
Entire Survey Period	Initial inspection, random meanders and vegetation mapping	64	Entire study area	-	-
08/08/2017	BioBanking Plot 1	3	315	395315	6368013
08/08/2017	BioBanking Plot 2	3	275	394967	6368068
08/08/2017	BioBanking Plot 3	3	48	394879	6367949

Date	Flora survey Type	Approximate Person hours	Orientation of plot (degrees)	Eastings GDA56	Northings GDA56
08/08/2017	BioBanking Plot 4	3	260	394665	6368071
08/08/2017	BioBanking Plot 5	3	186	394529	6368050
08/08/2017	BioBanking Plot 6	3	65	394693	6368048
08/08/2017	BioBanking Plot 7	3	291	394819	6368065
09/08/2017	BioBanking Plot 8	3	90	394730	6367945
09/08/2017	BioBanking Plot 9	3	315	394892	6367799
09/08/2017	BioBanking Plot 10	3	320	394561	6367574
09/08/2017	BioBanking Plot 11	3	180	394650	6367683
09/08/2017	BioBanking Plot 12	3	280	394631	6367771
10/08/2017	BioBanking Plot 13	3	328	394569	6367951
10/08/2017	BioBanking Plot 14	3	238	394450	6367718
10/08/2017	BioBanking Plot 15	3	80	394565	6367720
10/08/2017	BioBanking Plot 16	3	41	394440	6367645
10/08/2017	BioBanking Plot 17	3	198	394033	6367247
10/08/2017	BioBanking Plot 18	3	223	394060	6367144
10/08/2017	BioBanking Plot 19	3	42	394330	6367560
10/08/2017	BioBanking Plot 20	3	192	394175	6367483
11/08/2017	BioBanking Plot 21	3	242	394138	6367767
11/08/2017	BioBanking Plot 22	3	118	394262	6367723
11/08/2017	BioBanking Plot 23	3	230	394184	6367568

3.4.2 Targeted Threatened Flora Surveys

Targeted seasonal flora surveys were primarily conducted for three flora species. A summary of the survey effort is provided in Table 3-3. All other threatened flora species were also targeted during these and other survey methodologies across the entire study area.

Targeted surveys were conducted from the 14th - 15th September 2017 for *Diuris arenaria, and Diuris praecox*. Reference sites for *Diuris praecox* in Merewether and *Diuris arenaria* in Bobs Farm were visited on several occasions to ensure that these species were flowering before the surveys commenced. *Diuris praecox* was observed flowering well at Merewether on the 4th September 2017 and *Diuris arenaria* were observed flowering well on 8th September 2017 at Bobs Farm.

Targeted surveys were also undertaken on the 27th – 28th February 2018 for *Cryptostylis hunteriana*.

Figure 3-3 shows the random meander surveys used to target *Diuris arenaria,* and *Diuris praecox*. Figure 3-4 shows the random meander surveys for *Cryptostylis hunteriana*.

Random meander surveys were undertaken in accordance with the NSW Guide to Surveying Threatened Plants (OEH, 2016) and the LHCCREMS Flora and Fauna Survey Guidelines.

Table 3-3 Targeted threatened flora species survey effort

Flora Species	Common Name	BC Act	EPBC Act	Flowering Period	Surveyed during flowering period	Habitat surveyed	Survey Effort
Diuris arenaria	Sand Doubletail	E	-	August - September	Yes 13th to 15th September 2017	Grassland, scrub and woodland Entire Project area	18 hours
Diuris praecox	Rough Doubletail	V	V	July – September	Yes 13th to 15th September 2017	Grassland, scrub and woodland Entire Project area	18 hours
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	November - February	Yes 27th to 28th February 2018	Grassland, scrub and woodland Entire Project area	18 hours

Author:	S. Wilkin
Reviewer:	T. Lambert
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N

0 50 100 200 300 Metres

Map Projection: MGA Zone 56

Figure 3-3

Targeted *Diuris arenaria* and *Diuris praecox* Surveys

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0 50 100 200 300 Metres

Map Projection: MGA Zone 56

Figure 3-4

Targeted *Cryptostylis hunteriana* Surveys

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3.5 Fauna

3.5.1 Fauna Survey Effort Summary

Fauna survey locations are provided in Figure 3-5. A summary of the fauna survey effort is provided in Table 3-4.

Table 3-4 Fauna Survey Effort

Dates	Survey Type	Survey effort
August 8th – 11th 2017 September 13th – 15th 2017 February 27th – 28th 2018 April 30th – May 4th 2018	Opportunistic surveys throughout study area (e.g. identification of owl pellets, Koala scratches)	14 days
April 30th – May 3rd 2018	Diurnal Bird census targeting threatened species – one bird survey conducted each day at dawn/dusk	Four (30 minute) surveys per stratification unit 6 person hours
30th April to 2nd May 2018	Elliott B arboreal Trapping: 4 trap lines, 20 set for 3 nights	60 Elliott B arboreal trap nights
30th April to 2nd May 2018	Elliott B terrestrial Trapping 4 trap lines 20 set for 3 nights	60 Elliott B terrestrial trap nights
30th April to 2nd May 2018	Elliott A terrestrial Trapping 4 trap lines 50 set for 3 nights	150 Elliott A trap nights
30th April to 2nd May 2018	Cage traps – 4 cages set for 3 nights	12 cage trap nights
30th April to 2nd May 2018	Spotlighting throughout study area	8 person hours
30th April to 2nd May 2018	Call playback for Koala, Bush-stone Curlew, Powerful Owl, Masked Owl and Barking Owl.	2 person hours
30th April to 2nd May 2018	Mobile Anabat Surveys	27 person hours
30th April – 4th May 2018	Stationary Anabat surveys	60 hours
30th April – 3rd May 2018	Hollow-bearing Tree survey	Two days
30th April – 10th May 2018	Stationary Camera Surveys	Ten days
30th April – 3rd May 2018	Diurnal reptile and amphibian surveys including searches of fallen timber. leaf litter and rocks. Note general lack of aquatic habitats within the study area.	Opportunistic habitat searches with other surveys

3.5.2 Weather Conditions

Table 3-5 provides a summary of the weather conditions encountered during the field surveys. A range of weather conditions occurred within the survey periods. Low minimum temperatures were recorded throughout the majority of the survey period.

Table 3-5 Weather Conditions

Date	Temperate (C^o)	Cloud Cover	Rain (mm)	Wind Km/hr
08/08/2017	9.9 to 19.2 C^0	0/8 cloud	No Rain	WNW 38km/hr
09/08/2017	7.5 to 19.6 C^0	0/8 cloud	No Rain	S 19km/hr
10/08/2017	3.7 to 24.8 C^0	0/8 cloud	No Rain	NW 31km/hr
11/08/2017	5.9 to 28.2 C^0	0/8 cloud	No Rain	WNW 39km/hr
14/09/2017	10.3 to 18.2 C^0	5/8 cloud	9.6 mm	W 41km/hr
15/09/2017	8 to 23.1 C^0	0/8 cloud	0.2 mm	NW 33 km/hr
27/02/2018	16.9 to 25.0 C^0	5/8 cloud	10.8 mm	SSE 22km/hr
28/02/2018	12 to 33.2 C^0	0/8 cloud	No rain	NNW 11 km/hr
30/04/2018	11.6 to 18.2 C^0	8/8 cloud	24.8 mm	E 6km/hr
01/05/2018	12.1 to 21.9 C^0	0/8 cloud	6.6 mm	ESE 13km/hr
02/05/2018	10.6 to 22.7 C^0	8/8 Cloud	No Rain	ENE 11km/hr
03/05/2018	10.9 to 26.0 C^0	0/8 Cloud	No Rain	N 11km/hr
04/05/2018	16.4 to 27.4 C^0	0/8 Cloud	No Rain	NNW 15km/hr
10/05/2018	10.3 to 25.5 C^0	0/8 Cloud	No Rain	NW 24km/hr

* Records from BOM web site for the Williamtown weather station

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Reviewer:	T. Lambert
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N

0 50 100 200 300 Metres

Map Projection: MGA Zone 56

Figure 3-5

Fauna Survey Effort

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3.5.3 Fauna Habitat Assessment

To assess the fauna habitat, present within the study area, habitat data was collected to determine the range of fauna that may utilise the area for roosting, breeding and/or foraging. Throughout the study area habitat searches involved opportunistic searches plus twenty-three (23) habitat searches located at each BioBanking plot location. At each of the fauna survey sites the following habitat attributes were recorded:

- Presence of burrows, whitewash, owl pellets and nests/drays;
- Floristic structure of the canopy, mid stratum and ground layer;
- Depth and composition of leaf litter;
- Presence of rocks and rock shelves;
- Presence of fallen timber; and
- Aquatic habitat such as depressions.

3.5.4 Mammal Surveys

Mammal survey methods included a combination of trapping, camera trapping, opportunistic and nocturnal spotlighting and call playback surveys. Trapping surveys consisted of Elliott type A and B terrestrial traps, Elliott type B arboreal traps and terrestrial cage traps. Four trapping transects were set throughout the study area, with a particular focus on the highest quality habitat most likely to be impacted by the project. The location of the trapping transects are shown in Figure 3-5. Trapping transects were approximately 100m in length with approximately 10m between each terrestrial trap, though were variable to suit the area of habitat available. Elliott type A and B terrestrial traps were spread evenly along the transect separated by approximately 10m. Cage traps were generally placed at the beginning of each transect. Elliott type B arboreal traps were located within the Open Forest habitat and were separated by approximately 10 m. Table 3-6 is a summary of the number of traps placed within each trap line.

Table 3-6 Mammal Trapping Survey Effort

Trap line and stratification unit	Elliot A traps - terrestrial	Elliot B Traps - arboreal	Elliot B Traps – terrestrial	Cage Traps
Trap Line A (Heath)	15	-	10	1
Trap Line B (Forest)	15	10	3	1
Trap Line C (Heath)	10	-	4	1
Trap Line D (Forest)	10	10	3	1
Total	50	20	20	4

Elliott type A terrestrial traps were used to target small size terrestrial mammals, including the New Holland Mouse. Where affixed to tree trunks, the Elliott B traps targeted the Squirrel Glider and other common arboreal mammals. Where placed on the ground, the Elliott B traps targeted threatened terrestrial mammals, Brush-tailed Phascogale, Long-nosed Potoroo and other common terrestrial mammals. Cage traps were used to target medium size terrestrial mammals such as the Spotted-tailed Quoll.

Two (2) motion-activated wildlife cameras (Camera Traps; Maginon Vision models) were also deployed throughout the study area targeting primarily terrestrial and arboreal mammals. They were directed at a perforated PVC bait chamber filled with a sponge soaked in molasses, fish oil, vanilla and almond essence and truffle oil, with sardines and honey, oat and honey balls added separately. The area around each bait station was also sprayed with a similar attractant mixture. Captured photos were then reviewed later in the office to identify recorded fauna species.

Koalas were targeted via habitat assessment, targeted surveys for scratches and scats, nocturnal spotlighting and call playback. Spot Assessment Technique (SAT) surveys were not considered to be required as no Koala scats were observed, no preferred koala feed trees occurred within the study area and few records of Koala exist in the immediate vicinity of the site.

3.5.5 Nocturnal Surveys

Nocturnal birds were targeted using call playback and spotlighting. Call playback targeted Koala, Powerful Owl, Barking Owl, Masked Owl and Bush-stone Curlew. Call playback was in accordance with standard methods (Debus 1995, Kavanagh & Debus 1994). At each location after the call was played a 10 to 15-minute listening period was undertaken followed by a spotlight search for the targeted species. The location of the call playback locations is shown in Figure 3-5.

Spotlighting was undertaken throughout the study area and was conducted over two (2) nights for approximately 2 hours per night. Spotlighting of the study area was conducted by a combination of vehicle and walking throughout the study area. LED head lamps and spotlights were used for these surveys. Spotlighting was used to identify nocturnal species such as arboreal and ground-dwelling mammals, targeting threatened species including the Squirrel Glider and Grey-headed Flying Fox.

3.5.6 Microchiropteran Bat Surveys

Microchiropteran bat surveys consisted of stationary surveys using ultrasonic Anabat detectors (Anabat Express - Titley Electronics, Ballina). Stationary Anabat recorders were placed at four (4) sites throughout the study area (see Figure 3-5) in locations of potential habitat to increase the potential of detection. These included within and at the edge of forested vegetation/flyways and cleared land.

Mobile bat surveys were conducted during the spotlighting transects. Two Anabats were used during call playback surveys and walking spotlighting surveys over the three nocturnal survey nights.

Analysis of Anabat echolocation calls were completed by Amanda Lo Cascio. The call identification for the data was based on the call keys and descriptions for New South Wales (Pennay et al 2004) with reference to descriptions published for southern Queensland (Reinhold et al 2001).

The reliability of call identification was categorised as:

- Definite – one or more calls were there was no doubt on the identification of the species;
- Probable – most likely to be the species named, low probability of confusion with species that use similar calls; and
- Possible – call is comparable with the named species, with a moderate to high probability of confusion with species of similar calls.

3.5.7 Diurnal Bird Surveys

A total of twelve (12) morning and/or afternoon diurnal bird surveys were undertaken, in mid-autumn. The location of the bird survey points is shown in Figure 3-5.

These consisted of area searches for 20 minutes each. Birds were identified either by call and/or observation. All birds observed and heard were recorded. Opportunistic observations and identification of calls were recorded during all other field surveys throughout the study area.

3.5.8 Herpetofauna Active Searches

Herpetofauna searches were conducted during habitat assessments at BioBanking plot locations, and opportunistically throughout the study area. These included searches in habitat such as overturning rocks, fallen timber, racking debris, peeling bark or other structures man made that provide habitat such as carpet and corrugated iron. Opportunistic observations of any frogs and/or reptiles were also recorded throughout the field surveys. Frogs were identified either by observation and/or calls. Habitat for frogs was considered to be generally poor due to the absence of creeks, dams, ponds or other aquatic habitat within the study area.

3.5.9 Hollow-bearing Tree Survey

A comprehensive hollow bearing tree survey was conducted throughout the study area. The initial focus area was inclusive of the proposed development area and approximately 100m beyond its boundary extent. The survey was then expanded to the remainder of the study area.

All hollow-bearing trees were recorded. For each tree the following attributes were recorded:

- Location recorded on GPS;
- Tree tagged and id number recorded;
- Tree species;
- Location of the hollow as follows:
    - Broken trunk;
    - Branch;
    - Trunk;
    - Spilt; and
    - Peel back.
- Hollow size and number:
    - Small hollow <10 cm;
    - Medium hollow 10 to 20 cm;
    - Large hollow 20-30 cm; and
    - Extra-large hollows >30cm.
- Diameter at breast height in cm;
- Percentage of tree dead;
- Height in metres;
- Presence of any scratches;
- Presence of any sap feeding scars; and
- Presence of any nests.

3.6 Survey limitations

Field surveys are conducted over a relatively small period of time, and not all species can always be detected. These include mobile fauna species, migratory birds and fauna that utilise the resources on a seasonal basis. Flora species that are difficult to detect include cryptic, annuals and species present in the seed bank. Therefore, the results in this report are a result of the time when the field surveys were completed.

The field surveys were generally undertaken at certain points across all seasons, which maximised the likelihood of detection of maximum numbers of species, particularly threatened species. The surveys were conducted during the flowering periods for the threatened flora species that have habitat within the study area. All other threatened flora species are easily detected outside of the flowering period on vegetative features alone.

4 EXISTING ENVIRONMENT

4.1 Landscape Context

The study area is situated approximately 8km northeast of the Hunter River. The study area was previously a sand mine and the vegetation within the middle section is largely replanted vegetation (with variable success) as part of the conditions of the previous mine closure.

The ridges along the boundary of the study area on the south and north generally contains intact native vegetation not directly impacted by mining activities. The project area is roughly bordered by the Stockton Bight Track to the north and west, Worimi State Conservation Area to the south and Stockton Beach sand dunes directly to the east.

The study area occurs within the following landscape context:

- Port Stephens Council LGA;
- Northern Sydney Basin Bioregion;
- Karuah Catchment within the Hunter-Central Rivers Catchment Management Authority;
- North Coast Botanical sub region;
- Sydney – Newcastle Barriers and Beaches Mitchell Landscape;
- Boyces Track and Hawkes Nest soil landscapes – consist of Holocene transgressive aeolian dunes and Holocene quartz sandsheets and beach ridges; and
- Port Stephens LGA Priority Control Area (Priority Weeds – *Biosecurity Act 2015*).

4.2 Vegetation Communities

4.2.1 Regional Mapping

The Lower Hunter and Central Coast Regional Environmental Management Strategy (LHCCREMS; House 2003) mapped one native vegetation community within the study area, being Coastal Sand Apple - Blackbutt Forest. This vegetation community was mapped as occurring around the periphery of the study area, refer to Figure 4-1 below. The remainder of the study area was not mapped as supporting any native vegetation (presumably due to the known sand mining-affected areas).

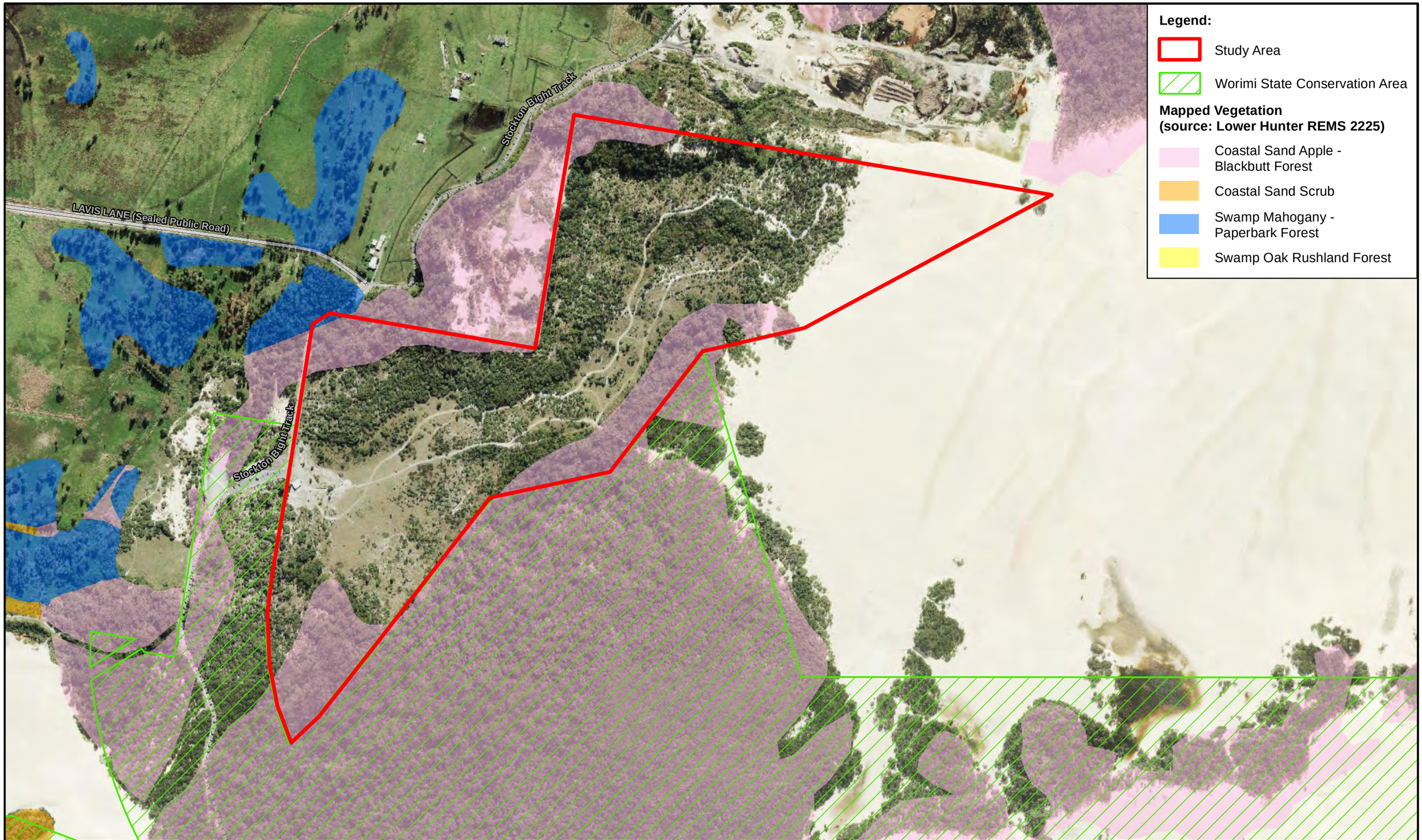
The Greater Hunter Vegetation Mapping (OEH 2012) mapped the majority of the study area as either not containing native vegetation or Derived Grasslands of the Greater Hunter Mapping area (presumably due to the known sand mining-affected areas). The central parts of the study area (where the subject site is located) are mapped as the Derived Grasslands of the Greater Hunter Mapping area. This vegetation type is described as:

"Treeless areas (crown cover less than about 5%) from which native tree and shrub species have been removed. It is distinguished from grasslands known to have occurred in the region prior to European settlement.

This vegetation type may be dominated by a large variety of species depending on season, most recent rain and most recent management. This type may comprise almost wholly native species or may support varying proportions of exotic species; the distinction between the native and nonnative form of this type are often difficult to distinguish, even in the field."

The peripheries of the study area are mapped as containing remnant Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (PCT 1646).

Refer to Figure 4-2 for the Greater Hunter Vegetation Mapping within the study area and surrounds.



Author:	S. Wilkin
Reviewer:	T. Lambert
A3 Scale:	1:6,000
Job Ref:	11245

Figure 4-1

Regional LHCCREMS Mapping

WLALC Eco-tourism | Williamtown, NSW, Australia

21 August 2018

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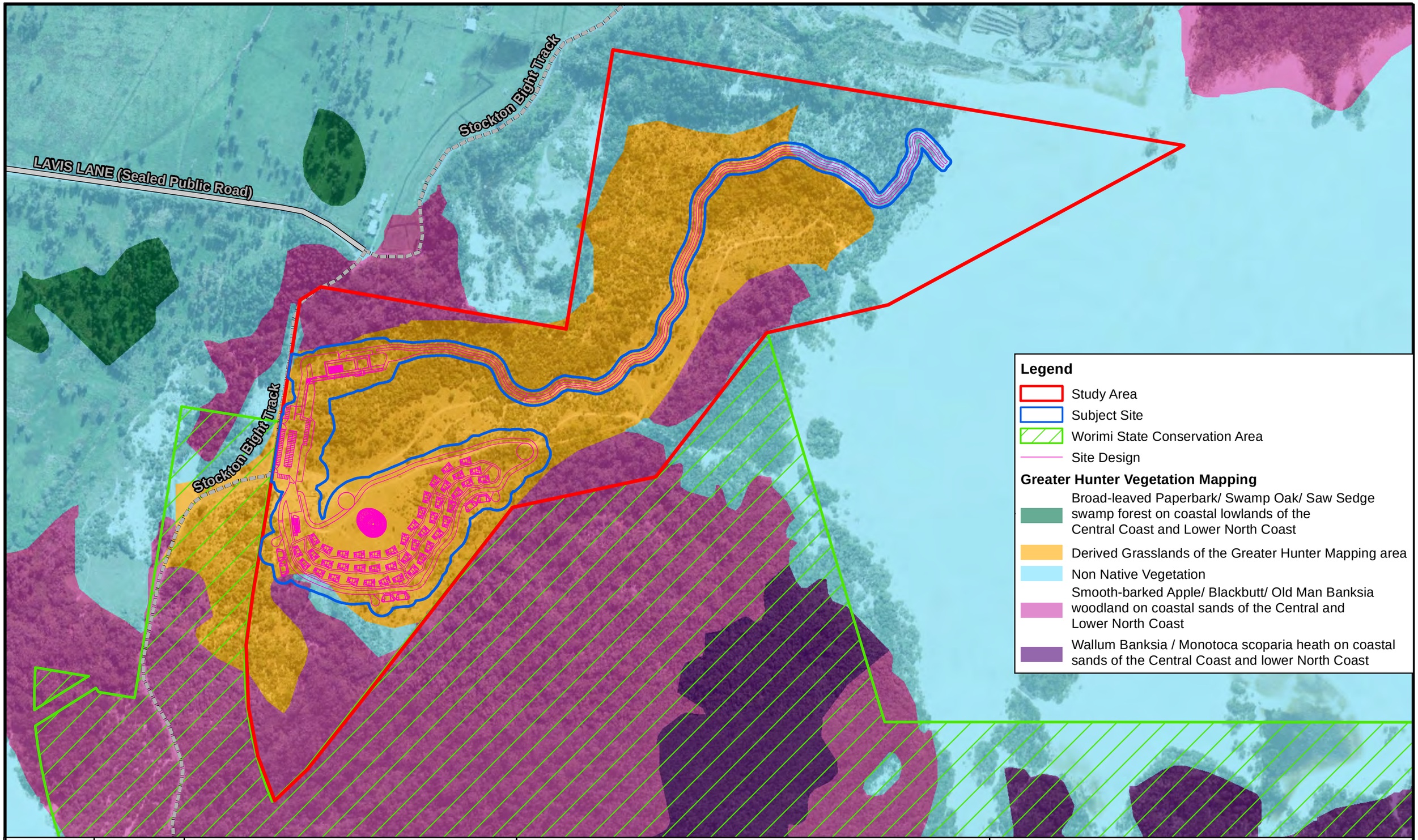

Author:	S. Wilkin
Reviewer:	T. Lambert
A3 Scale:	1:5,000
Job Ref:	11245

N

0 50 100 200 300 Metres

Map Projection: MGA Zone 56

Figure 4-2

Greater Hunter Vegetation Mapping

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28 August 2018

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4.3 Study Area Vegetation

Two native Plant Community Types (PCTs) were recorded within the project area. Two non-native vegetation types of Exotic Grassland with Scattered Trees and Bitou Bush Scrubland have also been mapped within the study area, as well as a large open area of Beach Sand (with no vegetation) in the eastern corner of the study area. Refer to Figure 4-3 for the location of the mapping units.

The field verified communities have been named in accordance with the VIS Classification database (2015). A summary of each of the vegetation communities is provided in the section below.

None of the PCTs mapped within the study area are commensurate with threatened ecological communities listed on the EPBC Act or the BC Act.

Table 4-1 Summary of each of the vegetation types

Vegetation type	Vegetation Zone	BioBanking Condition	Area (ha)	No of BioBanking plots required by BBAM	BioBanking Plots Completed
Coast Tea Tree – Old Man Banksia coastal shrubland on foredunes of the Central and Lower North Coast (PCT 1644; HU858)	Zone 1	moderate to good - high	13.01	3	8
Coast Tea Tree – Old Man Banksia coastal shrubland on foredunes of the Central and Lower North Coast (PCT 1644; HU858)	Zone 2	moderate to good - moderate	6.68	3	5
Smooth-barked Apple - Blackbutt -Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (PCT 1646; HU860)	Zone 3	moderate to moderate - high	11.76	3	6
Exotic Grassland with Scattered Shrubs	N/A	N/A	8.54	-	4
Bitou Bush Shrubland	N/A	N/A	0.38	-	-
Beach Sand	N/A	N/A	5.62	-	-

LAVIS LANE (Sealed Public Road)

Stockton Bight Track

Stockton Bight Track

BB1
BB2
BB3
BB4
BB5
BB6
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BB12
BB13
BB14
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BB19
BB20
BB21
BB22
BB23

Legend

- Study Area
- Subject Site
- Worimi State Conservation Area
- BioBanking Plot

Vegetation Communitites

PCT 1644 (HU858) Coast Tea Tree - Old Man Banksia coastal shrubland on foredunes of the Central and Lower North Coast

- Moderate to Good - high quality - Zone 1
- Moderate to Good - moderate quality - Zone 2

PCT 1646 (HU860) Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast

- Moderate to Good - high quality - Zone 3

Other

- Beach Sand
- Bitou Bush Scrubland
- Exotic Grassland with Scattered Shrubs

Author:	S. Wilkin
Reviewer:	T. Lambert
A3 Scale:	1:5,000
Job Ref:	11245

N

0 50 100 200 300 Metres

Map Projection: MGA Zone 56

Figure 4-3

Plant Community Types and BioBanking Plots

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4.3.1 Coast Tea Tree – Old Man Banksia coastal shrubland on foredunes of the Central and Lower North Coast - PCT 1644

Summary: Closed Shrubland dominated by *Leptospermum laevigatum* (Coastal Tea Tree), *Monotoca elliptica* (Tree Broom Heath) and *Banksia serrata* (Old Man Banksia) in the upper stratum with a moderate to sparse understorey and a sparse groundlayer. Emergent *Eucalyptus pilularis* (Blackbutt) occurred sparsely throughout this PCT. This PCT occurred in two conditions as detailed below.

A majority of this PCT appeared to be composed of revegetation from plantings or natural regeneration following ceasing of mining activities.

This PCT is not consistent with any endangered ecological community listed under the BC Act and/or EPBC Act.

Area within Study Area: 19.69ha (13.01ha high, 6.68ha moderate).

Vegetation Formation: Dry Sclerophyll Forest (Shrubby sub-formation).
Vegetation Class: Coastal Dune Dry Sclerophyll Forests.

Emergent height: ranged from 8 to 10m with percent foliage cover of 0-5%
Canopy height ranged from 4m to 8m with percent foliage cover of 12-100%.
Mid stratum height ranged from 1m to 3m with percent foliage cover of 0-40%.
Groundcover height ranged from 0.1 to 1.2m with percent foliage cover of 0-30%.

Dominant species were:

- ***Emergent*****:** *Eucalyptus pilularis,*
- ***Canopy:*** *Leptospermum laevigatum, Monotoca elliptica* and *Banksia serrata*
- ***Mid stratum:*** *Acacia longifolia subsp. sophorae, Pultenaea retusa, Bossiaea rhombifolia, Pimelea linifolia and Dillwynia retorta;*
- ***Groundcover:*** *Pomax umbellata, Carpobrotus glaucescens, Themeda triandra, Lomandra longifolia and Dianella caerulea var. producta,*

Vegetation Zones and Condition

This PCT occurs in two conditions and has been allocated into the moderate to good (high) and moderate to good (moderate) conditions.

Vegetation Zone 1

This vegetation zone has been classified into moderate to good - high condition as these plots recorded generally higher benchmark levels and have a more representative structure of PCT 1644 (Table 4-2). The BioBanking plots generally met or were above benchmark values for this PCT. Four of the benchmark attributes were below the benchmark and this is likely due to the majority of the community being composed of revegetation from plantings and natural regeneration. All of this condition had low exotic species diversity. Refer to Plates 4-1 and 4-2.

Table 4-2 Comparison of Coast Tea Tree - Old Man Banksia shrubland against PCT 1644 benchmarks within the Study Area - Zone 1

Benchmark Attribute	Benchmark	Plot 2	Plot 3	Plot 8	Plot 13	Plot 14	Plot 16	Plot 17	Plot 22
Plant Species Diversity	35	16	15	22	16	17	18	15	21
Native Over Storey % Cover	15-55	37	46.5	27.5	43.5	35	38.5	41.5	55
Native Mid Story % Cover	8-50	2*	2.5	2.6	1.5*	0.5*	3	1.5*	6.5
Native Ground Grasses	1-10	12	4	22	2	4	0	4	6
Native Ground Shrubs	5-40	32	30	34	20	22	36	36	24
Native Ground Other	0-90	14	28	4	24	30	6	6	22
Exotic Species %	N/A	6	4	0	10	4	10	0	4
Number of Trees with Hollows	0.2	0*	0*	0*	0*	0*	0*	0*	0*
Over Storey Regeneration	N/A	1	1	1	1	1	1	1	1
Length of Fallen Timber	30	10*	0*	0*	3*	5*	2*	0*	40

Note red number is below benchmark.
Red asterisk is below 25% of benchmark

Plate 4-1 Coast Tea Tree - Old Man Banksia shrubland (Moderate to good – high condition)

Plate 4-2 Coast Tea Tree – Old Man Banksia Shrubland (moderate to good – high condition)

Vegetation Zone 2

This vegetation zone has been classified into moderate to good - moderate condition as all of the BioBanking plots had low native species diversity and high exotic percentage cover (Table 4-3). The native over storey cover contained a low percentage cover which is not representative of the closed shrubland structure of this PCT. Refer to Plate 4-3.

Table 4-3 Comparison of Coast Tea Tree - Old Man Banksia shrubland against PCT 1644 benchmarks within the Study Area - Zone 2

Benchmark Attribute	Benchmark	Plot 1	Plot 6	Plot 7	Plot 9	Plot 19
Plant Species Diversity	35	5*	5*	8*	9*	10*
Native Over Storey % Cover	15-55	27	5*	0.5*	12	44
Native Mid Story % Cover	8-50	5	0*	0*	2.6	3
Native Ground Grasses	1-10	10	0*	2	0*	6
Native Ground Shrubs	5-40	14	0*	8	2	40
Native Ground Other	0-90	0	6	0	20	4
Exotic Species %	N/A	30	60	46	20	18
Number of Trees with Hollows	0.2	0*	0*	0*	0*	0*
Over Storey Regeneration	N/A	1	1	1	1	1
Length of Fallen Timber	30	5*	0*	0*	15	2*

Note red number is below benchmark.
Red asterisk is below 25% of benchmark

Plate 4-3 Coast Tea Tree - Old Man Banksia Shrubland (moderate to good - moderate condition)

4.3.2 Smooth-barked Apple - Blackbutt -Old Man Banksia woodland on coastal sands of the Central and Lower North Coast – PCT 1646

Summary: Remnant Open Forest dominated by *Eucalyptus pilularis* (Blackbutt) and *Angophora costata* (Smooth-barked Apple) and *Banksia serrata* (Old Man Banksia) in the upper stratum with a moderate shrublayer and a moderate to dense ground cover dominated native herbs and grasses.

This PCT is not consistent with any endangered ecological community listed under the BC Act and/or EPBC Act.

Area within Study Area: 11.76ha

Vegetation Formation: Dry Sclerophyll Forest (Shrubby sub-formation).
Vegetation Class: Coastal Dune Dry Sclerophyll Forests.

Canopy height ranged from 14 to 24 m with percent foliage cover of 15-40%.
Mid stratum height ranged from 3 to 10 m with percent foliage cover of 0-10%.
Groundcover height ranged from 0 to 1.5m with percent foliage cover of 14-85%.

Dominant species were:

- ***Canopy:*** *Eucalyptus pilularis, Angophora costata* and *Banksia serrata;*
- ***Mid stratum:*** *Acacia longifolia subsp. sophorae, Persoonia lanceolata, Chrysanthemoides monilifera, Persoonia levis, Pimelea linifolia* and *Dillwynia retorta*; and
- ***Groundcover:*** *Pomax umbellata, Pteridium esculentum, Gonocarpus teucrioides, Themeda triandra, Lomandra longifolia* and *Dianella caerulea var. producta.*

Vegetation Zones and Condition

This PCT occurs in one condition and has been allocated into the moderate to good (high) condition.

Vegetation Zone 3

This vegetation zone has been classified into moderate to good high condition as these plots recorded generally higher benchmark levels and have a representative structure of PCT 1646 (Table 4-4). The BioBanking plots generally met or were above benchmark values for this PCT. Species diversity of this PCT was below benchmark this is likely to be caused by areas of understorey dominated by *Chrysanthemoides monilifera* (Bitou Bush), with a portion of this PCT in the south east of the study area also dominated by an understorey of *Pteridium esculentum* (Bracken Fern) from previous fire events. Refer to Plate 4-4.

Table 4-4 Comparison of Smooth-barked Apple – Blackbutt – Old Man Banksia Woodland against benchmarks for PCT 1646 in the study area – Zone 3

Benchmark Attribute	Benchmark	Plot 4	Plot 5	Plot 10	Plot 11	Plot 18	Plot 21
Plant Species Diversity	32	19	16	16	15	19	24
Native Over Storey % Cover	30-56	36.5	43.5	24	41	47	21
Native Mid Story % Cover	5-50	16	9.5	14.5	5	26	13.5
Native Ground Grasses	2-10	0	8	8	0	6	14
Native Ground Shrubs	2-10	18	16	2	10	4	16
Native Ground Other	10-50	6	14	56	70	64	20
Exotic Species %	N/A	8	6	12	28	20	24
Number of Trees with Hollows	1.2	0	0	2	6	5	6
Over Storey Regeneration	1	1	1	1	1	1	1
Length of Fallen Timber	7	0	2	44	55	30	10

Plate 4-4 Smooth-barked Apple – Blackbutt – Old Man Banksia Woodland (Moderate to good – high condition)

4.3.3 Exotic Grassland with scattered shrubs

Summary: Cleared with scattered native shrubs but dominated by a ground cover of exotic herbs and grasses.

This vegetation community is not consistent with any endangered ecological community listed under the BC Act and/or EPBC Act.

Area within Study Area: 12.14 ha

Approximate height of scattered shrubs ranged from 1m to 5m with percent foliage cover 0-10%.
Groundcover height ranged from 0.1 to 1m with percent foliage cover of 60-100%.

Dominant species were:

- ***Canopy:*** Occasional *Leptospermum laevigatum, Monotoca elliptica* and *Persoonia lanceolata*;
- ***Mid stratum:*** Occasional *Acacia longifolia subsp. sophorae, Pimelea linifolia and Dillwynia retorta*; and

- ***Groundcover:*** *Eragrostis curvula*, Sporobolus africanus*, Carpobrotus glaucescens, Lomandra longifolia, Melinis repens*, Hypochaeris radicata*, Senecio madagascariensis* and Plantago lanceolata*.*

Plate 4-5: Exotic Grassland with scattered shrubs

4.3.4 Bitou Scrubland

Bitou scrubland consists of dense areas of *Chrysanthemoides monilifera** with a height of 1-2m and percentage foliage cover of 100%. It occurs in three patches in the north of the study area. This community does not form part of any native vegetation community. The area of this vegetation is 0.38ha within the study area. Refer to Plate 4-6.

4.3.5 Beach Sand

Dune sand within the Stockton sand dunes. This community does not form part of any native vegetation community and is entirely sand with vegetation being virtually absent. This area occupies 5.62ha within the study area. Refer to Plate 4-7.

Plate 4-6 Bitou Bush Scrubland

Plate 4-7 Beach Sand

4.4 Flora Species Recorded

Seventy-five (75) flora species were recorded in the study area (Appendix 2) from 26 families. The most common families were Poaceae (grasses) and Asteraceae. Nineteen (19) species were exotic.

No threatened flora species were recorded within the study area.

Of the 19 exotic flora species recorded within the study area, 3 are listed as priority weeds on the BSA Act for the Port Stephens LGA and 3 are listed as Weeds of National Significance (WONS).

Table 4-5 Listed Weeds Recorded

Species	NSW BS Act for Port Stephens LGA	Weed of National Significance (WONS) (Yes/-)
Chrysanthemoides monilifera subsp. rotundata (Bitou Bush)	Prohibition on dealings Biosecurity Zone	Yes
Lantana camara (Lantana)	Prohibition on dealings	Yes
Senecio madagascariensis (Fireweed)	Prohibition on dealings	Yes

Department of Primary Industries specifies the following restrictions for priority Weeds as follows:

- **Prohibition on dealings**: must not be imported into the state or sold.
- **Biosecurity Zone**: Must be eradicated where practical, or as much of the weed destroyed as practical and any remaining suppressed. The local control authority must be notified of any new infestations of this weed within the biosecurity zone.

4.5 Fauna Species Recorded

Fifty-one (51) species of fauna were recorded within the study area (Appendix 3). Refer to Appendix 8 for bat call analysis results. Fauna recorded included 29 birds, 9 mammals, 1 amphibian and 4 reptiles. Of the 51 fauna species recorded, 2 are exotic species. Of the 2 exotic species recorded, the European Rabbit is listed as an invasive species under the EPBC Act.

Four (4) species of threatened fauna were recorded during the field surveys. These were:

- Powerful Owl;
- White-bellied Sea Eagle;
- Little Bent-wing Bat; and
- Grey-headed Flying Fox.

A further five threatened species of microbats, Yellow-bellied Sheathtail Bat, Eastern Freetail-bat, Eastern False Pipistrelle and Southern Myotis were recorded as probable or possible within a species composite (Appendix 8). Habitat for these threatened bats has been recorded within the study area and significant impact assessments have been conducted as a precaution.

The observations in relation to these recorded threated species are summarised below. Refer to Figure 5-1 in Section 5 for the locations of the recorded threatened fauna.

4.5.1 Powerful Owl

The Powerful Owl was observed on 1st May 2018 during playback surveys in the south of the study area and calling on the 2nd May 2018 from the same location. Prey species were recorded within the study area which provide foraging habitat for this species. Twenty (20) hollow-bearing trees with hollow greater than 30 cm were recorded within the study area (Appendix 4). No nesting pairs were directly observed within any of these hollows. Large tracts of suitable mature open forest habitat also occurs within the adjoining Worimi State Conservation Area.

4.5.2 Little Bent-wing Bat

Little Bentwing-bat was recorded (to a 'definite' level of identification) during the stationary Anabat surveys. The heath and open forest habitats provide foraging habitat as well as adjacent cleared areas adjoining these habitats.

88 hollow-bearing trees recorded throughout the study area may provide roosting habitat for this species. All the hollow-bearing trees will be retained as part of this project. No other potential roosting habitats, such as caves, tunnels, abandoned mines, stormwater drains, culverts or bridges were observed within the study area.

4.5.3 Grey-headed Flying Fox

This species was recorded flying over and heard in the north west of the study area. Foraging habitat occurs within the open forest parts of the study area. This species has a large home range and it is unlikely to rely upon resources within the study area alone. No Grey-headed Flying Fox camps (or evidence of these) were recorded within the study area.

4.5.4 White-bellied Sea Eagle

The White-bellied Sea Eagle was recorded flying over in the south of the study area. This species was also recorded roosting at night in a Blackbutt tree near a nest in the south of the study (Plate 4-8, Figure 5-1). No mature or young birds were observed within the nest nor were there was any white wash or discarded prey species such as fish skeletons, indicating that this nest has not been used recently. However the nest could potentially be re-used for nesting and it must be assumed that the nest is likely to be reused for nesting of this species, unless there is evidence to the contrary. Foraging habitat occurs in the swamps around Tilligerry Creek, cleared pasture lands and the Pacific Ocean within close proximity to the study area.

Plate 4-8 White-bellied Sea Eagle Nest

4.5.5 Migratory Species

One migratory species, the White-bellied Sea Eagle, was recorded within the study area and is discussed above.

4.6 Fauna Habitat Assessment

Three (3) broad fauna habitat types were identified within the study area and these include the following:

- Open Forest;
- Heath; and
- Grassland.

4.6.1 Open Forest

The open forest is commensurate with the Smooth-barked Apple - Blackbutt -Old Man Banksia woodland PCT. Connectivity occurs in the east and south of the study to Worimi State Conservation Area, providing movement corridors for arboreal mammals, birds and ground dwelling fauna, such as reptiles, small terrestrial mammals, and macropods. The habitat has high quality floristic and structural diversity providing fauna resources for a diverse range of fauna species.

Canopy resources include blossom and nectar resources from the Smooth-barked Apple, Blackbutt trees and Old Man Banksia trees. *Allocasuarina* trees are present within the upper mid stratum which provides habitat for the Glossy Black-cockatoo. The canopy provides foraging and sheltering habitat for arboreal mammals, nectivorous birds and microbats. The Old Man Banksia trees provide nectar, blossom and seed resources for birds, bats and arboreal mammals.

The understorey contains a moderate to dense shrub layer which provides foraging habitat for arboreal mammals such as the threatened Squirrel Glider, birds and bats. The groundlayer contains flowering shrubs, ferns, grasses and herbs which provides foraging habitat for ground dwelling fauna, including the threatened Long-nosed Potoroo and the New Holland Mouse, reptiles and amphibians. A moderate to dense cover of dry leaf litter (30-50%) and fallen logs (<5%) providing protective and foraging habitat for ground dwelling fauna. Some areas of this habitat were covered by dense layers of Bitou Bush limiting the availably fauna resources within the understorey. However, this area provides sheltering habitat for small birds.

Threatened fauna species recorded within the open forest include the Powerful Owl, White-bellied Sea Eagle, Little Bent-wing Bat.

88 hollow-bearing trees were recorded in this habitat type, which provide abundant roosting and breeding habitat for birds, bats and arboreal mammals.

4.6.2 Heath

This habitat has a variable (sparse to dense) canopy layer of *Leptospermum laevigatum* (Coastal Tea-tree), *Monotoca elliptica* (Tree Broom Heath) and *Banksia serrata* (Old Man Banksia) with the occasional emergent *Eucalyptus pilularis* (Blackbutt) trees. Much of this habitat type is a result of active revegetation or natural regeneration following sand mining.

The heath provides limited fauna resources within the canopy, mainly restricted to blossom, nectar and seeds from the Old Man Banksia trees. The shrublayer was sparse, with *Acacia longifolia* subsp. *sophorae* being dominant species providing seed and blossom habitat. This habitat provides potential sheltering, breeding and foraging habitat for ground dwelling mammals, small birds and reptiles. The majority of the ground cover is dominated by a large cover of dry leaf litter (>60%) and fallen timber. Gaps in the heath occur throughout and are dominated by exotic grasses, providing seed resources for ground dwelling fauna and basking habitat for reptiles.

A small infestation of *Lantana camara* was recorded in the eastern section of the habitat, which provides limited habitat for fauna species, however sheltering and foraging habitat is available for small passerine birds.

4.6.3 Grassland

This habitat consisted of the Exotic Grassland with Scattered Shrubs vegetation community. It generally provides lower quality habitats for common species, or sub-optimal edge habitat for threatened species, such as microchiropteran bats, that are predominantly reliant on the remnant native forested areas. The grassland areas provide foraging habitat for birds, foraging habitat for birds of prey such as the White-bellied Sea Eagle, macropods and reptiles. The grassland habitat lacks a diversity of microhabitat and structural components, having been mostly previously mined, therefore it provides limited habitat for fauna species.

4.7 Hollow-bearing Trees

A total of 88 hollow bearing trees were recorded in the study area and all of these hollow-bearing trees will be retained as part of the project. A diversity of sizes was recorded, 3 very small, 62 small, 74 medium, 37 large and 23 extra-large (refer to Appendix 4 for details). These hollows provide potential breeding and roosting habitat for a variety of fauna including arboreal mammals, birds and microchiropteran bats. A Boobook Owl was recorded emerging from HBT2 in the south of the study area. A large stick nest likely to be a White-bellied Sea Eagle nest was recorded in HBT 4 in the south of the study area. The Powerful Owl was recorded in the south of the study area and the large hollows within the study area provide potential nesting and breeding habitat for this species. Refer to Figure 4-4 for the locations of the hollow-bearing trees within the study area.

LAVIS LANE (Sealed Public Road)

Stockton Bight Track

HB1 HB2 HB3 HB4 HB5 HB6 HB7 HB8 HB9 HB10 HB11 HB12 HB13 HB14 HB15 HB16 HB17 HB18 HB19 HB20 HB21 HB22 HB23 HB24 HB25 HB26 HB27 HB28 HB29 HB30 HB31 HB32 HB33 HB34 HB35 HB36 HB37 HB38 HB39 HB40 HB41 HB42 HB43 HB44 HB45 HB46 HB47 HB48 HB49 HB50 HB51 HB52 HB53 HB54 HB55 HB56 HB57 HB58 HB59 HB60 HB61 HB62 HB63 HB64 HB65 HB66 HB67 HB68 HB69 HB70 HB71 HB72 HB73 HB74 HB75 HB76 HB77 HB78 HB79 HB80 HB81 HB82 HB83 HB84 HB85 HB86 HB87 HB88

Legend

- Study Area
- Subject Site
- APZ
- Worimi State Conservation Area
- Hollow-bearing Tree to be Retained
- Site Design

Author:	S. Wilkin
Reviewer:	T. Lambert
A3 Scale:	1:5,000
Job Ref:	11245

N

0 50 100 200 300 Metres

Map Projection: MGA Zone 56

Figure 4-4

Hollow-bearing Tree Locations

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5 THREATENED BIODIVERSITY

Figure 5-1 shows the locations of recorded threatened species and connectivity.

5.1 Threatened Flora

No threatened flora species listed on the BC Act or the EPBC Act were recorded within the study area.

5.1.1 EPBC Act Listed Flora Species

The EPBC Act protected matters database identified 16 threatened flora species known and or to have potential to occur within a 10km radius of the study area. Of these 6 threatened flora species listed under the EPBC Act have been assessed as having potential habitat within the study area (Appendix 5) but were not recorded.

5.1.2 BC Act Listed Flora Species

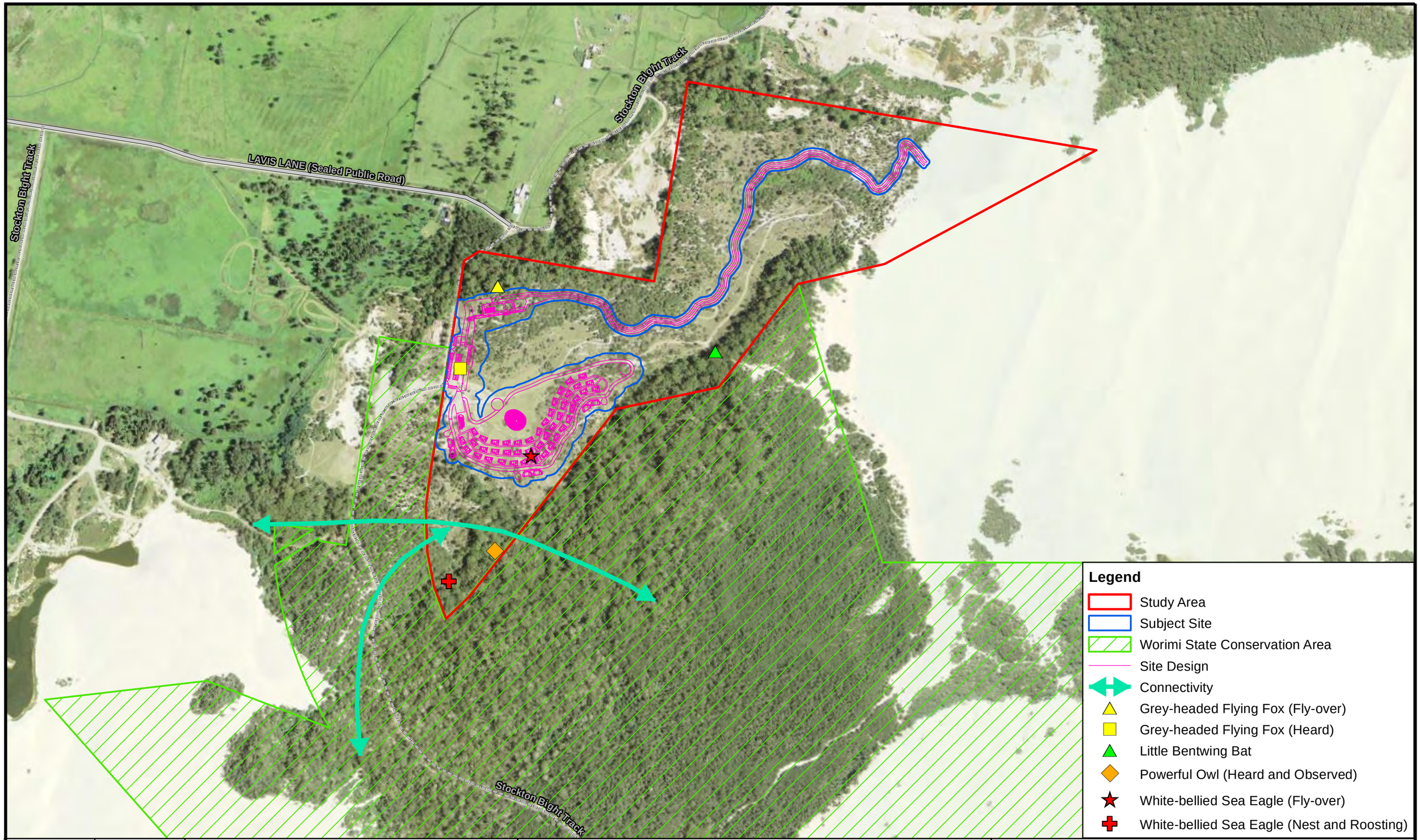
BioNet Atlas of NSW recorded 9 threatened flora species within a 10km radius of the study area. Of these 5 threatened flora species listed under the BC Act have been assessed as having potential habitat within the study area (Appendix 5) but were not recorded.

5.1.3 Targeted Threatened Flora Surveys

The study area is considered to provide potential habitat for three (3) threatened orchid species. These species include:

- *Diuris arenaria* Sand Doubletail
- *Diuris praecox* Rough Doubletail
- *Cryptostylis hunteriana* Leafless Tongue-orchid

Targeted orchid surveys were undertaken throughout the study area in September 2017 and February 2018. Despite these targeted surveys, no threatened orchid species were recorded and no other threatened flora species were recorded.



Author:	S. Wilkin
Reviewer:	T. Lambert
A3 Scale:	1:7,000
Job Ref:	11245

Map Projection: MGA Zone 56

Figure 5-1

Threatened Fauna Species and Connectivity

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5.2 Threatened Fauna

5.2.1 EPBC Act Listed Fauna species

The EPBC Act protected matters search recorded sixteen (16) threatened fauna species with potential habitat within a 10km radius of the study area, consisting of seven (7) birds, two (2) frogs and seven (7) mammals.

The Grey-headed Flying Fox, listed as Vulnerable on the EPBC Act, was recorded within the study area.

Eight threatened fauna species listed on the EPBC Act were assessed as having potential habitat within the study (Appendix 5) including six mammals and three birds. Apart from the Grey-headed Flying Fox no other EPBC-listed threatened fauna was recorded. The migratory species White-bellied Sea-Eagle was also recorded, and is threatened in NSW.

5.2.2 BC Act listed Fauna Species

As a result of database searches and habitat assessment, twenty-two (22) threatened fauna species listed under the BC Act are considered to have the potential to occur within the study area. Of these, four (4) species were recorded.

The four (4) species of threatened fauna recorded during the field surveys included:

- Powerful Owl;
- White-bellied Sea Eagle
- Little Bent-wing Bat; and
- Grey-headed Flying Fox.

A further five threatened species of microbats, Yellow-bellied Sheathtail Bat, Eastern Freetail-bat, Eastern False Pipistrelle and Southern Myotis were recorded as probable or possible within a species composite (Appendix 8). Habitat for these threatened bats has been recorded within the study area and significant impact assessments have been conducted as a precaution.

5.2.3 Migratory Species

The EPBC Act protected matters database search identified eleven (11) migratory species with the potential to occur within the study area (Appendix 5). Marine species and migratory marine species have been excluded for this assessment.

One migratory species, being the White-bellied Sea Eagle, was recorded within the study area.

A further two have potential habitat within the study area:

- *Apus pacificus* Fork-tailed Swift
- *Hirundapus caudacutus* White-throated Needletail

Under the EPBC Act listed migratory species have areas of important habitat. The EPBC Act Significant impact guidelines for Matters of National Significance (2013) defines important habitat for migratory species as:

- Habitat utilised by migratory species occasionally or periodically within a region that supports ecological significant proportion of the species; and /or
- Habitat that is of critical importance to the species at particular life-cycle stages; and/or
- Habitat utilised by a migratory species which is at the limit of the species range; and/or
- Habitat in an area where the species is declining.

Both of the above migratory species forage aerially for insects therefore would likely to fly over the study area. Therefore, the habitat within the study area is unlikely to be classified as important habitat under the EPBC Act significant assessment guidelines (2013) for these species.

Two threatened species, being the Swift Parrot and the Regent Honeyeater, are also listed as migratory. These species have limited potential foraging habitat within the study area. Significant impact assessments for these species have been conducted in Appendix 7.

5.3 Endangered Populations

One (1) endangered threatened fauna population, being *Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area*, was recorded on the BioNet database atlas as occurring within the Port Stephens Local Government area. This species was not recorded during the field surveys. Endangered populations are no longer listed on the BC Act, however as this project is being assessed under the TSC Act a significance assessment for this population has been undertaken in Appendix 7 as a precautionary measure.

5.4 Threatened Ecological Communities

A total of twenty-four (24) threatened ecological communities (TECs) listed under BC Act and/or EPBC Act have either been recorded, are known or are predicted to occur within the locality (Appendix 6).

No threatened ecological communities listed under the BC Act and/or the EPBC Act were recorded within the study area. The vegetation within the study area is either disturbed by previous sand mining or is very common throughout the locality on private and within conservation lands.

5.5 Koala Assessment

5.5.1 Overview

Three Koala policies have been reviewed to assess the Koala as part of this EA, these include the following:

- Port Stephens Council Comprehensive Koala Plan of Management (CKPoM);
- NSW Recovery plan for Koala; and
- EPBC Act Referral Guidelines for the Koala.

No Koala feed trees were identified within the study area that are listed in any of the above documents were recorded within the study area.

Two records of the Koala occur within the study area and these are greater than 10 years old.

The records of Koala that occur within the vicinity within the Worimi State Conservation Area are also greater than ten years old.

A large number of recent records occur to the north of the study area at Williamtown and near Grahamstown Dam. Port Stephens LGA has a large Koala population and the BioNet database records for the locality around the study area are shown in Figure 5-2 for context.

No Koalas were observed during the extensive field surveys. Detailed surveys including searches for scats and pock marks were conducted throughout the entire study area, however no evidence of Koala was observed. Whilst no feed trees are present the study area does provide connectivity from east to west for Koala movements. Figure 5-1 shows the connectivity through the south of the study which could facilitate Koala movements.

Author:	S. Wilkin
Reviewer:	T. Lambert
A3 Scale:	1:50,000
Job Ref:	11245

N

0 0.75 1.5 3 Km

Map Projection: GDA 1994 MGA Zone 56

Figure 5-2

Koala Database Search

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21 August 2018

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5.5.2 Port Stephens Council Comprehensive Koala Plan of Management (CKPoM)

The CKPoM maps the study area as being within the Fullerton Cove/Stockton Bight management unit. Much of the central previously sand-mined areas are not mapped as koala habitat in any form.

The peripheral parts of the study area have been mapped in the CKPoM as Supplementary Koala habitat with a small area in the north west of the study area as a mixture of 50 m buffer over mainly cleared land and preferred Koala habitat. No Koala feed trees were present within the study area.

Koalas generally are considered likely to occur in low densities throughout the locality, including the adjoining Worimi State Conservation Area that has been mapped as supplementary Koala habitat. The study area has connectivity from north to south which would facilitate movements between areas of habitat for the Koala. This area will not be impacted upon by the project and good connectivity will remain post construction (Figure 5-3).

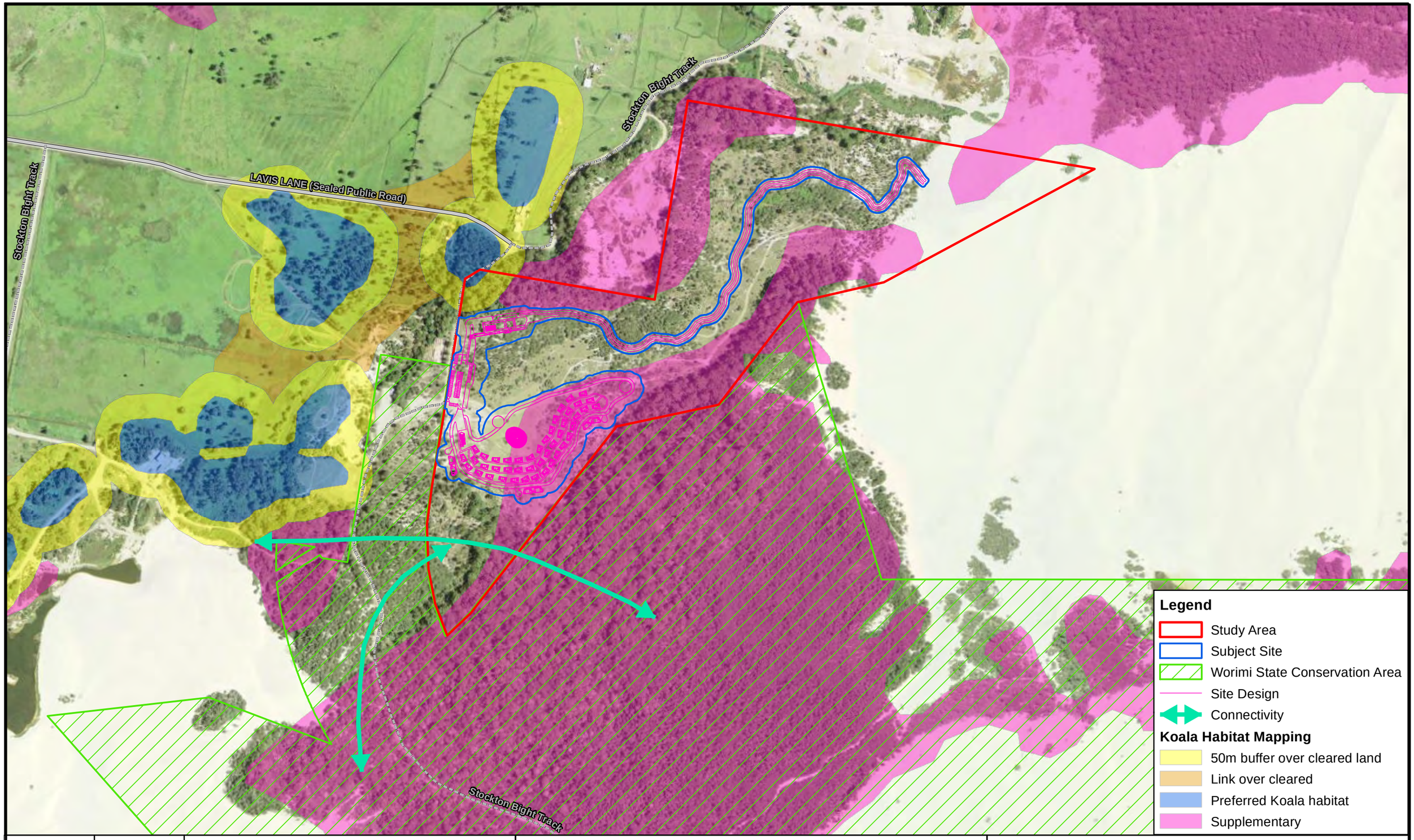
An assessment under the CKPoM has been undertaken in Appendix 9. This assessment concluded that consent for the project should be not be withheld on Koala habitat grounds.

5.5.3 NSW Recovery Plan for the Koala

The NSW Recovery plan for Koala identifies seven management areas (KMAs), each of these management areas lists primary, secondary and supplementary food trees for each KMA (Department of Environment and Climate Change, 2008). The study area is located in the North Coast KMA and no Koala feed trees listed for the North Coast KMA occur within the Study Area.

5.5.4 Federal Koala Assessment

A small number of Koala records occur within the Worimi State Conservation Area and two have been recorded within the study area which are over 10 years old. A large population occurs to the north at Williamtown, and the study area is part of large area of Koala habitat. Therefore, an assessment under the EPBC Act referral guidelines for the Vulnerable Koala (Department of the Environment, 2014) has been undertaken. As outlined in the Koala referral guidelines impact areas that score 5 or less are not critical to the survival to the Koala. The study area score was 3 (Table 5-1) and therefore the study area is not critical to the survival of the Koala. Furthermore, no feed trees were identified within the study area and in accordance with the flowchart on page 30 of the referral guidelines for the Koala a referral is not required.



Author:	S. Wilkin
Reviewer:	T. Lambert
A3 Scale:	1:7,000
Job Ref:	11245

Map Projection: MGA Zone 56

Figure 5-3

CKPoM Koala Habitat Mapping

WLALC Eco-tourism | Williamtown, NSW, Australia

21 August 2018

EPS
ENVIRONMENTAL PROPERTY SERVICES

Table 5-1 EPBC Act Koala habitat assessment tool

Attribute Score	Score	Inland	Coastal	Score
Koala Occurrence	+2 (high)	Evidence of one or more koalas within last 5 years	Evidence of one or more koalas within the last 2 years	No
	+1 (medium)	Evidence of one or more koalas within2 km of the edge of the impact area within the last 10 years.	Evidence of one or more koalas within 2 km of the edge of the impact area within the last 5 years.	No
	0 (low)	None of the above	None of the above	0 last record was from 2004
Vegetation Composition	+2 (high)	Has forest, woodland or shrubland with emerging trees with 2 or more known koala food tree species **OR** 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	Has forest or woodland with 2 or more known koala food tree species, **OR** 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	No
	+1 (medium)	Has forest, woodland or shrubland with emerging trees with 1 species of known koala feed tree.	Has forest or woodland with only 1 species of known koala food tree present.	No
	0 (low)	None of the above	None of the above	0 no Koala feed trees present
Habitat connectivity	+2 (high)	Area is part of a contiguous landscape ≥ 1000 ha	Area is part of a contiguous landscape ≥ 500 ha.	2 yes part of 600 ha connectivity
	+1 (medium)	Area is part of a contiguous landscape < 1000 ha, but ≥ 500 ha	Area is part of a contiguous landscape < 500 ha, but ≥ 300 ha.	No
	0 (low)	None of the above	None of the above	2

Attribute Score	Score	Inland	Coastal	Score
Key Existing threats	+2 (high)	Little or no evidence of koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence. **OR** Areas which score 0 for koala occurrence and have no dog or vehicle threat present		No
	+1 (medium)	Evidence of infrequent or irregular koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence, **OR** Areas which score 0 for koala occurrence and are likely to have some degree dog or vehicle threat present.		1 Dog tracks were observed, Quad Bikes are proposed to be part of the development
	0 (low)	Evidence of frequent or regular koala mortality from vehicle strike or dog attack in the study area at present, **OR** Areas which score 0 for koala occurrence and have a significant dog or vehicle threat present.		No
Recovery Value	+2 (high)	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.		No
	+1 (medium)	Uncertain whether the habitat is important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.		No
	0 (low)	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.		0 habitat is unlikely to be important for achieving interim recovery objectives
Total Score				**3**

While the site might be of limited importance for the Koala in terms of connectivity it is not considered to be of any particular significance due to its previous mining history, lack of records, lack of preferred feed trees and lack of evidence during the surveys of a regular occurrence within the study area. Good connectivity will continue to exist post-development.

5.6 Coastal Management SEPP (2018)

In accordance with the *Coastal Management Act 2016* SEPP 14 Coastal Wetlands, SEPP 26 Littoral Rainforest and SEPP 71 Coastal Protection have been merged into Coastal Management SEPP. A spatial database search has been development by the Department of Planning.

A search of the Department of Planning's Coastal Management database did not map any littoral rainforests, coastal wetlands or coastal protection areas within the study area (Appendix 1). Matters relevant to the Coastal Management SEPP are considered further in the SoEE by EPS (2018).

5.7 Groundwater Dependent Ecosystems

Groundwater Dependent Ecosystems (GDEs) are ecosystem that are wholly dependent or partially dependent on groundwater for their water requirements (Hatton & Evans, 1998). The NSW State Groundwater Dependent Ecosystem Policy has outlined five principles to manage impacts to groundwater dependent ecosystems (GDEs) (Department of Land and Water Conservation 2002). These principles have been developed to protect and manage GDEs. These policies include avoidance of threats, management of groundwater extraction to ensure the health of the GDE is maintained, maintenance of water quality, adoption of the precautionary principle to protect GDEs and management of developments, land use activities should aim to maintain natural patterns of GDE water flow, not polluting or causing changes in water quality and rehabilitating of degraded GDEs systems where practical.

The search of the Bureau of Meteorology Atlas of Groundwater Dependant Ecosystems mapped moderate and high potential terrestrial GDEs within and/or adjoining the study area (Appendix 1). Both the PCTs, being Coast Tea Tree – Old Man Banksia Coastal Shrubland on foredunes and Smooth – barked Apple – Blackbutt – Old Man Banksia Woodland on Coastal Sands are classified as groundwater dependent. These two PCTs have been classified as Subsurface phreatic aquifer ecosystems on unconsolidated sand beds.

No groundwater drawdown is proposed as part of the project. The project is unlikely to impact substantially upon groundwater levels.

5.8 Other Ecological Values and Matters of National Significance

5.8.1 World Heritage

No world heritage properties or places were identified by the EPBC Act protected matters search.

5.8.2 Ramsar Wetland

The Ramsar listed Hunter Estuary Wetlands occurs approximately 5km southwest of the study area. This site acts as both a feeding and roosting site for a large seasonal population of shorebirds and migratory birds. In excess of 250 species of birds have been recorded within the Ramsar site. In addition, the Ramsar site provides habitat for the nationally threatened Green and Golden Bell Frog, Red Goshawk and Australasian Bittern. The project is unlikely to impact upon the Hunter Estuary Wetlands due the distance from the study area.

No other MNES are relevant to this project.

6 PROJECT IMPACTS

The project has the potential to impact biodiversity during both the construction and operational phases.

It should be noted that the design of the project makes use of the previously mined areas, which has significantly reduced the level of overall impact to biodiversity. The project is also generally sympathetically designed to sit lightly within the site and is an eco-tourist project that will contribute positively to community education and understanding of the biodiversity values of the area. A major positive outcome is that of the 88 hollow-bearing trees recorded within the study area, none will be required to be removed. The WLALC Green Team will also continue to implement native vegetation restoration throughout the study area post-development.

Nevertheless there are unavoidable potential impacts likely to result from the project during particularly the construction phase including:

- Vegetation and habitat loss;
- Habitat fragmentation, edge and barrier effects;
- Fauna injury and mortality;
- Increase in spread of weeds;
- Noise, vibration and light; and
- Impact on key threatening processes.

6.1 Construction Phase

6.1.1 Vegetation Impacts

Maximum vegetation loss resulting from the project is predicted to amount to approximately 5.57 ha of native vegetation and 3.98 ha of non-native vegetation.

Correspondingly, retention of mapped native vegetation within the study area will total approximately 25.88 ha, not including areas of native vegetation likely to be increased by WLALC Green Team restoration activities.

Refer to Table 6.1 for a breakdown of vegetation impacts.

Table 6-1 Vegetation Impacts

Plant Community Type	Zone condition	BC Act	EPBC Act	Area of removal (ha)	Area of retention (ha)
Coast Tea Tree – Old Man Banksia coastal shrubland on foredunes of the Central and Lower North Coast – PCT 1644	Zone 1 Moderate to Good high condition	Not Listed	Not Listed	2.41	10.60
Coast Tea Tree – Old Man Banksia coastal shrubland on foredunes of the Central and Lower North Coast – PCT 1644	Zone 2 Moderate to Good moderate condition	Not Listed	Not Listed	2.45	4.23
Smooth-barked Apple – Blackbutt – Old Man Banksia Woodland on coastal sands of the Central and Lower North Coast – PCT 1643	Zone 3 Moderate to Good high condition	Not Listed	Not Listed	0.71	11.05
Grassland with Scattered Shrubs		-	-	3.97	4.57
Bitou Shrubland		-	-	0.01	0.37
Total Native Vegetation				**5.57**	**25.88**
Total All Vegetation				**9.55**	**30.82**

6.1.2 Fauna Habitat Loss

Fauna habitat loss within the study area is predicted to amount to 9.55 ha and fauna habitat retention is predicted to be 30.82 ha. Table 6-2 outlines the total fauna habitat loss within the study area.

Table 6-2 Fauna Habitat Impacts

Fauna Habitat	Corresponding PCT	Proposed Area of removal (ha)	Proposed Area of retention (ha)
Open Forest	Smooth-barked Apple – Blackbutt – Old Man Banksia Woodland on coastal sands of the Central and Lower North Coast	0.71	11.05
Heath	Coast Tea Tree – Old Man Banksia coastal shrubland on foredunes of the Central and Lower North Coast Bitou Shrubland	4.87	15.20
Grassland	Exotic Grassland with Scattered Shrubs	3.97	4.57
Total		**9.55**	**30.82**

6.1.3 Hollow-bearing Trees

Eighty-eight (88) hollow-bearing trees, with 199 hollows were recorded within the study area. All of the hollow-bearing trees are to be retained as part of the project as a result of sympathetic project design (Figure 4-4). Hollow-bearing trees provide important roosting and breeding habitat for a range of birds and mammals. Proposed mitigation measures are outlined in Section 7.

6.1.4 Threatened Fauna Species

Four threatened fauna species were recorded within the study area, being the Powerful Owl, White-bellied Sea Eagle, Grey-headed Flying Fox and the Little Bent-wing Bat. Impacts to the threatened fauna species recorded are described below.

Powerful Owl

The study area provides foraging habitat for Powerful Owl throughout the open forest and grassland areas. Denser areas of canopy vegetation, within the Smooth-barked Apple - Blackbutt - Old Man Banksia woodland provides suitable roosting habitat for this species. No evidence of foraging and roosting, such as fur and bones were observed within the study area.

Twenty (20) hollow-bearing trees with large hollows (30cm+) were recorded within the study area (Appendix 4). No nesting pairs were recorded within any of these hollows. None of these hollow-bearing trees will be removed as part of the project.

Prey species such as gliders, possums and small terrestrial mammals were recorded through the study area. The project is unlikely to have a significant impact upon the Powerful Owl (Appendix 7), as potential breeding trees and roosting habitat will be retained, and minimal foraging habitat will be impacted upon. Furthermore, due to the large foraging range of this species the subject site is unlikely to be critical or core habitat for this species. Worimi State Conservation Area also provides extensive adjoining habitat for this species.

Little Bent-wing Bat

Little Bentwing-bat was recorded (to a 'definite' level of identification) at one Anabat survey location. It is considered that all of the naturally vegetated parts of the study area, as well as adjacent cleared areas provide suitable foraging habitat for this species.

A small area of habitat will be impacted upon by the project. 88 hollow-bearing trees recorded throughout the study area that may provide roosting habitat for this species. No hollow-bearing trees will be removed as part of the project. No other potential roosting or breeding habitat, such as caves, tunnels, abandoned mines, stormwater drains, culverts or bridges were observed within the study area.

The Little Bent-wing Bat has a wide foraging range the study area is unlikely to be core or critical foraging and/or breeding habitat for this species. Therefore, the impact upon this species is unlikely to be significant (Appendix 7). Worimi State Conservation Area also provides extensive adjoining habitat for this species.

White-bellied Sea Eagle

The White-bellied Sea Eagle has an estimated territory of between 92 and 220 km^2. Foraging habitat is mainly in coastal seas, rivers, fresh and saline lakes, lagoons, reservoirs and grasslands. This species nests in large trees in open forests close to foraging habitat. Prey species consist of fish, birds and reptiles.

The White-bellied Sea Eagle was recorded flying over in the southern portion of the study area. It was also recorded roosting in a Blackbutt tree with nest in the south of the study (Plate 4-8, Figure 5-1). Foraging habitat occurs in the grassland areas of the study area, swamps around Tilligerry Creek, cleared pasture lands and the Pacific Ocean within close proximity to the Study Area.

The project is unlikely to have a significant impact upon this species (Appendix 7), as the nest will be retained and lower value foraging habitat for this species occurs within the study area. Furthermore, due to the large foraging range of this species the study area is unlikely to be core or critical foraging habitat for this species. Worimi State Conservation Area also provides extensive adjoining habitat for this species.

Grey-headed Flying Fox

Grey-headed Flying Fox was recorded in two locations in the west of the study area, it was both heard and observed flying over the study area. No roosting camps were recorded within the study area. This species has a wide range for foraging and the study area is unlikely to be a core or critical foraging habitat. Furthermore, the large areas of high quality native vegetation within the adjoining Worimi State Conservation Area, Worimi National Park and Tilligerry State Conservation Area provides a large area of foraging habitat for this species. Therefore, habitat for this species within the study area is not considered to be a core or critical foraging habitat for the Grey-headed Flying Fox.

6.1.5 Habitat Fragmentation

Habitat fragmentation can result in a barrier for fauna and flora to the function of ecosystems and species life cycles. Types of fauna impacted include mammals, both ground dwelling and arboreal and sedentary fauna. Reduction in connectivity can impact upon access to resources, predator avoidance and breeding capacity (Roads and Maritime Services, 2011a).

Barriers to plant lifecycles include barrier to pollinator vectors such as arboreal mammals, insects and sedentary birds. These barriers can genetically isolate populations of both common and threatened plant species.

The study area was previously a sand mine and the native vegetation is currently fragmented. Unformed tracks transect the study area from north to south with a mixture of shrubland and exotic grassland adjoining the tracks. Native vegetation occurs on the boundary of the study area with eastern boundary connecting to the Worimi State Conservation Area. An area of open forest is surrounded by the reserve on all sides in the south of the study area providing connectivity through the study area. Connectivity through this area will not be impacted by the project (Figure 5-1) retaining movement corridors for mobile fauna species. The vegetation that will be removed as part of the project is largely cleared areas and impact upon edges of vegetation that is already cleared. The project will involve the removal of 9.55 ha of native and non-vegetation within the south western portion of the study area. An existing access track traversing the study area from west to east will be widened to provide access to Stockton Beach. The widening of this access track is unlikely to fragment connectivity further as the impacts to native vegetation will be minor and the track will still essentially be a beach track.

6.1.6 Edge and Barrier Effects

The objective of the project is to provide ecological and aboriginal culture information and tours of the study area. Therefore, most of the construction footprint has been placed in the exotic grassland and scattered shrubs community to maximise the retention of native vegetation. However, the proposed works has the potential to introduce new edge effects from the construction of roads, camping zones and associated infrastructure. Currently exotic grasses impinge on the edges of the native vegetation.

On average a buffer of 20-25 m has been be implemented from the Worimi State Conservation Area boundary to ensure any indirect impacts from the project during construction and post constructions will not impact upon the Worimi State Conservation Area. Some points of the project are closer than this and some points are further away. The closet point to the Worimi State Conservation Area is in the area of the proposed car park, which is where the existing carpark occurs. Edge effects are unlikely to increase substantially as a result of the project.

Currently the exotic grassland areas of the study area are a potential barrier for the movement for terrestrial ground dwelling and arboreal fauna between areas of open forest and heath habitats. Mobile species such as birds and bats are unlikely to be impacted by the current potential barrier occurring within the study area. The construction of the caretakers building in the north west of the study area will create a minor barrier to ground dwelling fauna. However, this impact likely to be minor. As minimal native vegetation removal is likely to occur the project is unlikely to create a barrier to fauna more than is already occurring.

Pollinator and seed dispersal vectors for flora species are likely to include birds, mammals, insects and micro bats. The project is unlikely to create a barrier for flora species pollinators than already is occurring.

6.1.7 Injury and Mortality

Increase in fauna injury and mortality may occur, through collision with construction machinery and light vehicles during construction works and future development. Mobile species such as birds can avoid collision through moving out of the path of any vehicles during construction. However, species that roost in hollows and are nocturnal are likely to have difficulty in avoiding direct impact and moving out of the construction footprint. These species are most likely to sustain injury or mortality as a result of construction works.

All of the threatened fauna species recorded within the study were bats, birds and arboreal mammals. Therefore, the potential for injury or mortality to fauna is likely to be comparatively minor. No hollow-bearing trees will be removed as a result of the project.

Increased vehicle movement during construction works will have the potential to increase the mortality and injury to fauna within the study area.

Mitigation measures outlined in Section 7 will limit the effect of the project on such fauna species. Impact assessments for related threatened species have been undertaken in Appendix 7 to assess the impacts to threatened species.

6.1.8 Weeds

Nineteen (19) species of weed were recorded within the study area. Of these three (3) being, *Lantana camara, Chrysanthemoides monilifera and Senecio madagascariensis* are listed as priority weeds under the BC Act and are also listed as weeds of national significance (see Section 4.4). Other invasive weeds that were recorded include, *Eragrostis curvula* (African Lovegrass), *Cenchrus clandestinum* (Kikuyu) and *Melinis repens* (Red Natal Grass).

Currently there are high level densities of *Eragrostis curvula* (African Lovegrass), and *Melinis repens* (Red Natal Grass) within the grassland areas of the study area. The majority of the eco-tourist facility will be constructed within the grassland areas. This will result in large areas of grassland removal which will decrease the amount of these invasive weeds. However, during construction the project has the potential to spread weeds through the movements of heavy machinery and light vehicles.

Invasion of native plant communities by exotic perennial grass is a key threatening process under the BC Act. Exotic perennial grasses are listed as part of this KTP. The project has the potential to further spread weeds throughout the study area and exacerbate this KTP.

If the mitigation measures outlined in Section 7 are followed, then the impact of the project is unlikely to increase the spread of weeds recorded in the study area.

6.1.9 Noise impacts

Sound is important for fauna for communication, navigation, foraging and detecting prey species or danger. Changes in noise through a number of human induced noises, such as vehicle traffic, can affect fauna species ability to function (Forman et al, 2000). Adaption by animals to noise in their natural environment such as wind or other animals can cause them to change their behavior to function within their environment (Eve, 1991).

The study area is under the flight path for the Williamtown Airport, in which RAAF fighter planes and passenger planes fly over daily. The increase in noise levels during construction will be temporary and impact will be minimal.

The current fauna populations present within the study area have a high exposure human-induced noise. Whilst construction and recreational activities will add incrementally to the noise levels the fauna species are unlikely to be substantially affected by this increase in noise.

6.1.10 Impacts on Key Threatening Processes

Forty (40) KTPs are currently listed on the BC Act and/or the EPBC Act. Of these the following have been assessed as having the potential to being increased by the project:

- **Anthropogenic Climate Change** – minor incremental contribution to greenhouse gas;
- **Clearing of Native Vegetation** – The project will contribute to an incremental loss in native vegetation. Impact assessments for removal of vegetation and assessment of the need for biodiversity offsets is required;
- **Infection of Frogs by amphibian chytrid causing the disease chytridiomycosis** – The project has the potential to spread this disease through the transportation of machinery;
- **Infection of native plants by *Phytophthora cinnamomi* -** No evidence of Phytophthora was recorded on any plant species, however the project may facilitate the transmission of this disease through machinery transportation;
- **Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on the family Myrtaceae –** No evidence of myrtle rust was recorded on any Myrtaceaous species, however the project may facilitate the transmission of this disease through machinery transportation;
- **Invasion, establishment and spread of *Lantana camara*** – The project facilitates the spread of *Lantana camara* through vehicle traffic during construction and post construction and may exacerbate this KTP;

- **Invasion of native plant communities by exotic perennial grasses** – The project may facilitate the spread of invasive exotic perennial grasses through vehicle traffic during construction and post construction and may exacerbate this KTP;
- **Invasion of native plant communities by *Chrysanthemoides monilifera* –** The project may facilitate the spread of *Chrysanthemoides monilifera* through vehicle traffic during and post construction may exacerbate this KTP; and
- **Removal of dead wood and trees** – fallen timber and dead trees were recorded throughout the study area. The project is likely to remove these during the construction works.

6.2 Operation Phase

Generally, the post-construction activities will be low-impact and sensitive eco-tourist type activities such as quad bike tours (on controlled and defined tracks), educational tours and accommodation. Maintenance of the APZ will also be required.

Post construction vehicle movement within the study area will be limited to controlled quad bike riding lead by trained guides. All visitor vehicles will park in the proposed car parking area in the western end of the study area. Currently quad bike riding occurs within the study area and any increase in vehicle movement post-construction is likely to have a minor increase in impact upon fauna than that is already occurring within the study area.

7 MITIGATION MEASURES

The project has been sensitively designed to be located within the previously mined parts of the study area and in general avoids the better-quality areas of habitat. Construction impacts are likely to be relatively minor as the majority of the project is located in previously disturbed environments. Similarly, the operation phase of the project will consist of low-impact eco-tourist activities and controlled quad biking.

Mitigation measures to further reduce the residual impacts to the biodiversity values of the study area are outlined in Table 7-1 below.

Table 7-1 Mitigation Measures

Impact	Mitigation Measure	Responsibility	Timing
General	A Flora and Fauna Management Plan (FFMP) will be prepared and implemented as part of the Construction Environmental Management Plan. The FFMP should incorporate the design, construction and operational environmental management measures proposed. This should include (but not limited to) issues relating to location of threatened biodiversity, vegetation clearing procedures, wildlife connectivity, weed and pathogen control. Site personnel should be informed on procedures relating to the location of sensitive biodiversity issues.	WLALC	Pre-Construction
Vegetation Clearing	Limit disturbance of vegetation to the minimum necessary to construct works. Implement clearing protocols, including: • The boundaries of vegetation removal are to be clearly defined as 'no go zones' clearly signposted and delineated to prevent unauthorised clearing and vehicular and/or foot traffic. • Marking trees to be removed and preparing an inventory of trees to be removed. • Pre-clearance surveys to be completed by an appropriately qualified ecologist. • Relocate bushrock and fallen timber within areas of vegetation clearing into retained vegetation. • Stockpiles should be placed in cleared areas outside of the no-go zones	Construction contractor Ecologist	Pre-construction and construction

Impact	Mitigation Measure	Responsibility	Timing
Spread of priority weeds and pathogens	Implementation of a weed management control protocol. All equipment, vehicles and machinery wheels and tracks of excavators and other tracked machinery should be cleaned so that they are completely free of soil, seeds and plant material before entering the site to prevent the introduction of further exotic plant species and pathogens. All topsoil containing weeds, particularly African Lovegrass should be disposed of offsite.	Construction Contractor	Construction

Implementation of the above approaches will ensure that environmental impacts of the project are appropriately managed and controlled.

8 SIGNIFICANCE ASSESSMENTS SUMMARY

A summary of the impact assessments conducted for EPBC Act and BC Act threatened flora and fauna is provided in Table 8-1 and Table 8-2. The detailed impact assessments are provided in Appendix 7. No significant impacts were considered likely to occur upon any threatened biodiversity listed under the EPBC Act and/or the BC Act as a result of the project.

An assessment of migratory species recorded or those which have potential habitat within the study area is provided in Section 5.2.3.

No Commonwealth MNES are considered likely to be significantly impacted by the project.

A referral to the Commonwealth is not required as no significant impact was determined for any threatened biodiversity or other MNES listed under the EPBC Act.

Table 8-1 Threatened Fauna Species Significance Impact Assessments

Scientific Name	Common Name	BC Act	EPBC Act	Recorded (Y/N)	Significant impact likely?
Birds					
Anthochaera phrygia	Regent Honeyeater	CE	CE M	No	No
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-	No	No
Glossopsitta pusilla	Little Lorikeet	V	-	No	No
Lathamus discolor	Swift Parrot	E	CE M	No	No
Ninox strenua	Powerful Owl	V	-	Yes	No
Tyto novaehollandiae	Masked Owl	V	-	No	No
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-	No	No
Haliaeetus leucogaster	White-bellied Sea Eagle	V	M	Yes	No
Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area		EP	-	No	No
Mammals					
Dasyurus maculatus	Spotted-tail Quoll	V	E	No	No

Scientific Name	Common Name	BC Act	EPBC Act	Recorded (Y/N)	Significant impact likely?
Phascogale tapoatafa	Brush-tailed Phascogale	V	-	No	No
Phascolarctos cinereus	Koala	V	V	No	No
Petaurus norfolcensis	Squirrel Glider	V	-	No	No
Petauroides volans	Greater Glider	-	V	No	No
Potorous tridactylus	Long-nosed Potoroo	V		No	No
Pteropus poliocephalus	Grey-headed Flying Fox	V	V	Yes	No
Pseudomys novaehollandiae	New Holland Mouse	-	V	No	No
Bats					
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	No	No
Mormopterus norfolkensis	Eastern Freetail-bat	V	-	No	No
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	No	No
Austronomus australis	Little Bentwing-bat	V	-	Yes	No
Miniopterus schreibersii oceanensis	Eastern Bent wing-bat	V	-	No	No
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	No	No
Myotis macropus	Southern Myotis	V	-	No	No
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	No	No

* EP = Endangered Population, V=Vulnerable, E = Endangered, CE = Critically Endangered.

Table 8-2 Threatened Flora Significance Impact Assessments

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Recorded (Y/N)	Significant impact likely?
Commersonia prostrata	Dwarf Kerrawang	E	E	No	No
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	No	No
Diuris arenaria	Sand Doubletail	E	-	No	No
Diuris praecox	Rough Doubletail	V	V	No	No
Senecio spathulatus	Coast Groundsel	E	-	No	No

* V=Vulnerable, E = Endangered, CE = Critically Endangered.

9 CONCLUSIONS

The study area is comprised of remnant and regrowth vegetation and beach sand dunes. The study area was previously a sand mine and the majority of the heath vegetation is replanted vegetation as part of the mine closure conditions.

The project layout has been influenced by the former sand mining lease area, which has significantly impacted the site topography and vegetation quality. The entire development footprint is contained within the former sand mining area. Specifically, as a result of the former mining operations, a ridgeline loops around the site and a low-point of approximately 7m is located in the south-west of the western portion of the site. The design is sensitive to the site topography and has placed the carpark and quadbike storage and maintenance facility towards the top of the western ridgeline, and amphitheatre and the multifunctional units in the depression.

As part of the environmental ethos of the project, vegetation condition mapping was undertaken in August 2017, with the purpose being to guide the design of the project to make use of existing disturbed areas and minimise impacts to better quality areas. The end design of the project makes use of the mostly disturbed (previously mined) central parts of the site, while protecting the older remnant forest areas that adjoin Worimi State Conservation Area in the south and that occur on the ridgetops in the north. Where practical, existing tracks are being reused in the design process and some existing tracks are to be closed and rehabilitated by the WLALC Green Team.

The site is vegetated to a varying degree. The eastern portion of the site is more densely re-vegetated than the western portion, hence the design has focused on the western portion. The sites low-point is predominately vegetated with exotic grassland with scattered shrubs.

The site layout has been selected to maintain a buffer between the National Park and the development, to avoid high-quality vegetation as far as practicable, and to avoid the removal of any Hollow Bearing Trees (HBTs).

The layout has been selected to prevent the different site elements from visually intruding on each other, to give the effect of minimal development and seclusion.

The WLALC Green Team have previously replanted some of the disturbed sand mine area with locally native species with the aim of regenerating the site. The WLALC Green Team will continue their work on regeneration and rehabilitation of Lot 227 within the wider site (i.e. outside the project areas). The WLALC Green Team will also conduct weed removal operations and environmental education as part of the WLALC ecotourism project.

Two (2) Plant Community Types (PCTs) and two (2) non-native vegetation communities were recorded within the study area and these included the following:

- Coast Tea Tree – Old Man Banksia Coastal Shrubland;
- Smooth-barked Apple – Blackbutt – Old Man Banksia Woodland;
- Exotic grassland with scattered shrubs; and
- Bitou Bush Shrubland.

The proposed eco-tourist facility will involve the removal of 9.55 ha of disturbed and native vegetation. Retention of mapped native vegetation within the study area will total approximately 25.88 ha, not including areas of native vegetation likely to be increased by WLALC Green Team restoration activities. The removal is comprised of:

- 4.86 ha of Coast Tea Tree – Old Man Banksia Coastal Shrubland;
- 0.71 ha of Smooth-barked Apple – Blackbutt – Old Man Banksia Woodland;
- 3.97 ha of Exotic grassland with scattered shrubs; and
- 0.01 ha of Bitou Bush Shrubland.

The two native vegetation communities above are groundwater dependent, however as there is no proposed draw down of groundwater the project is unlikely to affect these GDEs.

No threatened communities listed on the BC Act and or the EPBC Act were recorded within the study area.

No threatened flora species were recorded within the study area. However, 5 threatened species of flora listed on the BC Act and or the EPBC Act were identified as having potential habitat within the study area. Significance assessments these threatened flora species was undertaken and no significant impacts were considered likely (Appendix 7).

88 hollow-bearing trees were recorded within the study area, all of these trees will be retained as part of the project, as a result of the sensitive project design.

One endangered population, Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area has the potential to occur within the study area. This species was not recorded and a significant impact to this population is unlikely (Appendix 7).

Four (4) threatened species of fauna were recorded within the study area as follows:

- Powerful Owl (Vulnerable, BC Act);
- White-bellied Sea Eagle (Vulnerable BC Act);
- Little Bent-wing-bat (Vulnerable BC Act); and
- Grey-headed Flying Fox (Vulnerable BC and EPBC Act).

A further 21 threatened fauna species have potential habitat within the study area (Appendix 5) though were not recorded. Significance assessments for these recorded and potential threatened fauna species was undertaken and no significant impacts were considered likely (Appendix 7).

One migratory species was recorded with habitat for additional two species to occur. An assessment of the impact of the project on these species was conducted and the study area is not classified as important habitat for any of the migratory species recorded or to have potential to occur within the study area.

No threatened ecological communities or aquatic species listed under the FM Act have potential habitat within the study area.

No areas of outstanding biodiversity value (AOBV) listed on the BC Act (previously critical habitat under the TSC Act) occurred within the study area.

In conclusion, the proposed eco-tourist facility is unlikely to have a significant impact on the threatened biodiversity and as such a Species Impact Statement or referral to the Commonwealth under the EPBC Act is not required.

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Appendix 1

Database Searches

Australian Government
Department of the Environment and Energy

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.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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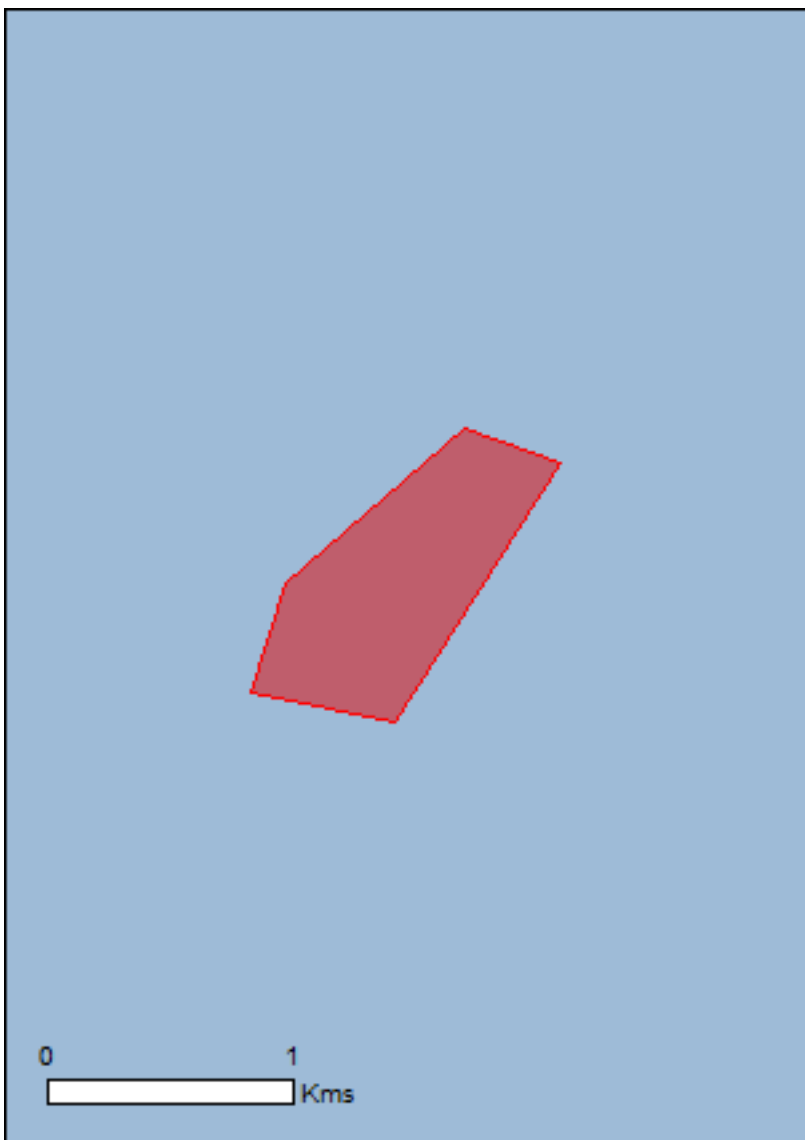

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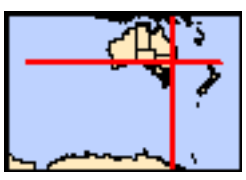

Summary

Matters of National Environmental 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:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	73
Listed Migratory Species:	74

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 environment anywhere.

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 Land:	6
Commonwealth Heritage Places:	2
Listed Marine Species:	101
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	8
Regional Forest Agreements:	1
Invasive Species:	44
Nationally Important Wetlands:	3
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Hunter estuary wetlands	Within Ramsar site

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
Temperate East

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.

Name	Status	Type of Presence
Central Hunter Valley eucalypt forest and woodland	Critically Endangered	Community may occur within area
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community may occur within area
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community may occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur

Name	Status	Type of Presence
		within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat likely to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within 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
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat may occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Fish		
Epinephelus daemelii Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Frogs		
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat may occur within area
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat likely to occur within area
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
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
Eubalaena australis		
Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Petauroides volans		
Greater Glider [254]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus		
Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat known to occur within area
Pseudomys novaehollandiae		
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
Plants		
Angophora inopina		
Charmhaven Apple [64832]	Vulnerable	Species or species habitat known to occur within area
Asperula asthenes		
Trailing Woodruff [14004]	Vulnerable	Species or species habitat may occur within area
Caladenia tessellata		
Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat likely to occur within area
Commersonia prostrata		
Dwarf Kerrawang [87152]	Endangered	Species or species habitat likely to occur within area
Cryptostylis hunteriana		
Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat likely to occur within area
Cynanchum elegans		
White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area
Diuris praecox		
Newcastle Doubletail [55086]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus camfieldii		
Camfield's Stringybark [15460]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus parramattensis subsp. decadens		
Earp's Gum, Earp's Dirty Gum [56148]	Vulnerable	Species or species habitat known to occur within area
Grevillea parviflora subsp. parviflora		
Small-flower Grevillea [64910]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Melaleuca biconvexa Biconvex Paperbark [5583]	Vulnerable	Species or species habitat known to occur within area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat likely to occur within area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat may occur within area
Prasophyllum sp. Wybong (C.Phelps ORG 5269) a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area
Syzygium paniculatum Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat likely to occur within area
Tetratheca juncea Black-eyed Susan [21407]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sharks		
Carcharias taurus (east coast population) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Breeding known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]		
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed		Foraging, feeding or

Name	Threatened	Type of Presence
Shearwater [82404]		related behaviour likely to occur within area
[Calonectris leucomelas](#) Streaked Shearwater [1077]		Species or species habitat known to occur within area
[Diomedea antipodensis](#) Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea epomophora](#) Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea exulans](#) Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea sanfordi](#) Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
[Fregata ariel](#) Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
[Fregata minor](#) Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
[Macronectes giganteus](#) Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
[Macronectes halli](#) Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
[Phoebetria fusca](#) Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
[Sternula albifrons](#) Little Tern [82849]		Breeding may occur within area
[Thalassarche bulleri](#) Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
[Thalassarche cauta](#) Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
[Thalassarche eremita](#) Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
[Thalassarche impavida](#) Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
[Thalassarche melanophris](#) Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
[Thalassarche salvini](#) Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Thalassarche steadi](#) White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Breeding known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		

Name	Threatened	Type of Presence
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat likely to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area

Name	Threatened	Type of Presence
Gallinago stenura		
Pin-tailed Snipe [841]		Roosting likely to occur within area
Limicola falcinellus		
Broad-billed Sandpiper [842]		Roosting known to occur within area
Limosa lapponica		
Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa		
Black-tailed Godwit [845]		Roosting known to occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus		
Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus		
Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus		
Osprey [952]		Species or species habitat known to occur within area
Philomachus pugnax		
Ruff (Reeve) [850]		Roosting known to occur within area
Pluvialis fulva		
Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola		
Grey Plover [865]		Roosting known to occur within area
Tringa brevipes		
Grey-tailed Tattler [851]		Roosting known to occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis		
Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Xenus cinereus		
Terek Sandpiper [59300]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [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.

Name
Commonwealth Land -
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Defence Housing Authority
Commonwealth Land - Defence Service Homes Corporation
Defence - RAAF BASE WILLIAMTOWN
Defence - STOCKTON RIFLE RANGE

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Historic		
Fort Wallace	NSW	Listed place
Williamtown RAAF Base Group	NSW	Listed place

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area
Cuculus saturatus Oriental Cuckoo, Himalayan Cuckoo [710]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or

Name	Threatened	Type of Presence
		related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area
Himantopus himantopus Black-winged Stilt [870]		Roosting known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat likely to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Roosting known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna albifrons Little Tern [813]		Breeding may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or

Name	Threatened	Type of Presence
		related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area
Fish		
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]		Species or species habitat may occur within area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Solenostomus paegnius Rough-snout Ghost Pipefish [68425]		Species or species habitat may occur within area
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stigmatopora olivacea a pipefish [74966]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known

Name	Threatened	Type of Presence
		to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Hunter Wetlands	NSW
Medowie	NSW
Moffats Swamp	NSW
Tilligerry	NSW
Tilligerry	NSW
Worimi	NSW
Worimi	NSW
Worimi	NSW

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
North East NSW RFA	New South Wales

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine,		Species or species

Name	Status	Type of Presence
Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643] Asparagus aethiopicus		habitat likely to occur within area
Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425] Asparagus asparagoides		Species or species habitat likely to occur within area
Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473] Asparagus plumosus		Species or species habitat likely to occur within area
Climbing Asparagus-fern [48993] Cabomba caroliniana		Species or species habitat likely to occur within area
Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171] Chrysanthemoides monilifera		Species or species habitat likely to occur within area
Bitou Bush, Boneseed [18983] Chrysanthemoides monilifera subsp. rotundata		Species or species habitat likely to occur within area
Bitou Bush [16332] Cytisus scoparius		Species or species habitat likely to occur within area
Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934] Eichhornia crassipes		Species or species habitat likely to occur within area
Water Hyacinth, Water Orchid, Nile Lily [13466] Genista monspessulana		Species or species habitat likely to occur within area
Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126] Genista sp. X Genista monspessulana		Species or species habitat likely to occur within area
Broom [67538] Lantana camara		Species or species habitat may occur within area
Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892] Opuntia spp.		Species or species habitat likely to occur within area
Prickly Pears [82753] Pinus radiata		Species or species habitat likely to occur within area
Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780] Rubus fruticosus aggregate		Species or species habitat may occur within area
Blackberry, European Blackberry [68406] Sagittaria platyphylla		Species or species habitat likely to occur within area
Delta Arrowhead, Arrowhead, Slender Arrowhead [68483] Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii		Species or species habitat likely to occur within area
Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497] Salvinia molesta		Species or species habitat likely to occur within area
Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665] Senecio madagascariensis		Species or species habitat likely to occur within area
Fireweed, Madagascar Ragwort, Madagascar		Species or species

Name	Status	Type of Presence
Groundsel [2624] Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		habitat likely to occur within area Species or species habitat likely to occur within area

Nationally Important Wetlands

[Resource Information]

Name	State
Kooragang Nature Reserve	NSW
Port Stephens Estuary	NSW
Salt Ash Air Weapons Range	NSW

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

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.

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

Where very little information is available for 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 reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

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

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

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

Coordinates

-32.823062 151.868773,-32.823062 151.868773,-32.818302 151.875296,-32.819384 151.878815,-32.82739 151.872721,-32.826452 151.867485,-32.823062 151.868773

Acknowledgements

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-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 the Environment
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111

Data from the BioNet BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1Â°; ^^ rounded to 0.01Â°). Copyright the State of NSW through the Office of Environment and Heritage. Search criteria : Licensed Report of all Valid Records of Threatened (listed on TSC Act 1995) or Commonwealth listed Entities in selected area [North: -32.77 West: 151.81 East: 151.92 South: -32.87] returned a total of 2,565 records of 34 species.
Report generated on 22/05/2018 12:15 PM

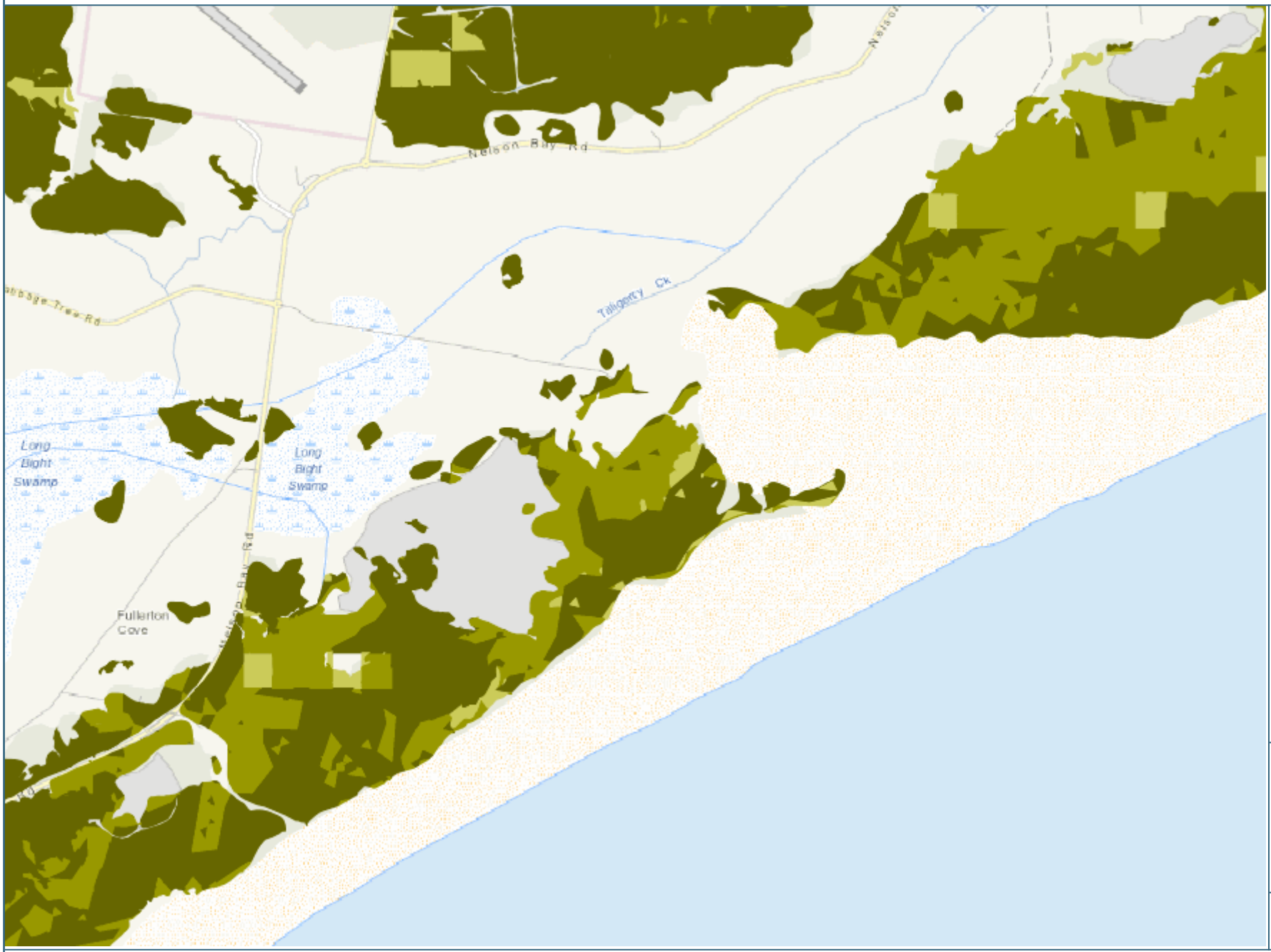
Kingdom	Class	Family	Scientific Name	Common Name	NSW status	Comm. status
Animalia	Amphibia	Myobatrachidae	*Crinia tinnula*	Wallum Froglet	V,P	
Animalia	Amphibia	Myobatrachidae	*Uperoleia mahonyi*	Mahonyâ€™s Toadlet	E1	
Animalia	Aves	Casuariidae	*Dromaius novaehollandiae*	Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area	E2,P	
Animalia	Aves	Ciconiidae	*Ephippiorhynchus asiaticus*	Black-necked Stork	E1,P	
Animalia	Aves	Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	V,P	C
Animalia	Aves	Haematopodidae	*Haematopus longirostris*	Pied Oystercatcher	E1,P	
Animalia	Aves	Psittacidae	*Glossopsitta pusilla*	Little Lorikeet	V,P	
Animalia	Aves	Psittacidae	*Lathamus discolor*	Swift Parrot	E1,P,3	CE
Animalia	Aves	Strigidae	*Ninox strenua*	Powerful Owl	V,P,3	
Animalia	Aves	Tytonidae	*Tyto novaehollandiae*	Masked Owl	V,P,3	
Animalia	Aves	Artamidae	*Artamus cyanopterus cyanopterus*	Dusky Woodswallow	V,P	
Animalia	Mammalia	Dasyuridae	*Dasyurus maculatus*	Spotted-tailed Quoll	V,P	E
Animalia	Mammalia	Dasyuridae	*Phascogale tapoatafa*	Brush-tailed Phascogale	V,P	
Animalia	Mammalia	Phascolarctidae	*Phascolarctos cinereus*	Koala	V,P	V
Animalia	Mammalia	Petauridae	*Petaurus norfolcensis*	Squirrel Glider	V,P	
Animalia	Mammalia	Potoroidae	*Potorous tridactylus*	Long-nosed Potoroo	V,P	V
Animalia	Mammalia	Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	V,P	V
Animalia	Mammalia	Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	V,P	
Animalia	Mammalia	Molossidae	*Mormopterus norfolkensis*	Eastern Freetail-bat	V,P	

Animalia	Mammalia	Vespertilionidae	*Miniopterus australis*	Little Bentwing-bat	V,P		
Animalia	Mammalia	Vespertilionidae	*Miniopterus schreibersii oceanensis*	Eastern Bentwing-bat	V,P		
Animalia	Mammalia	Vespertilionidae	*Myotis macropus*	Southern Myotis	V,P		
Animalia	Mammalia	Vespertilionidae	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V,P		
Animalia	Mammalia	Muridae	*Pseudomys novaehollandiae*	New Holland Mouse	P	V	
Animalia	Mammalia	Otariidae	*Arctocephalus forsteri*	New Zealand Fur-seal	V,P		
Plantae	Flora	Asteraceae	*Senecio spathulatus*	Coast Groundsel	E1,P		
Plantae	Flora	Juncaginaceae	*Maundia triglochinoides*		V,P		
Plantae	Flora	Malvaceae	*Commersonia prostrata*	Dwarf Kerrawang	E1,P	E	
Plantae	Flora	Myrtaceae	*Angophora inopina*	Charmhaven Apple	V,P	V	
Plantae	Flora	Myrtaceae	*Callistemon linearifolius*	Netted Bottle Brush	V,P,3		
Plantae	Flora	Myrtaceae	*Eucalyptus camfieldii*	Camfield's Stringybark	V,P	V	
Plantae	Flora	Myrtaceae	*Eucalyptus parramattensis subsp. decadens*		V,P	V	
Plantae	Flora	Orchidaceae	*^^Diuris arenaria*	Sand Doubletail	E1,P,2		
Plantae	Flora	Orchidaceae	*^^Diuris praecox*	Rough Doubletail	V,P,2	V	

Australian Government
Bureau of Meteorology

Groundwater Dependent Ecosystems Atlas

Worimi Goundwater Dependent Ecosystems



Terrestrial GDE (no data)

No ecosystems analysed

Terrestrial GDE

- Known GDE (regional study)
- High potential GDE (regional study)
- Moderate potential GDE (regional study)
- Low potential GDE (regional study)
- Unclassified potential GDE (regional study)
- High potential GDE (national assessment)
- Moderate potential GDE (national assessment)
- Low potential GDE (national assessment)
- Unclassified potential GDE (national assessment)

N

1:46,504

Kilometres 1 2

Data Source: Bureau of Meteorology, Geoscience Australia and State/Territory lead water agencies. Refer to metadata for further information: Click here

Australian Albers GDA94

Date: 8 June, 2018

Coastal Management SEPP 2018

Legend

Coastal Wetlands

Proximity Area for Coastal Wetlands

Coastal Use Area Map

Notes:

0 0.39 0.8 1.57 kilometres

Worimi SEPP Coastal Management Map

Map created: 16-May-2018

Appendix 2

Flora Species Recorded

Life Form	Family	*Species*	Common Name	BC Act listed	EPBC Act listed	Exotic Species	HTE
Tree	Myrtaceae	*Angophora costata*	Smooth-barked Apple	-	-	-	-
Tree	Myrtaceae	*Eucalyptus pilularis*	Blackbutt	-	-	-	-
Tree	Proteaceae	*Banksia serrata*	Old Man Banksia	-	-	-	-
Small Tree	Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum	-	-	-	-
Small Tree	Phyllanthaceae	*Glochidion ferdinandi*	Cheese Tree				
Shrub	Fabaceae	*Acacia implexa*	Hickory Wattle				
Shrub	Fabaceae	*Acacia irrorata* subsp. *irrorata*	Green Wattle	-	-	-	-
Shrub	Fabaceae	*Acacia longifolia* subsp. *sophorae*	Sydney Golden Wattle	-	-	-	-
Shrub	Fabaceae	*Acacia suaveolens*	Sweet Wattle	-	-	-	-
Shrub	Fabaceae	*Acacia ulicifolia*	Prickly Moses	-	-	-	-
Shrub	Fabaceae	*Aotus ericoides*	Common Aotus	-	-	-	-
Shrub	Fabaceae	*Bossiaea heterophylla*	Variable Bossiaea	-	-	-	-
Shrub	Fabaceae	*Bossiaea obcordata*	Spiny Bossiaea	-	-	-	-
Shrub	Fabaceae	*Bossiaea scolopendria*		-	-	-	-
Shrub	Phyllanthaceae	*Breynia oblongifolia*	Coffee Bush	-	-	-	-
Shrub	Asteraceae	*Chrysanthemoides monilifera* subsp. *rotundata*	Boneseed	-	-	Y	Y
Shrub	Fabaceae	*Dillwynia retorta*	Eggs and Bacon Pea	-	-	-	-
Shrub	Euphorbiaceae	*Homalanthus populifolius*	Bleeding Heart	-	-	-	-

Life Form	Family	*Species*	Common Name	BC Act listed	EPBC Act listed	Exotic Species	HTE
Shrub	Myrtaceae	*Leptospermum laevigatum*	Coastal Tea Tree	-	-	-	-
Shrub	Verbenaceae	*Lantana camara*	Lantana	-	-	Y	Y
Shrub	Myrtaceae	*Leptospermum trinervium*	Slender Tea Tree	-	-	-	-
Shrub	Ericaceae	*Monotoca elliptica*	Tree Broom Heath	-	-	-	-
Shrub	Asteraceae	*Ozothamnus diosmifolius*	Rice Flower, White Dogwood	-	-	-	-
Shrub	Thymelaeaceae	*Pimelea linifolia*	Slender Rice Flower	-	-	-	-
Shrub	Proteaceae	*Persoonia lanceolata*	Lance Leaf Geebung	-	-	-	-
Shrub	Proteaceae	*Persoonia levis*	Broad-leaved Geebung	-	-	-	-
Shrub	Pittosporaceae	*Pittosporum revolutum*	Rough Fruit Pittosporum				
Rush	Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-Rush	-	-	-	-
Herb	Apiaceae	*Actinotus helianthi*	Flannel Flower	-	-	-	-
Herb	Aizoaceae	*Carpobrotus glaucescens*	Pigface	-	-	-	-
Herb	Asteraceae	*Conyza bonariensis*	Flaxleaf Fleabane	-	-	Y	
Herb	Convolvulaceae	*Dichondra repens*	Kidney Weed	-	-	-	-
Herb	Phormiaceae	*Dianella caerulea var. producta*	Blue Flax-lily	-	-	-	-
Herb	Haloragaceae	*Gonocarpus teucrioides*	Raspwort	-	-	-	-
Herb	Dilleniaceae	*Hibbertia linearis*		-	-	-	-
Herb	Asteraceae	*Hypochaeris glabra*	Smooth Catsear	-	-	Y	

Life Form	Family	*Species*	Common Name	BC Act listed	EPBC Act listed	Exotic Species	HTE
Herb	Asteraceae	*Hypochaeris radicata*	Cats Ear or Flatweed	-	-	Y	
Herb	Apiaceae	*Platysace lanceolata*	Shrubby Platysace	-	-		
Herb	Rubiaceae	*Pomax umbellata*	Pomax	-	-	-	-
Herb	Plantaginaceae	*Plantago lanceolata*	Lamb's Tongues	-	-	Y	
Herb	Asteraceae	*Senecio madagascariensis*	Fireweed	-	-	Y	
Herb	Malvaceae	*Sida rhombifolia*	Paddy's Lucerne	-	-	Y	
Herb	Asteraceae	*Taraxacum officinale*	Dandelion	-	-	Y	
Herb	Anthericaceae	*Tricoryne elatior*	Yellow Autumn-lily	-	-		
Herb	Fabaceae	*Trifolium repens*	White Clover	-	-	Y	
Herb	Campanulaceae	*Wahlenbergia stricta*	Australian Bluebell	-	-	-	-
Grass	Poaceae	*Axonopus fissifolius*	Narrow-leafed Carpet Grass	-	-	Y	
Grass	Poaceae	*Cynodon dactylon*	Couch	-	-		
Grass	Poaceae	*Digitaria parviflora*	Small-flowered Finger Grass	-	-		
Grass	Poaceae	*Eleusine indica*	Crows Foot Grass	-	-	Y	
Grass	Poaceae	*Eragrostis curvula*	African Lovegrass	-	-	Y	Y
Grass	Poaceae	*Eragrostis tenuifolia*	Elastic Grass	-	-	Y	
Grass	Poaceae	*Ehrharta erecta*	Panic Veldtgrass	-	-	Y	
Grass	Poaceae	*Imperata cylindrica*	Blady Grass	-	-		
Grass	Poaceae	*Melinis repens*	Red Natal Grass	-	-	Y	

Life Form	Family	*Species*	Common Name	BC Act listed	EPBC Act listed	Exotic Species	HTE
Grass	Poaceae	*Paspalum dilatatum*	Paspalum	-	-	Y	
Grass	Poaceae	*Cenchrus clandestinum*	Kikuyu Grass	-	-	Y	
Grass	Poaceae	*Spinifex sericeus*	Hairy Spinifex	-	-		
Grass	Poaceae	*Sporobolus africanus*	Parramatta Grass	-	-	Y	
Grass	Poaceae	*Sporobolus elongatus*	Slender Rat's Tail Grass	-	-		
Grass	Poaceae	*Themeda triandra*	Kangaroo Grass	-	-		
Sedge	Cyperaceae	*Cyperus congestus*	-	-	-	Y	
Fern	Dennstaedtiaceae	*Pteridium esculentum*	Common Bracken	-	-		
Climber	Apocynaceae	*Parsonsia straminea*	Common Silkpod	-	-		
Climber	Bignoniaceae	*Pandorea pandorana*	Wonga Wonga Vine	-	-		
Climber	Lauraceae	*Cassytha pubescens*	Devils Twine	-	-		
Climber	Fabaceae	*Desmodium rhytidophyllum*		-	-		
Climber	Fabaceae	*Desmodium varians*	Slender Tick-trefoil	-	-		
Climber	Fabaceae	*Glycine clandestina*	Twining Glycine	-	-		
Climber	Fabaceae	*Glycine tabacina*		-	-		
Climber	Fabaceae	*Hardenbergia violacea*	False Sarsparilla	-	-		
Climber	Apocynaceae	*Marsdenia rostrata*	Milk Vine	-	-		
Climber	Smilacaceae	*Smilax australis*	Lawyer Vine	-	-		
Orchid	Orchidaceae	*Acianthus fornicatus*	Pixie Orchid	-	-		

Life Form	Family	*Species*	Common Name	BC Act listed	EPBC Act listed	Exotic Species	HTE
Orchid	Orchidaceae	*Pterostylis nutans*	Nodding Green Hood	-	-		
Orchid	Orchidaceae	*Pterostylis concinna*		-	-		

Appendix 3

Fauna Species Recorded

Life Form	Family	*Species*	Common Name	BC Act listed	EPBC Act listed	Introduced	Observation type	Confidence
Bird	Acanthizidae	*Acanthiza nana nana*	Yellow Thornbill	-	-	-	O W	
Bird	Acanthizidae	*Acanthiza pusilla*	Brown Thornbill	-	-	-	O W	
Bird	**Accipitridae**	***Haliaeetus leucogaster***	**White-bellied Sea-eagle**	**V**	**M**	**-**	**O, E**	
Bird	Accipitridae	*Haliastur sphenurus*	Whistling Kite	-	-	-	O	
Bird	Artamidae	*Cracticus tibicen*	Australian Magpie	-	-	-	O W	
Bird	Artamidae	*Cracticus torquatus*	Grey Butcherbird	-	-	-	O W	
Bird	Cacatuidae	*Calyptorhynchus funereus*	Yellow-tailed Black-Cockatoo	-	-	-	O W	
Bird	Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	-	-	-	O W	
Bird	Cinclosomatidae	*Psophodes olivaceus*	Eastern Whipbird	-	-	-	W	
Bird	Climacteridae	*Cormobates leucophaea*	White-throated Treecreeper	-	-	-	O W	
Bird	Columbidae	*Macropygia amboinensis*	Brown Cuckoo-dove	-	-	-	W	
Bird	Corvidae	*Corvus coronoides*	Australian Raven	-	-	-	O W	
Bird	Halcyonidae	*Dacelo novaeguineae*	Laughing Kookaburra	-	-	-	O W	
Bird	Hirundinidae	*Hirundo neoxena*	Welcome Swallow	-	-	-	O	
Bird	Maluridae	*Malurus cyaneus*	Superb Fairy-wren	-	-	-	O	
Bird	Meliphagidae	*Anthochaera chrysoptera*	Little Wattlebird	-	-	-	O W	
Bird	Meliphagidae	*Acanthorhynchus tenuirostris*	Eastern Spinebill				OW	-
Bird	Meliphagidae	*Lichenostomus chrysops*	Yellow-faced Honeyeater	-	-	-	O W	
Bird	Meliphagidae	*Manorina melanocephala*	Noisy Miner	-	-	-	O W	
Bird	Meliphagidae	*Meliphaga lewinii*	Lewins Honeyeater	-	-	-	W	
Bird	Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush	-	-	-	O W	-
Bird	Petroicidae	*Eopsaltria australis*	Eastern Yellow Robin	-	-	-	O W	
Bird	Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	-	-	-	O W	
Bird	Psittacidae	*Trichoglossus chlorolepidotus*	Scaly-breasted Lorikeet				O W	
Bird	Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail	-	-	-	O W	
Bird	Rhipiduridae	*Rhipidura leucophrys*	Willy Wagtail	-	-	-	O	
Bird	Strigidae	*Ninox novaehollandiae*	Southern Boobook Owl	-	-	-	O	
Bird	**Strigidae**	***Ninox strenua***	**Powerful Owl**	**V**	**-**	**-**	**O W**	
Bird	Timaliidae	*Zosterops lateralis*	Silvereye	-		-	O W	
Mammal	Canidae	*Canis lupus*	Dog?	-	-	x		Pr
Mammal	Dasyuridae	*Antechinus stuartii*	Brown Antechinus	-	-	-	T	
Mammal	Leporidae	*Oryctolagus cuniculus*	European Rabbit	-	-	x	P	

Life Form	Family	*Species*	Common Name	BC Act listed	EPBC Act listed	Introduced	Observation type	Confidence
Mammal	Macropodidae	*Macropus rufogriseus*	Red-necked Wallaby	-	-	-	O	
Mammal	Macropodidae	*Wallabia bicolor*	Swamp Wallaby				Q	
Mammal	Petauridae	*Petaurus breviceps*	Sugar Glider	-	-	-	O	
Mammal	Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum	-	-	-	O, Q	
Mammal	Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna				O	
Mammal	**Miniopteridae**	***Miniopterus australis***	**Little Bentwing-bat**	**V**	**-**	**-**	**U**	**D**
Mammal	-	*Chalinolobus gouldii / Mormopterus sp*	Species Grouping				U	Pr
Mammal	-	*Chalinolobus morio / Vespadelus sp.*	Species Grouping				U	Pr
Mammal	-	*Mormopterus ridei / **Mormopterus norfolkensis***	Species Grouping				U	Pr
Mammal	-	*Mormopterus ridei **/Falsistrellus tasmaniensis** / Scotorepens orion / **Scoteanax rueppellii***	Species Grouping				U	Pr
Mammal	-	***Miniopterus australis** / Saccolaimus flaviventris*	Species Grouping				U	Po
Mammal	-	***Minipterus australis** / Vespadelus pumilus*	Species Grouping				U	Pr
Mammal	-	*Nyctophilus sp. / **Myotis macropus***	Species Grouping				U	Pr
Frog	Myobatrachidae	*Crinia signifera*	Common Eastern Froglet	-	-	-	W	
Reptile	Elapidae	*Pseudechis porphyriacus*	Red-bellied Black Snake	-	-	-	O	
Reptile	Elapidae	*Pseudonaja textilis*	Eastern Brown Snake	-	-	-	O	
Reptile	Scincidae	*Eulamprus quoyii*	Eastern Water Skink	-	-	-	O	
Reptile	Varanidae	*Varanus varius*	Goanna				O, F	

Observation Type Codes (Atlas of NSW Wildlife Database): AR – Acoustic recording; E – Nest/ Roost; F – Tracks;; K – Dead; O – Seen; OW – Seen & heard; P – Scat; Q – Camera; R – Road Kill; T – Trapped; U – Anabat detection, W – Heard call

Identification confidence: D – Definite; Pr – Probable; & Po – Possible.

Appendix 4

Hollow-bearing Tree Data

HBT #	DBH (cm)	Species	Number & Size of Hollows					Notes
			Very Small < 5cm	Small 5 – 10cm	Medium 10 – 20cm	Large 20 – 30cm	Extra Large 30cm+	
HB1	50	*Angophora costata*	0	2	0	0	0	
HB2	90	*Eucalyptus pilularis*	0	0	1	1	1	Boobook Owl
HB3	60	*E. pilularis*	0	0	3	0	1	
HB4	120	*E. pilularis*	0	2	1	0	0	White-bellied Sea Eagle Nest
HB5	80+25	*E. pilularis*	0	0	0	1	0	
HB6	100	*E. pilularis*	0	0	1	0	0	
HB7	90	*E. pilularis*	0	0	0	0	2	
HB8	90	*E. pilularis*	0	5	2	0	0	
HB9	55	*E. pilularis*	0	0	0	1	0	
HB10	80	*A. costata*	0	0	0	0	1	
HB11	45	*Stag*	0	0	0	2	0	
HB12	50+90	*E. pilularis*	0	0	2	1	0	
HB13	90	*E. pilularis*	0	0	0	1	0	
HB14	75	*E. pilularis*	0	0	1	0	0	
HB15	85	*E. pilularis*	0	0	2	1	0	
HB16	60	*A. costata*	0	0	0	0	1	
HB17	55	*A. costata*	0	5	1	0	0	
HB18	50	*E. pilularis*	0	0	1	0	1	
HB19	100	*E. pilularis*	0	1	1	1	0	
HB20	65	*A. costata*	0	1	1	0	0	
HB21	35+10	*A. costata*	0	0	1	0	0	
HB22	10+40	*A. costata*	0	0	0	0	0	
HB23	90	*A. costata*	0	1	0	0	0	
HB24	45	*A. costata*	0	0	0	0	1	Scratches on tree
HB25	45	*A. costata*	0	2	0	0	0	
HB26	40	*Dead Stag*	0	1	0	1	0	

HBT #	DBH (cm)	Species	Number & Size of Hollows					Notes
			Very Small < 5cm	Small 5 – 10cm	Medium 10 – 20cm	Large 20 – 30cm	Extra Large 30cm+	
HB27	70	*A. costata*	0	0	1	0	0	
HB28	40	*A. costata*	0	0	1	0	0	
HB29	55	*A. costata*	0	0	1	0	0	
HB30	60	*E. pilularis*	0	2	2	0	0	
HB31	120	*E. pilularis*	0	1	1	0	0	
HB32	85	*E. pilularis*	0	1	0	1	0	
HB33	75	*Stag*	0	0	1	1	0	
HB34	120	*E. pilularis*	0	0	0	1	1	
HB35	70	*E. pilularis*	0	0	2	0	0	
HB36	50	*A. costata*	0	0	2	0	0	
HB37	65	*E. pilularis*	0	0	0	0	1	
HB38	75	*E. pilularis*	0	0	0	2	0	
HB39	50	*A. costata*	0	2	0	0	0	
HB40	100	*E. pilularis*	0	0	0	0	1	
HB41	80	*E. pilularis*	0	0	1	1	0	
HB42	70	*E. pilularis*	0	0	1	0	0	
HB43	60	*E. pilularis*	0	1	2	0	0	
HB44	100	*E. pilularis*	0	0	3	0	0	
HB45	70	*E. pilularis*	0	2	1	0	0	
HB46	60	*E. pilularis*	0	0	1	0	0	
HB47	50	*A. Costata*	2	0	1	0	0	
HB48	90	*E. pilularis*	0	0	2	1	0	
HB49	50	*A. Costata*	1	0	0	0	0	
HB50	50	*E. pilularis*	0	0	1	0	0	
HB51	50	*A. costata*	0	2	0	0	0	
HB52	90	*E. pilularis*	0	0	0	0	1	
HB53	40+40	*Dead Stag*	0	0	0	2	0	
HB54	50+45	*Dead Stag*	0	0	0	0	1	
HB55	75	*A. costata*	0	1	0	1	0	

HBT #	DBH (cm)	Species	Number & Size of Hollows					Notes
			Very Small < 5cm	Small 5 – 10cm	Medium 10 – 20cm	Large 20 – 30cm	Extra Large 30cm+	
HB56	90	*E. pilularis*	0	2	1	1	0	
HB57	75	*E. pilularis*	0	1	4	3	0	
HB58	60	*Dead Stag*	0	0	0	1	1	
HB59	170	*E. pilularis*	0	0	1	0	0	
HB60	50+30	*Dead Stag*	0	1	0	1	0	
HB61	80	*E. pilularis*	0	0	1	0	0	
HB62	70	*E. pilularis*	0	0	3	3	0	
HB63	60	*E. pilularis*	0	1	0	0	0	
HB64	70	*E. pilularis*	0	2	1	0	0	
HB65	85	*E. pilularis*	0	1	1	0	1	
HB66	40	*Dead Stag*	0	2	0	0	0	
HB67	130	*E. pilularis*	0	0	2	2	0	
HB68	70	*Dead Stag*	0	0	2	2	0	
HB69	50	*Dead Stag*	0	0	1	0	0	
HB70	50	*Dead Stag*	0	1	2	0	0	
HB71	35	*Dead Stag*	0	1	1	0	0	
HB72	75	*A. costata*	0	2	1	0	0	
HB73	80	*E. pilularis*	0	0	0	0	1	
HB74	100	*E. pilularis*	0	2	1	1	0	
HB75	130	*E. pilularis*	0	2	1	0	0	
HB76	75	*E. pilularis*	0	2	0	0	0	
HB77	60	*Dead Stag*	0	1	2	1	0	
HB78	70	*Dead Stag*	0	0	0	0	2	
HB79	100	*E. pilularis*	0	0	1	1	0	
HB80	85	*E. pilularis*	0	0	0	0	1	
HB81	80	*A. costata*	0	1	2	0	0	
HB82	100	*Dead Stag*	0	2	1	0	0	
HB83	90	*Dead Stag*	0	0	0	1	2	
HB84	65	*Dead Stag*	0	0	0	0	1	

HBT #	DBH (cm)	Species	Number & Size of Hollows					Notes
			Very Small < 5cm	Small 5 – 10cm	Medium 10 – 20cm	Large 20 – 30cm	Extra Large 30cm+	
HB85	90	*E. pilularis*	0	0	0	0	1	
HB86	40+10	*Dead Stag*	0	3	0	0	0	
HB87	120	*E. pilularis*	0	2	1	0	0	
HB88	40	*Dead Stag*	0	1	2	0	0	
Totals			**3**	**62**	**74**	**37**	**23**	**199**

Appendix 5

Threatened Flora and Fauna Assessment

Species, populations and communities with a likelihood of occurrence of greater than or equal to Moderate have had potential impacts formally assessed using a 7-part test under the *Environmental Planning and Assessment Act 1979.* Due to the nature of the site, oceanic species have been omitted from the formal assessment.

E1 - Endangered; E2 - Endangered Population; E3 - Endangered ecological community; E4 Critically endangered; P - Protected; K - Known occurrence; PR - Predicted occurrence; V - Vulnerable

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Amphibians							
Crinia tinnula	Wallum Froglet	V	-	Occurs along the coastal margin from Litabella National Park in south east QLD to Kurnell in Sydney. Occurs in a wide range of habitat particularly with acidic swamps on coastal sand plains. Typically occur in sedgelands and wet heathlands. Can also be found along drainage lines within other vegetation communities and disturbed areas and occasionally in swamp sclerophyll forests. Breed in swamps with permanent water as well as shallow ephemeral pools and drainage ditches. Shelter under leaf litter, vegetation, other debris or in burrows of other species. Shelter sites are often wet or very damp and often located near the water's edge.	45	Low. No habitat within the study area	Low.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Heleioporus australiacus	Giant Burrowing Frog	V	V	Distributed in south-eastern NSW and Victoria, a northern population largely confined to the sandstone geology of the Sydney Basin and extending as far south as Ulladulla. Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except clay based. Breeding habitat is generally soaks or pools within first or second order streams.	K	Low. No habitat within the study area	Low
Mixophyes balbus	Stuttering Frog	E1	V	Stuttering Frogs occur along the east coast of Australia from southern Qld to north-eastern Victoria. Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor.	-	Low. Rainforest and wet, tall open forest is absent from the study area.	Low.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Litoria aurea	Green and Golden Bell Frog	E1	V	Distributed from NSW north coast near Brunswick Heads, southwards along NSW coast to Victoria where it extends into east Gippsland. Inhabits marshes, dams and stream-sides, particularly those containing bulrushes or spikerushes. Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (*Gambusia holbrooki*), have a grassy area nearby and diurnal sheltering sites available. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas.	-	Low no habitat within the study area.	Low
Uperoleia mahonyi	Mahony's Toadlet	E	-	Recorded almost exclusively on a substrate of leached (highly nutrient impoverished) white sand and is commonly associated with acid paperbark swamps. The typically occur in wallum heath, swamp mahogany-paperbark swamp forest, heath shrubland and Sydney red gum woodland. During non-breeding periods the species has been recorded up to 400 m from standing water within intact native vegetation. This species seeks shelter by burrowing into the sandy substrate. Rocks, logs and leaf litter may also be used for shelter	1	Low no habitat within the study area.	Low

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Birds							
Dromaius novaehollandiae	Emu population in the New South Wales North Coast Bioregion and Port Stephens Local Government Area	E2	-	On the NSW north coast, Emus occur in a range of predominantly open lowland habitats, including grasslands, heathland, shrubland, open and shrubby woodlands, forest, and swamp and sedgeland communities, as well as the ecotones between these habitats. They also occur in plantations of tea-tree and open farmland, and occasionally in littoral rainforest. The population of Emus in the NSW North Coast Bioregion and Port Stephens LGA is of significant conservation value as the last known population in northern coastal NSW, and for the role that birds play in dispersing large seeds of native plant species, and over long distances.	3	Moderate. Areas of exotic grasslands may provide very marginal potential habitat for this species.	Low.
Botaurus poiciloptilus	Australasian Bittern	E1	E	Inhabits terrestrial and estuarine wetlands, generally where there is permanent water. The species prefers wetlands with dense vegetation, including sedges, rushes and reeds.	-	Low no habitat within the study area.	Low.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Rostratula Australia	Australian Painted Snipe	E1	E	Restricted to Australia. Most records are from the south-east, particularly the Murray Darling Basin. In NSW, many records are from the Murray-Darling Basin. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	-	Low no habitat within the study area.	Low.
Ephippiorhynchus asiaticus	Black-necked Stork	E1	-	Widespread in coastal and subcoastal northern and eastern Australia, south to central-eastern NSW. Mainly found on shallow, permanent, freshwater terrestrial wetlands, and surrounding marginal vegetation, including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters, as well as extending into adjacent grasslands, paddocks and open savannah woodlands.	4	Low no habitat within the study area.	Low.
Monarcha melanopsis	Black-faced Monarch	-	M	The Black-faced Monarch is widespread in eastern Australia. Mainly occurs in rainforest ecosystems although it can be found in gullies in mountain areas or coastal foothills, softwood scrub dominated by Brigalow (Acacia harpophylla), coastal scrub dominated by Coast Banksia (Banksia integrifolia) and Southern Mahogany.		Low no habitat within the study area.	Low

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Calidris ferruginea	Curlew Sandpiper	E1	CE	This species is distributed around most of the coastline of Australia. Generally occupies littoral and estuarine habitats, and in NSW is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes the inland.	-	Low no habitat within the study area.	Low.
Apus pacificus	Fork-tailed Swift	-	M	In NSW, the species is recorded in all regions. Many records occur east of the Great Divide. The Fork-tailed Swift is almost exclusively aerial with them foraging and roosting aerially.	K	Moderate. This species may fly over the study area while foraging for insects.	Low
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-	Feeds almost exclusively on the seeds of *Casuarina* sp. and *Allocasuarina* sp. Open forest and woodlands up to 1000 m with feed trees present.	1	Moderate. *Casuarina* sp. and *Allocasuarina* sp. are present within the study area. No foraging evidence was recorded. However, forest containing hollow-bearing trees may provide potential nesting habitat for this species.	Low.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-	This species habitat is within woodlands and dry sclerophyll forests dominated by Eucalypts and Mallee associations. This species feeds on insects and other invertebrates captured on the wing. Occasionally feeds on nectar, fruit and seeds. Distribution of this species is widespread in NSW from the coast to inland including the western slopes and plains.	2	Moderate. The study area may provide low-quality suitable habitat for this species.	Low.
Dasyornis brachypterus	Eastern Bristlebird	-	E	Habitat is characterised by dense, low vegetation including heath and open woodland with a heathy understorey. Age of habitat since fires (fire-age) is of paramount importance to this species; Illawarra and southern populations reach maximum densities in habitat that has not been burnt for at least 15 years.	K	Low. The study area is not generally known to be in the area of occurrence of this species.	Low.
Numenius madagascariensis	Eastern Curlew	-	CE	A large wader 55-61 cm. Have a very long curved black bill which is pink at the base. Has a prominent eye-ring. Primarily coastal distribution, species is found in all states including Tasmania. Rarely recorded inland, mainly found in estuaries such as hunter river, Port Stephens, Clarence river Richmond river.	K	Low. No habitat for this species occurs within the study area.	Low.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Glossopsitta pusilla	Little Lorikeet	V	-	Forages in flowering eucalypts and Melaleuca sp. Riparian habitats are particularly used, due to higher soil fertility and greater productivity. Nests in tree hollows.	3	Moderate. The study area may provide potential foraging and nesting habitat for this species.	Low.
Tyto novaehollandiae	Masked Owl	V	-	Extends from the coast where it is most abundant to the western plains. Lives in dry eucalypt forests and woodlands from sea level to 1100 m.	3	Moderate. The study area may provide potential foraging habitat for this species.	Low
Grantiella picta	Painted Honeyeater	V	V	Nomadic species and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	-	Low no habitat within the study area.	Low.
Haematopus longirostris	Pied Oystercatcher	E1	M	The species is distributed around the entire Australian coastline. Favours intertidal flats of inlets and bays, open beaches and sandbanks. Nests mostly on coastal or estuarine beaches although occasionally they use saltmarsh or grassy areas.	5	Low no habitat within the study area.	Low.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Ninox strenua	Powerful Owl	V	-	Endemic to eastern and south-eastern Australia, mainly on the coastal side of the Great Dividing Range. Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest.	6	Recorded. This species was recorded during call playback surveys within the study area. 23 large hollows were recorded that contain potential nesting habitat within the study area.	Low.
Erythrotriorchis radiatus	Red Goshawk	CE	V	Occurs sparsely through northern and eastern Australia from Western Australian Kimberley division to north eastern Queensland and south to far north-eastern NSW with scattered records in central Australia. Inhabit open woodland and forest preferring mosaic of vegetation types. Often found in riparian habitats along or near watercourses or wetlands.	K	Low no habitat within the study area.	Low
Anthochaera phrygia	Regent Honeyeater	CE	CE M	Dry open forest and woodland. Particularly box-ironbark woodland and riparian forests of river Sheoak. Feeds on the nectar from a wide range of eucalypts and mistletoes.	-	Moderate. The study area provides marginal potential foraging habitat for this species.	Low

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Rhipidura rufifrons	Rufous Fantail	-	M	The Rufous Fantail occurs in coastal and near coastal districts of northern and eastern Australia. In east and south-east Australia, this species mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts usually with a dense shrubby understorey often including ferns. They also occur in subtropical and temperate rainforests.	K	Low no habitat within the study area.	Low
Myiagra cyanoleuca	Satin Flycatcher	-	M	The Satin Flycatcher is found along the east coast of Australia from far northern Queensland to Tasmania, including south-eastern South Australia. The Satin Flycatcher is found in tall forests, preferring wetter habitats such as heavily forested gullies.	K	Low no habitat within the study area.	Low
Lathamus discolor	Swift Parrot	E1	CE M	Migrates to south-eastern mainland Mar-Oct. Winter-flowering trees such as *Eucalyptus robusta*, *Corymbia maculata*, *C. gummifera*, *E. sideroxylon* and *E. albens* are important. Breeds in Tasmania.	4	Moderate. The open forest within of the study area provides potential foraging habitat for this species, however, preferred winter-flowering tree species are absent from the study area.	Low
Monarcha trivirgatus	Spectacled Monarch		M	Inhabits dense rainforests and moist eucalypt forests of eastern and north-eastern Australia, the Spectacled Monarch sometimes also inhabits mangroves and other densely vegetated habitats.	K	Low no habitat within the study area.	Low

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Hirundapus caudacutus	White-throated Needletail	-	M	Recorded in all coastal regions of Qld and NSW. In Australia, this species is almost exclusively aerial, almost always foraging aerially. Although it has been recorded roosting in trees in forests and woodlands, both among dense foliage in the canopy or in hollows. Probably recorded most often above wooded areas, including open forest and rainforest.	K	Moderate. This species may fly over the study area while foraging for insects.	Low.
Haliaeetus leucogaster	White-bellied Sea Eagle	V	M	Distributed along the coastline of Australia, also extending inland along some larger waterways. Habitat includes large areas of open water. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland and forest. Breeding territories are close to water, mainly in tall open forest or woodland, although nests are sometimes located in other habitats such as dense forest, closed scrub or in remnant trees on cleared land.	50	Recorded. This species was recorded, and a nest occurs in the southern extent of the study area.	Low.
Motacilla flava	Yellow Wagtail	-	M	Non-breeding habitat only: mostly well-watered open grasslands and the fringes of wetlands. Roosts in mangroves and other dense vegetation.	K	Low no habitat within the study area.	Low

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Fish							
Epinephelus daemelii	Black Rock Cod	-	V	-	K	Low no habitat within the study area.	Low
Mammals							
Dasyurus maculatus	Spotted-tailed Quoll	V	E	A variety of vegetation such as rainforest, open forest, woodland, coastal heath, inland riparian forest. Have home ranges 750 - 3500 ha. Den sites may be located in hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky cliffs.	4	Moderate. The species may use the study area as part of a larger home range. No evidence of den or latrine sites were found within the study area. No individuals were recorded despite targeted trapping surveys.	Low
Phascogale tapoatafa	Brush-tailed Phascogale	V	-	Mostly found in dry sclerophyll open forest with sparse groundcover, east of the Great Dividing Range. However, has been recorded in heath, swamps, rainforest and wet sclerophyll forest. Nest and shelter in tree hollows with small entrances (2.5 - 4cm).	3	Moderate. Open forest within the study area provides foraging habitat for this species. Hollow bearing trees provide roosting and breeding habitat. No individuals were recorded despite trapping and spotlighting surveys.	Low
Phascolarctos cinereus	Koala	V	V	Found in eucalypt woodlands and forest foraging on preferred food trees.	944	Moderate. The study area provides potential habitat for this species; however, no feed trees occur within the study area. Koalas may use connectivity between areas of foraging habitat.	Low

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Petaurus norfolcensis	Squirrel Glider	V	-	Inhabits mature or old growth box, box-ironbark woodlands and river red gum forest west of the Great Dividing Range. Prefers mixed species stands with a shrub or Acacia midstorey. Uses tree hollows as den sites.	28	Moderate. Open forest within the study area provides foraging habitat for this species. Hollow bearing trees provide roosting and breeding habitat. No individuals were recorded despite trapping and spotlighting surveys.	Low
Petauroides volans	Greater Glider	-	V	The Greater Glider occurs in eucalypt forests and woodlands along the east coast of Australia. Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. Shelters during the day in tree hollows.	-	Moderate. Open forest within the study area provides foraging habitat for this species. Hollow bearing trees provide roosting and breeding habitat. No individuals were recorded despite trapping and spotlighting surveys.	Low
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	This species is generally found within 200 km of Australia's eastern coast. Generally, occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are commonly found in gullies, close to water, in vegetation with a dense canopy.	18	Recorded.	Low

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Potorous tridactylus	Long-nosed Potoroo	V	V	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or Melaleucas. A sandy loam soil is also a common feature.	1	Moderate. The heath vegetation within the study area provides habitat for this species. No individuals were recorded during the field surveys despite trapping and spotlighting surveys.	Low
Pseudomys novaehollandiae	New Holland Mouse, Pookila	-	V	The New Holland Mouse has a fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes.	9	Moderate. The study area provides suitable habitat for this species. No individuals were recorded during the field surveys despite trapping and spotlighting surveys.	Low
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	Wide-ranging species found across northern and eastern Australia. Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows.	1	Moderate. The study area provides foraging, roosting and breeding habitat for this species.	Low
Mormopterus norfolkensis	Eastern Freetail-bat	V	-	The Eastern Freetail-bat is found along the east coast from south QLD to southern NSW. Occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark.	3	Moderate. The study area provides foraging, roosting and breeding habitat for this species.	Low

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin, frequenting low to mid-elevation dry open forest and woodland close to these features. Also found in well-timbered areas containing gullies.	-	Moderate. The study area may provide potential foraging habitat for this species.	Low
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	Found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania. Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings.	1	Moderate. The study area provides foraging, roosting and breeding habitat for this species.	Low
Austronomus australis	Little Bentwing-bat	V	-	Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.	18	Recorded.	Low

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-	Forages in a range of habitat types. Roosts in caves, derelict mines, culverts and other man-made structures. Form maternity colonies that are faithful to particular caves.	8	Moderate. The study area may provide potential foraging habitat for this species.	Low
Myotis macropus	Southern Myotis	V	-	Forages over streams and pools catching insects and small fish by raking their feet across the water surface. Roost close to water in caves, mine shafts, tree hollows and man-made structures.	3	Low-moderate. The study area may provide some potential roosting habitat for this species, however, water bodies are absent from the study area limiting foraging habitat.	Low
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. This species usually roosts in tree hollows.	9	Moderate. The study area may provide potential roosting, breeding and foraging habitat for this species.	Low

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of Occurrence	Potential Impacts
Angophora inopina	Charmhaven Apple	V	V	Located in the Central Coast region of NSW. Occurs most frequently in four main vegetation communities: (i) *Eucalyptus haemastoma–Corymbia gummifera–Angophora inopina* woodland/forest; (ii) *Hakea teretifolia–Banksia oblongifolia* wet heath; (iii) *Eucalyptus resinifera–Melaleuca sieberi–Angophora inopina* sedge woodland; (iv) *Eucalyptus capitellata–Corymbia gummifera–Angophora inopina* woodland/forest.	6	Low. No habitat for this species occurs within the study area.	Low
Asperula asthenes	Trailing Woodruff	V	V	This small herb occurs only in NSW. It is found in scattered locations from Bulahdelah north to near Kempsey, with several records from the Port Stephens/Wallis Lakes area. Habitat is in moist areas often along river banks.	K	Low. No habitat for this species occurs within the study area.	Low
Caladenia tessellata	Thick-lipped Spider-orchid	E1	V	This species is endemic to mainland south-east Australia. Favours low, dry sclerophyll woodland with a heathy or sometimes grassy understorey on clay loams or sandy soils.	2	Low. The study area is outside of the distribution of this species. The northern know population is at Munmorah Nature Reserve on the Central Coast.	Low.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of Occurrence	Potential Impacts
Callistemon linearifolius	Netted Bottle Brush	V	-	Shrub up to 3-4m tall with linear to linear-lanceolate leaves. Flowers in typical "bottlebrushes". Red and usually 9-10cm long and approximately 50mm in diameter. Recorded form the Georges River to Hawkesbury River in the Sydney area to north of Nelson Bay area of NSW, also recorded in Yengo National Park. Grows in dry Sclerophyll forests on the coast and adjacent ranges. Flowers spring-summer.	4	Low. No habitat for this species occurs within the study area.	Low
Commersonia prostrata	Dwarf Kerrawang	E1	E	Ground hugging shrub that forms mats to more than 1m across. Occurs in the southern highlands and southern tablelands with a larger population in the Thirlmere Lakes area. On the Tomago Sands beds this species has been recorded in an area previously subject to sand mining.	6	Moderate. The study area is located within the Tomago sand beds and on a former sand mining site. The study area provides potential habitat for this species. It was not recorded within the study area.	Low.
Cryptostylis hunteriana	Leafless Tongue-orchid	V	V	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum, Silvertop Ash, Red Bloodwood and Black Sheoak; appears to prefer open areas in the understorey and is often found in association with the Large Tongue Orchid and the Tartan Tongue Orchid.	-	Moderate. Potential habitat occurs within the eucalypt forest. Targeted surveys for this species was conducted during the flowering period and no individuals were recorded.	Low.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of Occurrence	Potential Impacts
Cynanchum elegans	White-flowered Wax Plant	E	E	Occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest, coastal tea tree and coastal banksia coastal scrub, forest red gum aligned open forest and woodland, spotted gum aligned open forest and woodland and bracelet honey myrtle scrub to open scrub. Restricted to eastern NSW where it is distributed from Brunswick Heads on the north coast to Gerroa in the Illawarra region. Been recorded as far west as Merriwa in the upper Hunter river valley.	K	Low. No habitat for this species occurs within the study area.	Low
Diuris arenaria	Sand Doubletail	E	-	Known to occur in the Tomaree peninsula near Newcastle NSW. Occurs in coastal heath and dry grassy eucalypt forest on sandy flats. Grows in gentle undulating country in eucalypt forest with grassy understorey on clay soil.	180	Moderate. Potential habitat occurs within the coastal heath and eucalypt forest. Targeted surveys for this species was conducted during the flowering period and no individuals were recorded.	Low.
Diuris praecox	Rough Doubletail	V	V	Known to occur between Bateau Bay and Smiths Lake, growing on hills and slopes of near-coastal districts in open forests which have a grassy to fairly dense understorey. Exists as subterranean tubers most of the year, flowering in winter.	-	Moderate. Potential habitat occurs within the eucalypt forest. Targeted surveys for this species was conducted during the flowering period and no individuals were recorded.	Low.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of Occurrence	Potential Impacts
Eucalyptus camfieldii	Camfield's Stringybark	V	V	Restricted distribution in a narrow band with the most northerly records in the Raymond Terrace area south to Waterfall. Occurs in poor coastal country in shallow sandy soils overlying Hawkesbury sandstone coastal heath mostly on exposed sandy ridges. Small scattered stands near the boundary of tall coastal heaths and low open woodlands of slightly more fertile inland areas. Associated species include stunted species of E. *oblonga* Narrow-leaved Stringybark, *E. capitellata* Brown Stringybark and *E. haemastoma* Scribbly Gum. Flowering period irregular, poor response to fires.	2	Low. No habitat for this species occurs within the study area.	Low.
Eucalyptus parramattensis subsp. *decadens*	-	V	V	Two separate meta-populations, Kurri-Kurri meta-population is bordered by Cessnock – Kurri Kurri in the north and Mulbring-Aberdare in the south. Large aggregations of the subspecies is bounded by Salt Ash and Tanilba Bay in the north and Williamtown and Tomago in the south. Occupies deep, low nutrient sands often those subject to periods of inundation or where water tables are relatively high. Dry Sclerophyll woodland with dry heath understorey, also occurring as an emergent in dry or wet heathland. Flowers from November to January.	820	Low. The study area is within the Tomago sand beds. The study area may provide potential habitat for this species, however it was not recorded during the field surveys. Therefore, the project will not have any impact upon this species.	Low.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of Occurrence	Potential Impacts
Grevillea parviflora subsp. *parviflora*	Small-flower Grevillea	V	V	Distributed sporadically in Sydney Basin and Hunter area. Found in light sandy soils over thin shales with lateritic ironstone gravels. Occurs in a wide range of vegetation types from heath and shrubby woodland to open forests.	-	Low. No habitat for this species occurs within the study area.	Low.
Maundia triglochinoides	-	V	-	Restricted to coastal NSW and extending to southern QLD, grows in swamps, lagoons, dams, channels, creeks or shallow freshwater 30-60cm deep on heavy clay soils with low nutrients. Flowering occurs during the warmer months (Nov – Jan). Associated with wetland species.	3	Low. No water bodies or preferred heavy clay soils exists within the study area.	Low.
Melaleuca biconvexa	Biconvex Paperbark	V	V	Biconvex Paperbark generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	-	Low. No habitat for this species occurs within the study area.	Low.
Persicaria elatior	Tall Knotweed	V	V	This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	-	Low. No habitat for this species occurs within the study area.	Low.
Phaius australis	Lesser Swamp Orchid, Southern Swamp Orchid	E1	E	Occurs in Queensland and north-east NSW as far south as Coffs Harbour. Historically, it extended farther south to Port Macquarie. Swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas.	-	Low. No habitat for this species occurs within the study area.	Low.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of Occurrence	Potential Impacts
Prasophyllum sp. Wybong (C. Phelps ORG 5269)		-	CE	Endemic to NSW, it is known from near Ilford, Premer, Muswellbrook, Wybong, Yeoval, Inverell, Tenterfield, Currabubula and the Pilliga area. Most populations are small, although the Wybong population contains by far the largest number of individuals.	K	Low. No habitat for this species occurs within the study area.	Low
Senecio spathulatus	Coast Groundsel	E1	-	Occurs in Nadgee Nature Reserve (Cape Howe) and between Kurnell in Sydney and Myall Lakes National Park. Found on frontal dunes.	2	Moderate. Atlas Database records for this species occur to the east of the study area in the foredunes. Although the study area is located in the hind dunes, the study area may provide potential marginal habitat for this species.	Low.
Syzygium paniculatum	Magenta Lilly Pilly	E1	V	On the South Coast, the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the Central Coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	5	Low. No habitat for this species occurs within the study area.	Low.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of Occurrence	Potential Impacts
Tetratheca juncea	Black-eyed Susan	V	V	Low shrub growing in clumps of single or multiple stems. Flowers face downwards and usually have 4 petals which range from white to pink to dark purple in colour. Born singly or twos along the stem. Stems are 30 to60cm long, usually leafless with 2 to 3 narrow wings that give them an angular appearance. Confined to northern portion of the Sydney Basin bioregion and the southern portion of the North Coast bioregion, LGA's of Cessnock, Wyong, Lake Macquarie, Newcastle, Port Stephens and Great Lakes.	-	Low. No habitat for this species occurs within the study area.	Low.

Appendix 6

Threatened Ecological Community Assessment

Species, populations and communities with a likelihood of occurrence of greater than Moderate have had potential impacts formally assessed using a 7-part test under the *Environmental Planning and Assessment Act 1979*.

E1 - Endangered; E2 - Endangered Population; E3 - Endangered ecological community; E4 Critically endangered; P - Protected; K - Known occurrence; PR - Predicted occurrence; V – Vulnerable

Community Name	NSW status	Comm. status	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Central Hunter Valley eucalypt forest and woodland	-	CE	The community occurs in the Hunter Valley regions. The canopy of the ecological community is dominated by one or more of the following four eucalypt species: *Eucalyptus crebra* (narrow-leaved ironbark), *Corymbia maculata* (spotted gum), *E. dawsonii* (Slaty gum) and *E. moluccana* (grey box). The shrub layer is likely to include *Bursaria spinosa* subsp. *spinosa* (native blackthorn). *A. decora A. implexa* (lightwood), *A. falcata* (sickle wattle) and *Breynia oblongifolia* (coffee bush).	P	Low. Not observed within the study area.	Low.

Community Name	NSW status	Comm. status	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Lowland Rainforest of Subtropical Australia	-	E	The ecological community primarily occurs from Maryborough in Queensland to the Clarence River (near Grafton) in New South Wales (NSW). The ecological community also includes isolated areas between the Clarence River and Hunter River such as the Bellinger and Hastings valley. The ecological community occurs on basalt and alluvial soils, including sand and old or elevated alluvial soils as well as floodplain alluvia. It also occurs occasionally on enriched rhyolitic soils and basalt enriched metasediments. Lowland Rainforest mostly occurs in areas <300 m above sea level.	P	Low. Not observed within the study area.	Low.
Subtropical and Temperate Coastal Saltmarsh	-	V	Occurs within a relatively low margin of coastline from south east Qld to Shark Bay in WA. Has regular intermittent tidal influence. Consists of salt tolerant vegetation including: grasses, herbs, sedges, rushes and shrubs.	P	Low. Not observed within the study area.	Low.

Community Name	NSW status	Comm. status	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Central Hunter Grey Box-Ironbark Woodland in the NSW North Coast and Sydney Bioregions	E3	CE	Found in the Central Hunter Valley between Singleton and Muswellbrook occurring in area of relatively low rainfall and high temperatures. Associated with Permian lithology and situated on gently undulating hills, slopes and valleys and occasionally on rocky knolls. Characterised by the presence of Narrow-leaved Ironbark (*Eucalyptus crebra*), Kurrajong (*Brachychiton populneus* subsp. *populneus*) and Grey Box (*Eucalyptus moluccana*). Other tree species such as Rough-barked Apple (*Angophora floribunda*) and Black Cypress Pine (*Callitris endlicheri*) may be present and occasionally dominate or co-dominate.	K	Low. Not observed within the study area.	Low.
Coastal Swamp Oak (Casuarina glauca) Forest of NSW and SE Qld	-	E	Found on the coastal floodplains of NSW occurring on the fringes of coastal estuaries on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains. Associated with grey-black clay-loams and sandy loams where the groundwater is saline or sub-saline. Characterised by a dense layer *of Casuarina glauca* (swamp oak) is the dominant species northwards from Bermagui.	K	Low. Not observed within the study area.	Low.

Community Name	NSW status	Comm. status	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Coastal Saltmarsh in New South Wales North Coast, Sydney Basin and South East Corner Bioregion	E3	V	Coastal Saltmarsh occurs in the intertidal zone on the shores of estuaries and lagoons that are permanently or intermittently open to the sea. Characteristic plants include *Baumea juncea*, Sea Rush (*Juncus kraussii* subsp. *australiensis*), Samphire (*Sarcocornia quinqueflora* subsp. *quinqueflora*), Marine Couch (*Sporobolus virginicus*), streaked Arrowgrass (*Triglochin striata*), Knobby Club-rush (*Ficinia nodosa*), Creeping Brook weed (*Samolus repens*), Swamp Weed (*Selliera radicans*), Seablite (*Suaeda australis*) and Prickly Couch (*Zoysia macrantha*).	P	Low. No saltmarsh occurs within or adjacent to the study area.	Low.
Freshwater Wetlands on Coastal Floodplains of the New South wales North Coast, Sydney Basin and South East Corner Bioregions	E3	-	Associated with coastal areas subject to periodic flooding. Those that lack standing water most of the time are usually dominated by dense grassland or sedgeland vegetation, often forming a turf less than 0.5 metre tall and dominated by aquatic plants including *Paspalum distichum* (water couch), *Leersia hexandra* (swamp rice-grass), *Pseudoraphis spinescens* (mud grass) and *Carex appressa* (tussock sedge). Where they are subject to regular inundation and drying the vegetation may include large emergent sedges over 1 metre tall, such as *Baumea articulata, Eleocharis equisetina* and *Lepironia articulata*,	K	Low. Not observed within the study area.	Low.

Community Name	NSW status	Comm. status	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions	E3	-	Found within the Central Hunter Valley geographic distribution, occurring on floodplains and floodplain rises. This community is known to contain the endangered River Red Gum population. Characterised by very tall woodland, occurring on floodplain and associated rises along the Hunter River and tributaries. Generally dominated by *Eucalyptus camaldulensis* (River Red Gum) in combinations with *Eucalyptus tereticornis* (Forest Red Gum), *Eucalyptus melliodora* (Yellow Box) and *Angophora floribunda* (Rough-barked Apple).	K	Low. Not observed within the study area.	Low.
Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions	E3	-	Found between Muswellbrook, Beresfield, Mulbring and Cessnock in the Lower Hunter. Has been recorded from the Maitland, Cessnock, Port Stephens, Muswellbrook and Singleton LGAs, but may occur elsewhere in these bioregions. Occurs on Permian sediments of the Hunter Valley floors, with much of the remaining community fragmented and disturbed. Occurs on gentle slopes and depressions and drainage flats. Common canopy tree species are *Eucalyptus tereticornis* (Forest Red Gum) and *E. punctata* (Grey Gum).	K	Low. Not observed within the study area.	Low.

Community Name	NSW status	Comm. status	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion	V2	CE	Found in the Hunter Valley from Bulga to Bylong/Goulburn River National Park and known to occur in Singleton, Muswellbrook and the Upper Hunter local government areas. Occurring on colluvial soils on exposed footslopes associated with the interface between Triassic Narrabeen sandstones and Permian sediments. Characterised by the typically dominated by *Eucalyptus dawsonii* (Slaty Gum) and/or *Eucalyptus moluccana* (Grey Box). *Acacia salicina* (Cooba) and *Allocasuarina luehmannii* (Bulloak). Other trees which may be present include *Brachychiton populneus* subsp. *populneus* (Kurrajong), *Callitris endlicheri* (Black Cypress Pine), *Eucalyptus crebra* (Narrow-leaved Ironbark) and *Eucalyptus punctata* (Grey Gum).	K	Low. Not observed within the study area.	Low.

Community Name	NSW status	Comm. status	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Hunter Valley Vine Thicket in the NSW North Coast and Sydney Basin Bioregions	E3	-	This community occurs strictly within the central Hunter Valley area. The canopy may include *Elaeodendron australe* (Red Olive Plum), *Geijera parviflora* (Wilga), *Notelaea microcarpa* var. *microcarpa* (Native Olive), *Alectryon oleifolius* subsp. *elongatus* (Western Rosewood), *Melia azedarach* (White Cedar) and *Brachychiton populneus* subsp. *populneus* (Kurrajong). Emergent eucalypts are common and include *Eucalyptus albens* (White Box), *E. dawsonii* (Slaty Box) and *E. crebra* (Narrow-leaved Ironbark). A shrub stratum is usually present and includes *Olearia elliptica* subsp. *elliptica* (Sticky Daisy Bush) and *Rhagodia parabolica* (Mealy Saltbush).	K	Low. Not observed within the study area.	Low.
Hunter Valley Weeping Myall Woodland in the Sydney Basin Bioregion	E4	CE	Typically has a dense to open tree canopy up to about 15 m tall, depending on disturbance and regrowth history. The most common tree is *Acacia pendula* (Weeping Myall), which may occur with *Eucalyptus crebra* (Narrow-leaved Ironbark), *A. salicina* (Cooba) and/or trees within the *A. homalophylla* - *A. melvillei* complex.	K	Low. Not observed within the study area.	Low.

Community Name	NSW status	Comm. status	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Kurri Sand Swamp Woodland in the Sydney Basin Bioregion	E3	-	Occurs within the Kurri Kurri – Cessnock area in the Hunter Valley. Occurs on soils developed on poorly-drained Tertiary sand deposits that blanket Permian sediments. The overstorey is usually dominated by *Eucalyptus parramattensis* subsp. *decadens* (Parramatta Red Gum) and *Angophora bakeri* (Narrow-leaved Apple) while other tree species that occur less frequently include *E. racemosa* (Narrow-leaved Scribbly Gum), *E. fibrosa* (Red Ironbark), *E.* sp. aff. *agglomerata* and *Corymbia gummifera* (Red Bloodwood).	K	Low. Not observed within the study area.	Low.
Littoral Rainforest in New South Wales North Coast, Sydney Basin and South East Corner Bioregion	E3	CE	Found along the NSW east coast, this EEC is considered very rare and occurs in many small stands. Predominantly rainforest species, where the canopy is dominated by scattered emergent individuals of sclerophyll species, such as *Angophora costata, Banksia integrifolia, Eucalyptus botryoides* and *Eucalyptus tereticornis*. Several floristic variations between strands and in particular areas localised variants may be recognised.	P	Low. No rainforest vegetation communities occur within the study area.	Low.

Community Name	NSW status	Comm. status	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Lower Hunter Spotted Gum-Ironbark Forest in the Sydney Basin Bioregion	E3	-	Dominated by Spotted Gum *Corymbia maculata* and Broad-leaved Ironbark *Eucalyptus fibrosa*, while Grey Gum *E. punctata* and Grey Ironbark *E. crebra* occur occasionally. The understorey is marked by the tall shrub, *Acacia parvipinnula*, and by the prickly shrubs, *Daviesia ulicifolia*, *Bursaria spinosa*, *Melaleuca nodosa* and *Lissanthe strigosa*.	K	Low. Not observed within the study area.	Low.
Lower Hunter Valley Dry Rainforest in the Sydney Basin and NSW North Coast Bioregions	V2	-	Found in the Lower Hunter Valley, mainly occurring on the Barrington footslopes but is known to occur or have occurred in the Muswellbrook, Singleton, Dungog and Upper hunter local government areas. This community occurs on the Carboniferous sediments in gullies and on steep hillslopes with south facing aspects. Characterised by the common canopy trees, *Elaeocarpus obovatus* (Hard Quandong), *Baloghia inophylla* (Brush Bloodwood), *Streblus brunonianus* (Whalebone Tree), *Mallotus philippensis* (Red Kamala), *Capparis arborea* (Brush Caper Berry), *Olea paniculata* (Native Olive) and *Dendrocnide excelsa* (Giant Stinging Tree). Emergent trees 20 to 30m tall such as *Brachychiton populneus* subsp. *populneus* (Kurrajong), *Corymbia maculata* (Spotted Gum), *Brachychiton discolor* (Lacebark) and *Ficus rubiginosa* (Port Jackson Fig) are often present.	K	Low. Not observed within the study area.	Low.

Community Name	NSW status	Comm. status	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Lowland Rainforest in the New South Wales North Coast and Sydney Basin Bioregions	E3	CE	The Hawkesbury River notionally marks the southern limit of this EEC in the NSW North Coast and Sydney Basin Bioregions. This EEC is a community of subtropical rainforest and some related, structurally complex forms of dry rainforest. Lowland Rainforest in a relatively undisturbed state has a closed canopy, characterised by a high diversity of trees whose leaves may be mesophyllous and encompass a wide variety of shapes and sizes. Includes palms, vines, and vascular epiphytes. In disturbed strands of this community the canopy may be broken or the canopy be smothered by exotic vines.	K	Low. Not observed within the study area.	Low.
River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions	E3	-	Found on the river flats of the coastal floodplains. It has a tall open tree layer of eucalypts, (may exceed 40m), but can be considerably shorter in regrowth stands or under conditions of lower site quality. While the composition of the tree stratum varies considerably, the most widespread and abundant dominant trees include *Eucalyptus tereticornis* (forest red gum), *E. amplifolia* (cabbage gum), *Angophora floribunda* (rough-barked apple) and *A. subvelutina* (broad-leaved apple). *Eucalyptus baueriana* (blue box), *E. botryoides* (Bangalay) and *E. elata* (river peppermint) may be common south from Sydney, *E. ovata* (swamp gum) occurs on the far south coast.	K	Low. Not observed within the study area.	Low.

Community Name	NSW status	Comm. status	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregion	E3	-	Found on the coastal floodplains of NSW occurring on the fringes of coastal estuaries on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains. Associated with grey-black clay-loams and sandy loams where the groundwater is saline or sub-saline. Characterised by a dense layer *of Casuarina glauca* (swamp oak) is the dominant species northwards from Bermagui.	K	Low. Not observed within the study area.	Low.
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregion	E3	-	Found on humic clay loams and sandy loams on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains. Characterised *Eucalyptus robusta* (swamp mahogany), *Melaleuca quinquenervia* (paperbark) and, south from Sydney, *Eucalyptus botryoides* (bangalay) and *Eucalyptus longifolia* (woollybutt).	K	Low. Not observed within the study area.	Low.

Community Name	NSW status	Comm. status	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Sydney Freshwater Wetlands in the Sydney Basin Bioregion	E3	-	Found on the Warriewood and Tuggerah soil landscapes, this community is largely restricted to freshwater swamps in swales and depressions on sand dunes and low nutrient sandplains. Characterised by the lack of saline influence and complex vegetation types restricted of freshwater swamps in coastal areas. Species include sedges and aquatic plants such as *Baumea* species, *Eleocharis sphacelata*, *Gahnia* species, *Ludwigia peploides* subsp. *montevidensis* and *Persicaria* species. Areas of open water may occur where drainage conditions have been altered and there may also be patches of emergent trees and shrubs.	K	Low. Not observed within the study area.	Low.
Themeda grassland on seacliffs and coastal headlands in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	-	*Themeda triandra* is the dominant species in the Themeda Grassland on sea cliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner bioregion ecological community. *Banksia integrifolia* subsp. i*ntegrifolia, Westringia fruticosa* and *Acacia sophorae* occurs as an emergent shrub or as a dense cover where they have recruited over grasslands.	K	Low. No headlands or seacliffs occur within the study area.	Low.

Community Name	NSW status	Comm. status	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Warkworth Sands Woodland in the Sydney Basin Bioregion	E3	CE	Confined to a small area near Warkworth occurring on aeolian sand deposits south of Singleton. Characterised by the low woodland dominated by *Angophora floribunda* (Rough-barked Apple) and *Banksia integrifolia* subsp. *integrifolia* (Coast Banksia). Other tree species may be present such as *Eucalyptus tereticornis* (Forest Red Gum) and *E. glaucina* (Slaty Red Gum).	K	Low. Not observed within the study area.	Low.
White Box Yellow Box Blakely's Red Gum Woodland	E3	CE	Found from the Queensland border to the Victorian border along the tablelands and western slopes of NSW. Commonly co-occurring eucalypts include Apple Box (*E. bridgesiana*), Red Box (*E. polyanthemos*), Candlebark (*E. rubida*), Snow Gum (*E. pauciflora*), Argyle Apple (*E. cinerea*), Brittle Gum (*E. mannifera*), Red Stringybark (*E. macrorhyncha*), Grey Box (*E. microcarpa*), Cabbage Gum (*E. amplifolia*) and others.	K	Low. Not observed within the study area.	Low.

Appendix 7

Significance Assessments

1 SIGNIFICANCE ASSESSMENTS FOR BC ACT/TSC ACT SPECIES

Birds

Glossy Black-cockatoo – Seven part Test TSC Act	Response
Profile: The Glossy Black-cockatoo is listed as Endangered on the BC Act/TSC Act. Inhabits open forest and woodlands of the coast and the Great Dividing Range, feeding almost exclusively on the seeds of several species of she-oak (*Casuarina* and *Allocasuarina* species), shredding the cones with its massive bill (OEH, 2015a). Utilises large hollow-bearing eucalypts for nest sites, laying a single egg between March and May (OEH, 2015a).	
a) In the case of a threatened species, whether an action is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	This species was not recorded during the field surveys. No chewed cones were recorded during surveys, however two records for the Glossy Black-cockatoo have been recorded at Saltash and Tilligerry State Conservation area. The Smooth-barked Apple – Blackbutt – Old Man Banksia Woodland contains a small number of *Allocasuarina torulosa* trees which provide foraging habitat for this species. 0.71 ha (6%) of this community will be impacted upon by the project. 11.76 ha (93%) will be retained. 35 hollow-bearing trees which contain large hollows are considered to provide potential nesting habitat for this species and all of these trees will be retained as part of the project. Whilst the project will remove minor habitat for Glossy Black-cockatoo, it is considered unlikely to have an adverse effect on the life cycle of this species, such that a viable local population will be placed at risk of extinction, particularly as similar habitat is extensive in the locality and some will be retained and protected on-site.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable.
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: *(i) is likely to have an adverse effect on the extent of the ecological community such that its local*	Not Applicable.

Glossy Black-cockatoo – Seven part Test TSC Act	Response
occurrence is likely to be placed at risk of extinction, or *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*	
(d) in relation to the habitat of a threatened species, population or ecological community: *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and* *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*	(i) 0.71 ha (6%) of open forest habitat within the study area will be removed as part of the project. (ii) The project will remove minor areas on the edge of the existing exotic grassland. Connectivity in the south of the study area will not be impacted upon by the project. Therefore, the habitat is unlikely to become fragmented or isolated from other areas of habitat. (iii) No hollow-bearing trees will be removed as part of the project. The habitat to be removed has dense understorey of Bitou Bush and the area to be removed is small compared to the extensive area of habitat that occurs in the Worimi State Conservation Area. Given that no individuals of this species were observed and large areas of habitat occur within the locality, it is considered that minor habitat to be removed within the study area are of relatively low importance.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	The study area is not located near any declared areas of outstanding biodiversity value (AOBV) (previously critical habitat under the TSC Act).
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is no recovery plan for this species.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The project has the potential to contribute to ten Key Threatened Processes. In regard to the Glossy Black-Cockatoo four key threatening processes of Clearing of Native vegetation, invasion of *Lantana camara* and invasion of *Chrysanthemoides monilifera* may affect this species. The project will remove a maximum of 0.71 ha of open forest habitat, which equates to 6% of the open forest habitat within the study area. Construction vehicles during construction could increase the current invasions of *Lantana camara* and *Chrysanthemoides monilifera* within the study area but this potential is proposed to be managed as part of the project development. It is considered that the contribution to these KTPs will be very small.
Conclusion	The project is unlikely to have a significant impact upon the Glossy Black-cockatoo.

Little Lorikeet – Seven part Test TSC Act	Response
Profile: The Little Lorikeet is listed as Vulnerable on the BC Act/TSC Act. Nomadic species that forages in flowering eucalypts and Melaleuca sp. Riparian habitats are used, due to higher soil fertility and greater productivity. Nests in tree hollows. This species feeds on nectar and pollen and occasionally on fruit. Travels in small flocks and roosts in tree tops.	
a) In the case of a threatened species, whether an action is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	This species was not recorded within the study area during the field surveys. The open forest area of the study area provides foraging, roosting and breeding habitat for this species. 0.71 ha of Open Forest will be impacted upon by the project. 11.76 ha (93%) will be retained. 88 hollow-bearing trees considered to provide potential nesting habitat for this species, all of these trees will be retained as part of the project. Whilst the project will remove minor habitat for this species, it is considered unlikely to have an adverse effect on the life cycle of the species such that a viable local population will be placed at risk of extinction.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable.
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not Applicable.
(d) in relation to the habitat of a threatened species, population or ecological community: *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*	(i) 0.71 ha of open forest habitat will be removed as part of the project

Little Lorikeet – Seven part Test TSC Act	Response
(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*	(ii) The project will remove minor areas on the edge of the existing exotic grassland. Connectivity in the south of the study area will not be impacted upon by the project. Therefore, the habitat is unlikely to become fragmented or isolated from other areas of habitat. (iii) The habitat to be removed has dense understorey of Bitou Bush and the area to be removed is small compared to the extensive area of habitat that occurs in the Worimi State Conservation Area. Given that no individuals of this species were observed and large areas of habitat occur within the locality, it is considered that habitats to be removed within the study area are of relatively low importance.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	The study area is not located near any declared areas of outstanding biodiversity value (AOBV) (previously critical habitat under the TSC Act).
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is no recovery plan for this species.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The project has the potential to contribute to ten Key Threatened Processes. In regard to the Little Lorikeet four key threatening processes of Clearing of Native vegetation, invasion of *Lantana camara* and invasion of *Chrysanthemoides monilifera* may affect this species. The project will remove a maximum of 0.71 ha of open forest habitat. Vehicles may increase the current invasions of *Lantana camara* and *Chrysanthemoides monilifera* within the study area but this potential is proposed to be managed as part of the project development. It is considered that the contribution to these KTPs will be very small.
Conclusion	The project is unlikely to have a significant impact upon the Little Lorikeet.

Regent Honeyeater – Seven part Test TSC Act	Response
Profile: The Regent Honeyeater is listed as critically endangered on the BC Act/TSC Act. The habitat for this species is within dry open forest and woodland. Particularly box-ironbark woodland and riparian forests of river sheoak. Feeds on the nectar from a wide range of eucalypts mistletoes and invertebrates. The distribution of this species is confined to Victoria and New South Wales. This species breeds in cup-like nests constructed with bark.	
a) In the case of a threatened species, whether an action is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at	This species was not recorded within the study area. However, low quality potential foraging habitat occurs within the Open Forest.

Regent Honeyeater – Seven part Test TSC Act	Response
risk of extinction	0.71 ha of Open Forest habitat will be removed as a result of this project. The breeding pattern of this species is variable in the timing and movements. The seasonally movements of the Regent Honeyeater can be regular but in some years variability of the timing and pattern of movements and breeding can occur. This is associated with the seasonal patterns in the flowering of key eucalypt species. Whilst the study area does contain foraging habitat for this species, it is likely that it would use the study area on an intermittent basis only. The project will remove some low quality potential foraging habitat for this species. However, it is considered unlikely to have an adverse effect on the life cycle of the Regent Honeyeater such that a viable local population will be placed at risk of extinction.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable.
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not Applicable.
(d) in relation to the habitat of a threatened species, population or ecological community: *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and* *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the*	(i) 0.71 ha of open forest will be removed as part of the project (ii) The project will remove minor areas on the edge of the existing exotic grassland. Connectivity in the south of the study area will not be impacted upon by the project. Therefore, the habitat is unlikely to become fragmented or isolated from other areas of habitat.

Regent Honeyeater – Seven part Test TSC Act	Response
species, population or ecological community in the locality	(iii) The habitat to be removed has dense understorey of Bitou Bush and the area to be removed is small compared to the extensive area of habitat that occurs in the Worimi State Conservation Area. Given that no individuals of this species were observed and large areas of habitat occur within the locality, it is considered that habitats to be removed within the study area are of relatively low importance.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	The study area is not located near any declared areas of outstanding biodiversity value (AOBV) (previously critical habitat under the TSC Act).
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	The National Recovery Plan for the Regent Honeyeater (Department of Environment, 2016) outlines two objectives to assist the recovery of this species as follows: 1. Reverse the long-term population trend of decline and increase the numbers of regent honeyeaters to a level where there is a viable, wild breeding population, even in poor breeding years; and to 2. Enhance the condition of habitat across the regent honeyeater range to maximise survival and reproductive success and provide refugia during periods of extreme environmental fluctuation. The project is unlikely to affect the objectives of the national recovery plan for the Regent Honeyeater
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The project has the potential to contribute to ten Key Threatened Processes. In regard to the Regent Honeyeater three key threatening processes of Clearing of Native vegetation, invasion of *Lantana camara* and invasion of *Chrysanthemoides monilifera* may affect this species. Vehicles may increase the current invasions of *Lantana camara* and *Chrysanthemoides monilifera* within the study area but this potential is proposed to be managed as part of the project development. It is considered that the contribution to these KTPs will be very small.
Conclusion	The project is unlikely to have a significant impact upon the Regent Honeyeater.

Swift Parrot – Seven part Test TSC Act	Response
Profile: The Swift Parrot is listed as endangered on the BC Act/TSC Act. This species breeds in Tasmania and migrates to south-eastern mainland Australia in Mar-Oct. Winter-flowering trees such as *Eucalyptus robusta*, *Corymbia maculata*, *C. gummifera*, *E. sideroxylon* and *E. albens* provide foraging habitat for this species.	
a) In the case of a threatened species, whether an action is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	This species was not recorded within the study area. However, potential foraging habitat occurs within the Open Forest. 0.71 ha of Open Forest habitat will be removed as a result of this project. Whilst the study area does contain foraging habitat for this species, it is likely to use the study area on an intermittent basis only. This species breeds in Tasmania and the project is unlikely to affect movements of this species to and from the Tasmanian breeding grounds. Whilst the project will remove a minor area of foraging habitat for this species it is considered unlikely to have an adverse effect on the life cycle of the Swift Parrot such that a viable local population will be placed at risk of extinction.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable.
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not Applicable.
(d) in relation to the habitat of a threatened species, population or ecological community: *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *(ii) whether an area of habitat is*	(i) 0.71 ha of open forest will be removed as part of the project. (ii) The project will remove minor areas of open forest. Connectivity within the study area is unlikely to be impacted upon by the project. Therefore, the habitat is unlikely to

Swift Parrot – Seven part Test TSC Act	Response
likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*	become fragmented or isolated from other areas of habitat. (iii) The habitat to be removed has dense understorey of Bitou Bush and the area to be removed is small compared to the extensive area of habitat that occurs in the Worimi State Conservation Area. Given that no individuals of this species were observed and large areas of habitat occur within the locality, it is considered that habitats to be removed within the study area are of relatively low importance.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	The study area is not located near any declared areas of outstanding biodiversity value (AOBV) (previously critical habitat under the TSC Act).
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	The National Recovery Plan for the Swift Parrot (Saunders and Tzaros, 2011) outlines two objectives to assist the recovery of this species as follows: 1. To prevent further decline of the Swift Parrot population. 2. To achieve a demonstrable sustained improvement in the quality and quantity of Swift Parrot habitat to increase carrying capacity. The project is unlikely to affect the objectives of the national recovery plan for the Swift Parrot.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The project has the potential to contribute to ten Key Threatened Processes. In regard to the Swift Parrot three key threatening processes of Clearing of Native vegetation, invasion of *Lantana camara* and invasion of *Chrysanthemoides monilifera* may affect this species. Vehicles may increase the current invasions of *Lantana camara* and *Chrysanthemoides monilifera* within the study area but this potential is proposed to be managed as part of the project development. It is considered that the contribution to these KTPs will be very small.
Conclusion	The project is unlikely to have a significant impact upon the Swift Parrot.

White-bellied Sea Eagle – Seven part Test TSC Act	Response
Profile: White-bellied Sea Eagle is listed as Vulnerable on the BC Act/TSC Act Distributed along the coastline of Australia, also extending inland along some larger waterways. Habitat includes large areas of open water. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland and forest. Breeding territories are close to water, mainly in tall open forest or woodland, although nests are sometimes located in other habitats such as dense forest, closed scrub or in remnant trees on cleared land.	

White-bellied Sea Eagle – Seven part Test TSC Act	Response
a) In the case of a threatened species, whether an action is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	The White-bellied Sea Eagle was recorded flying over and roosting near the large stick nest in the south of the study area. The study area provides foraging habitat and breeding habitat for this species within the open forest and marginal foraging habitat within the exotic grassland. A large stick nest was recorded in the south of the study which is likely to be a White-bellied Sea Eagle nest. This nest will be retained as part of the project and no works will be required within approximately 200m from the tree containing the nest. 0.71 ha of Open Forest habitat and 3.97 ha of exotic grasslands will be removed as part of this project. Whilst the project will remove minor foraging habitat for the White-bellied Sea Eagle, it is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population will be placed at risk of extinction.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable.
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not Applicable.
(d) in relation to the habitat of a threatened species, population or ecological community: *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of*	(i) 0.71 ha of open forest and 3.97 ha of exotic grasslands (foraging habitat) will removed as part of the project. (ii) The project will remove minor areas on the edge of the existing exotic grassland. Connectivity within the study area is unlikely to be impacted upon by the project. Therefore, the habitat is unlikely to become fragmented or isolated from other areas of habitat.

White-bellied Sea Eagle – Seven part Test TSC Act	Response
habitat as a result of the proposed action, and *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*	(iii) The nest tree will be retained for this species and no works will be required within approximately 200m from the tree containing the nest. Small areas of potential of open forest foraging habitat (0.71) and 3.97 ha of exotic grassland will be impacted upon by the project. Large areas of habitat for this species occur within the surrounding environment of the Worimi State Conservation Area and ocean habitat to the east of the study area. It is considered that habitats to be removed within the study area are of low importance.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	The study area is not located near any declared areas of outstanding biodiversity value (AOBV) (previously critical habitat under the TSC Act).
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is currently no recovery plan for this species.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The project has the potential to contribute to ten Key Threatened Processes. Regarding the White-bellied Sea Eagle one key threatening process of Clearing of Native vegetation may affect this species. The project will remove a maximum of 0.71 ha of open forest and 3.97 ha of exotic grassland habitat. It is considered that the contribution to these KTPs will be minor.
Conclusion	The project is unlikely to have a significant impact upon the White-bellied Sea Eagle.

Dusky Woodswallow – Seven part Test TSC Act	Response
Profile: The Dusky Woodswallow is listed as Vulnerable on the BC Act/TSC Act. Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. Dusky Woodswallows are widespread in eastern, southern and south western Australia. The species occurs throughout most of New South Wales, but is sparsely scattered in, or largely absent from, much of the upper western region. Most breeding activity occurs on the western slopes of the Great Dividing Range. Eats invertebrates and insects captured whilst hovering over the canopy or water (OEH Threatened Species Profile).	
a) In the case of a threatened species, whether an action is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	This species was not recorded within the study area. Habitat for this species occurs in the open forest. The project will remove a small area of open forest habitat (0.71ha) for this species. A large expanse of high quality habitat occurs in close proximity within Fullerton Cove and the adjoining Worimi State Conservation Area. Whilst the project will affect minor habitat for this species it is considered unlikely to have an adverse effect on the life cycle of the Dusky Woodswallow such that a viable local population will be placed

Dusky Woodswallow – Seven part Test TSC Act	Response
	at risk of extinction.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable.
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not Applicable.
(d) in relation to the habitat of a threatened species, population or ecological community: *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and* *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*	(i) 0.71 ha of open forest habitat will be removed as part of the project (ii) The project will affect minor existing open forest habitat. However, this is unlikely to fragment or isolate habitat from other areas of habitat of this species than that which is already is occurring. (iii) The project will remove a small area open forest habitat (0.71 ha). A large expanse of high quality habitat occurs in close proximity within Fullerton Cove and the adjoining Worimi State Conservation Area. It is considered to be likely of low importance that is likely to impact upon the long-term survival of this species in the locality.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	The study area is not located near any declared areas of outstanding biodiversity value (AOBV) (previously critical habitat under the TSC Act).
(f) whether the action proposed is consistent with the objectives or actions of a recovery	There is no recovery plan for this species.

Dusky Woodswallow – Seven part Test TSC Act	Response
plan or threat abatement plan	
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The project has the potential to contribute to ten Key Threatened Processes. In regard to the Dusky Woodswallow three key threatening processes of Clearing of Native vegetation, invasion of *Lantana camara,* invasion of native plant communities by exotic perennial grasses and invasion of *Chrysanthemoides monilifera* may affect this species. Vehicles may increase the current invasions of *Lantana camara,* exotic perennial grasses and *Chrysanthemoides monilifera* within the study area but this potential is proposed to be managed as part of the project development. It is considered that the contribution to these KTPs will be very small.
Conclusion	The project is unlikely to have a significant impact upon the Dusky Woodswallow.

Forest Owls – Seven part Test TSC Act	Response
Profile: Powerful Owl is listed as Vulnerable on the BC Act/TSC Act Endemic to eastern and south-eastern Australia, mainly on the coastal side of the Great Dividing Range. Inhabits a range of vegetation types, from woodland and open Sclerophyll forest to tall open wet forest and rainforest. **Profile: Masked Owl is listed as Vulnerable on the BC Act/TSC Act** Extends from the coast where it is most abundant to the western plains. Lives in dry eucalypt forests and woodlands from sea level to 1100m.	
a) In the case of a threatened species, whether an action is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	The Powerful Owl was observed on 1st May 2018 during playback surveys in the south of the study area and was calling on the 2nd May 2018 from the same location. The Masked Owl was not recorded within the study area despite targeted surveys. The study area provides foraging habitat for forest owl species within the open forest and grassland habitats. 20 potential nesting trees with hollows over 30 cm were recorded in the open forest habitat. No evidence of nesting pairs was recorded. All of these trees will be retained as part of the project. Prey species such as gliders, possums and small terrestrial mammals were recorded throughout the study area. Whilst the project will remove minor habitat for forest owls, it is considered unlikely to have an adverse effect on the life cycle of these species such that a viable local population will be placed at risk of extinction.

Forest Owls – Seven part Test TSC Act	Response
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable.
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not Applicable.
(d) in relation to the habitat of a threatened species, population or ecological community: *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and* *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*	(i) 0.71 ha of open forest and 3.97ha of grassland (marginal foraging habitat) will be removed as part of the project. (ii) The project will affect minor existing open forest habitat. However, this is unlikely to fragment or isolate habitat from other areas of habitat of this species than that which is already is occurring. (iii) The habitat to be removed is small compared to the extensive area of habitat that occurs in the Worimi State Conservation Area. Large areas of habitat occur within the locality, it is considered that habitats to be removed within the study area are of relatively low importance. Areas of the study area to be impacted by the project contain no potential nesting habitat, small areas of potential roosting habitat and foraging habitat. It is considered that habitats to be removed within the study area are of low importance.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	The study area is not located near any declared areas of outstanding biodiversity value (AOBV) (previously critical habitat under the TSC Act).
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	A recovery plan has been prepared for Large Forest Owls, Powerful Owl, Masked Owl and Sooty Owl (DEC 2006). The has eight objectives as follows:

Forest Owls – Seven part Test TSC Act	Response
	1. Model and map owl habitat and validate with surveys 2. Monitor owl population parameters 3. Audit forestry prescriptions 4. Manage and protect habitat off reserves and state forest 5. Minimise further loss and fragmentation of habitat by protection and more informed management of significant owl habitat (including protection of individual nest sites 6. Undertake research 7. Increase community awareness and involvement in owl conservation 8. Provide organisational support and integration It is considered that the project is generally consistent with the management actions outlined by this recovery plan.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The project has the potential to contribute to ten Key Threatened Processes. In regard to Forest Owls one key threatening processes of Clearing of Native vegetation and may affect this species. The project will remove a maximum of 0.71 ha of open forest and 3.97 ha of grassland foraging habitat. It is considered that the contribution to these KTP will be minor.
Conclusion	The project is unlikely to have a significant impact upon the Masked Owl or the Powerful Owl.

Mammals

Koala – Seven part Test TSC Act	Response
Profile: The Koala is listed as Vulnerable on the BC Act/TSC Act. Found in eucalypt woodlands and forest foraging on preferred food trees. Koalas will feed almost exclusively on a small number of preferred species. The preferred tree species vary widely on a regional and local basis.	
a) In the case of a threatened species, whether an action is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	No Koalas, or any evidence of the presence of Koalas, was recorded within the study area during the field surveys. Whilst a large population of Koalas occurs within the Port Stephens LGA, minimal records have been recorded within and immediately surrounding the study area. 0.71 ha of open forest habitat will be removed as part of the project. No food tree species listed by the Port Stephens Council Comprehensive Koala Plan of Management or the NSW Recovery Plan for the North Coast KMA will be impacted. The study area has been mapped as primarily no koala habitat or at the periphery supplementary Koala habitat under the CKPoM and therefore an assessment under the CKPoM has been conducted in Appendix 9. This assessment concluded that the consent for the development should not be withheld on Koala habitat grounds. The project is unlikely to have an adverse effect on the lifecycle of this species such that a viable local population will be placed at risk of extinction.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable.
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*	Not Applicable.

Koala – Seven part Test TSC Act	Response
(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction	
(d) in relation to the habitat of a threatened species, population or ecological community: *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and* *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*	(i) 0.71 ha of open forest habitat will be removed as part of the project (ii) Whilst no preferred feed trees are present, the native vegetation in the south of the study area is part of a native vegetation corridor which provides connectivity for Koala movements. This vegetation will be retained as part of the project. The project will affect minor existing open forest habitat. However, this is unlikely to fragment or isolate habitat from other areas of habitat of this species than that which is already is occurring. (iii) Given no Koala feed trees were present and the vegetation types to impacted and the extent of forested areas to be retained within the study area, it is considered that habitats to be removed within the study area are of low importance to this species.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	The study area is not located near any declared areas of outstanding biodiversity value (AOBV) (previously critical habitat under the TSC Act).
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	The recovery plan that has been prepared for the Koala and aims to: • reverse the decline of the koala in NSW; • ensure adequate protection, management and restoration of Koala habitat; and • maintain healthy and breeding populations of koalas are present throughout their current range. Specific objectives of the plan are to: • conserve koalas in their existing habitat; • rehabilitate and restore koala habitat and populations; • develop a better understanding of the conservation biology of koalas; • ensure that the community has access to factual information about the distribution, conservation and management of koalas at a national, state and local scale; • manage captive, sick or injured koalas and orphaned wild koalas to ensure consistent and high standards of

Koala – Seven part Test TSC Act	Response
	care; and • manage over-browsing to prevent both koala starvation and ecosystem damage in discrete patches of habitat. Although the project would include removal of a small area of potential habitat for the Koala, it is unlikely to affect the conservation of koalas. Future restoration by the WLALC Green Team is actually like to increase Koala habitat. Furthermore, the assessment under the CKPoM found that the project is unlikely to impact upon on any preferred Koala feed trees, will retain over 98% of the koala habitat and will retain connectivity for Koala movements as part of the project.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The project has the potential to contribute to ten Key Threatened Processes. In regard, to the Koala one key threatening processes of Clearing of Native vegetation may affect this species. No Koala feed trees will be removed as part of the project and therefore, the project is unlikely to exacerbate this KTP to any significant degree.
Conclusion	The project is unlikely to have a significant impact upon the Koala.

Brush-tailed Phascogale – Seven part Test TSC Act	Response
Profile: The Brush-tailed Phascogale is listed as Vulnerable on the BC Act/TSC Act. The Brush-tailed Phascogale occurs along the coast of Australia. Mainly found in NSW east to the Great Dividing Range. Prefers dry sclerophyll open forest with a sparse groundlayer. Other habitats include heath, swamps, rainforest and wet sclerophyll forest. Is an agile climber and prefers to forge in rough barked trees. Feeds on arthropods, invertebrates, nectar and sometimes small vertebrates. Nests in tree hollows. Mating occurs in May-July (OEH Threatened Species Profile).	
a) In the case of a threatened species, whether an action is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	This species was not recorded within the study area during the field surveys. Habitat for this species occurs within the open forest and heath habitats. The project will remove 0.71 ha of open forest (6%) and 4.86 ha (25%) of heath habitat within the study area. 88 hollow-bearing trees recorded throughout the study area provide potential nesting habitat. All of the hollow-bearing trees will be retained as part of the project. A large expanse of high quality habitat occurs in the adjoining Worimi State Conservation Area. Whilst the project will affect

Brush-tailed Phascogale – Seven part Test TSC Act	Response
	habitat for this species it is considered unlikely to have an adverse effect on the life cycle of the Brush-tailed Phascogale such that a viable local population will be placed at risk of extinction.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable.
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not Applicable.
(d) in relation to the habitat of a threatened species, population or ecological community: *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and* *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*	(i) The project will remove 0.71 ha of open forest (6%) and 4.86 ha (25%) of heath habitat. (ii) The project will affect minor existing open forest and heath habitats for this species. An existing access track located in the north of the site traversing heath habitat will be widened. This track will provide access to the beach for walking and quad bike riding. It is unlikely to disrupt movements of Brush-tailed Phascogale as the width of the road is small and not fenced. Furthermore, this species is nocturnal, and no quad bike riding will occur after sunset. Therefore, it is unlikely to result in vehicle strikes for the species. Connectivity in the south of the study area through open forest habitat will not be impacted upon by the project. Therefore, the habitats are unlikely to become fragmented or isolated from other areas of habitat. The project will affect minor existing open forest and heath

Brush-tailed Phascogale – Seven part Test TSC Act	Response
	habitats. However, this is unlikely to fragment or isolate habitat from other areas of habitat of this species than that which is already is occurring. (iii) Over 93% of the open forest habitat and 75% of the heath habitat will be retained as part of the project. This removal is minor compared to the extensive area of habitat that occurs to the north in the Worimi State Conservation Area. Given that no individuals of this species were observed, and large areas of habitat occur within the locality, it is considered that habitats to be removed within the study area are of relatively low importance.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	The study area is not located near any declared areas of outstanding biodiversity value (AOBV) (previously critical habitat under the TSC Act).
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	No recovery Plan has been prepared for the Brush-tailed Phascogale.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The project has the potential to contribute to ten Key Threatened Processes. In regard to the Brush-tailed Phascogale four key threatening processes of Clearing of Native vegetation, invasion of *Lantana camara*, invasion of *Chrysanthemoides monilifera*, removal of dead wood and trees. The project will remove a maximum of 0.71 ha of open forest and 4.86 ha of heath habitat. All fallen timber and dead trees will be relocated to adjoining native vegetation. It is considered that the contribution to these KTPs will be minor.
Conclusion	The project is unlikely to have a significant impact upon the Brush-tailed Phascogale.

Long-nosed Potoroo – Seven part Test TSC Act	Response
Profile: The Long-nosed Potoroo is listed as Vulnerable on the BC Act/TSC Act. Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or Melaleucas. Diet includes fungi, roots, tubers, insects and soft bodied animals in the soil. Nocturnal and hides during the day in dense vegetation.	
a) In the case of a threatened species, whether an action is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of	The Long-nosed Potoroo was not recorded within the study area during the field surveys. Habitat for this species occurs within the open forest and heath habitats in the areas of dense understorey cover.

Long-nosed Potoroo – Seven part Test TSC Act	Response
extinction	0.71 ha of open forest (6%) and 3.97 ha of heath habitat (25%) will be removed as part of the project. The project has been placed within the mostly disturbed areas to minimise native vegetation removal. Large areas of habitat will be retained as part of the project and the adjoining Worimi State Conservation Area also provides future protection of habitat this species. The project is unlikely to have an adverse effect on the lifecycle of this species such that a viable local population will be placed at risk of extinction.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not Applicable.
(d) in relation to the habitat of a threatened species, population or ecological community: *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and* *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-*	(i) 0.71 ha of open forest and 3.97 ha of heath habitat will be removed as part of the project. (ii) The project will affect minor existing open forest and heath habitats for this species. An existing access track located in the north of the site traversing heath habitat will be widened. This track will provide access to the beach for walking and quad bike riding. This will involve an increase in vehicle movements. It is unlikely to disrupt movements of Long-nosed Potoroo as the width of the road is small and not fenced. Furthermore, this species is nocturnal, and no quad bike riding will occur after sunset. It is unlikely to result in vehicle strikes for the species.

Long-nosed Potoroo – Seven part Test TSC Act	Response
term survival of the species, population or ecological community in the locality	Connectivity in the south of the study area through open forest habitat will not be impacted upon by the project. Therefore, the habitats are unlikely to become fragmented or isolated from other areas of habitat. (iii) Over 93% of the open forest habitat and 75% of the heath habitat will be retained as part of the project. This removal is minor compared to the extensive area of habitat that occurs in the Worimi State Conservation Area. Given that no individuals of this species were observed, and large areas of habitat occur within the locality, it is considered that habitats to be removed within the study area are of relatively low importance.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	The study area is not located near any declared areas of outstanding biodiversity value (AOBV) (previously critical habitat under the TSC Act).
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is no recovery plan for this species.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The project has the potential to contribute to ten Key Threatened Processes. In regard to the Long-nosed Potoroo five key threatening processes of Clearing of Native vegetation, spread of exotic perennial grasses, invasion of *Chrysanthemoides monilifera,* invasion of *Lantana camara*, and removal of dead wood and trees may affect this species. All fallen timber and dead trees will be relocated to adjoining native vegetation. It is considered that the contribution to these KTPs will be minor.
Conclusion	The project is unlikely to have a significant impact upon the Long-nosed Potoroo.

Spotted-tail Quoll – Seven part Test TSC Act	Response
Profile: The Spotted-tailed Quoll is listed as Vulnerable on the BC Act/TSC Act. A variety of vegetation such as rainforest, open forest, woodland, coastal heath, inland riparian forest. Have home ranges 750 - 3500 ha. Den sites may be located in hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky cliffs. The Spotted-tailed Quoll will hunt possums and gliders in tree hollows and prey on roosting birds. A generalist predator with a preference for medium-sized (500g-5kg) mammals. Consumes a variety of prey, including gliders, possums, small wallabies, rats, birds, bandicoots, rabbits, reptiles and insects.	
a) In the case of a threatened species, whether an action is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	This species was not recorded during the field surveys. The study area provides foraging habitat for this species. No den sites were observed within the study area. However, habitat features such as hollow-bearing trees and fallen timber, were present within the study area,

Spotted-tail Quoll – Seven part Test TSC Act	Response
	providing potential den sites for this species. 88 hollow-bearing trees recorded within the study area may provide roosting and breeding habitat. All the hollow-bearing trees will be retained as part of the project. 0.71 ha of Open Forest, 4.86 ha heath and 3.97 ha of grasslands will be removed as part of this project. The project will retain 94% of the open forest habitat, 75% of the heath habitat and 54% of the grassland habitat. The project will remove some areas of habitat for this species however, due to the extent of habitat to be retained, it is considered the project is unlikely to have an adverse effect on the lifecycle of this species such that a viable local population will be placed at risk of extinction.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable.
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not Applicable.
(d) in relation to the habitat of a threatened species, population or ecological community: *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and* *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*	(i) 0.71 ha of open forest, 4.86 ha of heath and 3.97 ha of grassland will be removed as part of the project (ii) The project will affect minor existing open forest heath and grassland habitats for this species. An existing access track located in the north of the site traversing heath habitat will be widened. This track will provide access to the beach for walking and quad bike riding. This will involve an increase in vehicle movements. It is unlikely to disrupt movements of Spotted-tailed Quoll as the width of the road is small and not fenced. Furthermore, this species is nocturnal, and no quad bike riding will occur after sunset. Therefore, it is unlikely to result in vehicle strikes for the species. Connectivity in the south of the study area through open forest habitat will not be impacted upon by the project. Therefore, the habitats are unlikely to become fragmented or isolated

Spotted-tail Quoll – Seven part Test TSC Act	Response
	from other areas of habitat. (iii) Over 93% of the open forest habitat and 75% of the heath habitat will be retained as part of the project. This removal is minor compared to the extensive area of habitat that occurs in the Worimi State Conservation Area. Given that no individuals of this species were observed, and large areas of habitat occur within the locality, it is considered that habitats to be removed within the study area are of relatively low importance.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	The study area is not located near any declared areas of outstanding biodiversity value (AOBV) (previously critical habitat under the TSC Act).
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	A national Recovery Plan for the Spotted-tailed Quoll outlines eleven objectives as follows: 1. Determine the distribution and status of Spotted-tailed Quoll populations throughout the range, and identify key threats and implement threat abatement management practices. 2. Investigate key aspects of the biology and ecology of the Spotted-tailed Quoll to acquire targeted information to aid recovery. 3. Reduce the rate of habitat loss and fragmentation on private land. 4. Evaluate and manage the risk posed by silvicultural practices. 5. Determine and manage the threat posed by introduced predators (foxes, cats, wild dogs) and of predator control practices on Spotted-tailed Quoll populations. 6. Determine and manage the impact of fire regimes on Spotted-tailed Quoll populations. 7. Reduce deliberate killings of Spotted-tailed Quolls. 8. Reduce the frequency of Spotted-tailed Quoll road mortality. 9. Assess the threat Cane Toads pose to Spotted-tailed Quolls and develop threat abatement actions if necessary. 10. Determine the likely impact of climate change on Spotted-tailed Quoll populations. 11. Increase community awareness of the Spotted-tailed Quoll and involvement in the Recovery Program. Although the project would include removal of a small

Spotted-tail Quoll – Seven part Test TSC Act	Response
	area of potential habitat for the Spotted-tailed Quoll, it is unlikely to affect the conservation of Spotted-tailed Quoll or interfere with any of the other objectives of the recovery plan.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The project has the potential to contribute to ten Key Threatened Processes. In regard to Spotted-tailed Quoll three key threatening processes of Clearing of Native vegetation, spread of exotic perennial grasses, invasion of *Chrysanthemoides monilifera,* invasion of *Lantana camara*, and removal of dead wood and trees may affect this species. It is considered that the project will exacerbate these KTPs to a small degree.
Conclusion	The project is unlikely to have a significant impact upon the Spotted-tailed Quoll.

Squirrel Glider – Seven part Test TSC Act	Response
Profile: The Squirrel Glider is listed as Vulnerable on the BC Act/TSC Act. Inhabits mature or old growth box, box-ironbark woodlands and river red gum forest west of the Great Dividing Range. Prefers mixed species stands with a shrub or Acacia mid-storey. Uses tree hollows as den sites.	
a) In the case of a threatened species, whether an action is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	This species was not recorded within the study area during the field surveys. Habitat for this species occurs within the open forest habitat. The project will remove 0.71 ha of open forest (6%) and 4.86 ha (25%) of heath habitat within the study area. 88 hollow-bearing trees recorded throughout the study area may provide roosting and breeding habitat. All of the hollow-bearing trees will be retained as part of the project. The Draft Squirrel Glider Management Guidelines for Lake Macquarie (LMCC, 2015) provides a guideline to the likely risk to the viability of a Squirrel Glider population relative to patch size (or minimum habitat size), and is as follows: • <4ha – unsuitable for permanent occupancy; • 4-30ha – high risk of local extinction; • 30-100ha – moderate to low risk in the short-term (50-100 years) & high risk in the long-term; & • 100-1000ha – no risk in the short-term & a low

Squirrel Glider – Seven part Test TSC Act	Response
	to moderate risk in the long-term. Based on this guideline, the potential Squirrel Glider population within the study area is at no risk in the short-term and low to moderate risk in the long term. The project will remove some areas of habitat for this species however, due to the extent of habitat to be retained and the patch size in the wider locality, it is considered the project is unlikely to have an adverse effect on the lifecycle of this species such that a viable local population will be placed at risk of extinction.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable.
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not Applicable.
(d) in relation to the habitat of a threatened species, population or ecological community: *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and* *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*	(i) The project will remove 0.71 ha of open forest (6%) and 4.86 ha (25%) of heath habitat. (ii) The project will affect minor existing open forest and heath habitats for this species. An existing access track located in the north of the site traversing heath habitat will be widened. This track will provide access to the beach for walking and quad bike riding. It is unlikely to disrupt movements of Brush-tailed Phascogale as the width of the road is small and not fenced. Furthermore, this species is nocturnal, and no quad bike riding will occur after sunset. Therefore, it is unlikely to result in vehicle strikes for the species. Connectivity in the south of the study area through open forest habitat will not be impacted upon by the project. Therefore, the habitats are unlikely to become fragmented or isolated from other areas of habitat.

Squirrel Glider – Seven part Test TSC Act	Response
	The project will affect minor existing open forest and heath habitats. However, this is unlikely to fragment or isolate habitat from other areas of habitat of this species than that which is already is occurring. (iii) Over 93% of the open forest habitat and 75% of the heath habitat will be retained as part of the project. This removal is minor compared to the extensive area of habitat that occurs to the north in the Worimi State Conservation Area. Given that no individuals of this species were observed, and large areas of habitat occur within the locality, it is considered that habitats to be removed within the study area are of relatively low importance.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	The study area is not located near any declared areas of outstanding biodiversity value (AOBV) (previously critical habitat under the TSC Act).
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is no recovery plan for this species.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The project has the potential to contribute to ten Key Threatened Processes. In regard to the Squirrel Glider four key threatening processes of Clearing of Native vegetation, invasion of *Lantana camara*, invasion of *Chrysanthemoides monilifera*, removal of dead wood and trees. The project will remove a maximum of 0.71 ha of open forest and 4.86 ha of heath habitat. All fallen timber and dead trees will be relocated to adjoining native vegetation. It is considered that the contribution to these KTPs will be minor.
Conclusion	The project is unlikely to have a significant impact upon the Squirrel Glider.

Grey-headed Flying Fox – Seven part Test TSC Act	Response
Profile: The Grey-headed Flying-Fox is listed as Vulnerable on the BC Act/TSC Act. This species is generally found within 200 km of Australia's eastern coast. Generally, occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are commonly found in gullies, close to water, in vegetation with a dense canopy.	

Grey-headed Flying Fox – Seven part Test TSC Act	Response
a) In the case of a threatened species, whether an action is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	This species was recorded flying over and the with a call heard in the south west of the study area. No camps were observed. The areas of Open Forest and heath habitats are likely to provide suitable foraging habitat for this species. The project is likely to impact upon 0.71 ha of open forest habitat and 4.86 ha of heath habitat. Given that no breeding or roosting activity was recorded in the study area and the extent of suitable foraging habitats to be retained effect on the life cycle of the Grey-headed Flying Fox such that a viable local population will be placed at risk of extinction.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable.
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not Applicable.
(d) in relation to the habitat of a threatened species, population or ecological community: *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and* *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species,*	(i) 0.71 ha of open forest habitat and 4.86 ha of heath habitat will be removed as part of the project (ii) The project will affect minor existing habitat. However, this is unlikely to fragment or isolate habitat from other areas of habitat of this species than that which is already is occurring. (iii) The habitat to be removed is small compared to the extensive area of habitat that occurs in the Worimi State Conservation Area. Large areas of habitat occur within the locality, it is considered that habitats to be removed within the study area are of relatively low importance. Areas of the study

Grey-headed Flying Fox – Seven part Test TSC Act	Response
population or ecological community in the locality	area to be impacted by the project contain only small areas of potential roosting habitat and foraging habitat. It is considered that habitats to be removed within the study area are of low importance.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	The study area is not located near any declared areas of outstanding biodiversity value (AOBV) (previously critical habitat under the TSC Act).
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	The Draft National Recovery Plan for the Grey-headed Flying Fox, (Department of Environment and Energy, 2017) outlines nine objectives to assist the recovery of this species as follows: • Objective 1: To identify protect and enhance native foraging habitat critical to the survival of the Grey-headed Flying Fox • Objective 2: Identify, protect and enhance roosting habitat of Grey-headed Flying-fox camps. • Objective 3: Determine population trends in Grey-headed Flying-foxes so as to monitor the species' national distribution and conservation status. • Objective 4: Build community capacity to coexist with flying-foxes and minimise the impacts on urban settlements from existing camps without resorting to dispersal • Objective 5: Increase public awareness and understanding of Grey-headed Flying-foxes and the recovery program, and involve the community in the recovery program where appropriate. • Objective 6: Improve the management of Grey-headed Flying-fox camps in sensitive areas. • Objective 7: Significantly reduce levels of deliberate Grey-headed Flying-fox destruction associated with commercial horticulture. • Objective 8: Support research activities that will improve the conservation status and management of Grey-headed Flying-foxes. • Objective 9: Assess and reduce the impact on Grey-headed Flying-foxes of electrocution on power lines, and entanglement in netting and on barbed-wire. The project is unlikely to affect the objectives of the draft national recovery plan for the Grey-headed Flying-Fox.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The project has the potential to contribute to nine Key Threatened Processes. In regard to this species one key threatening processes of Clearing of Native Vegetation is relevant. The project is unlikely to exacerbate this KTP to any significant degree.

Grey-headed Flying Fox – Seven part Test TSC Act	Response
Conclusion	The project is unlikely to have a significant impact upon the Grey-headed Flying Fox.

Hollow-dwelling bats – Seven part Test TSC Act	Response
Profile: Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) listed as Vulnerable on the BC Act/TSC Act. Found on the south-east coast and ranges of Australia, from Southern Queensland to Victoria and Tasmania. Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. **Profile: Eastern Freetail Bat (*Mormopterus norfolkensis*) listed as Vulnerable on the BC Act/TSC Act.** The Eastern Freetail-Bat is found along the east coast from Southern QLD to Southern NSW. Occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark. **Profile: Little Bent-wing Bat (*Miniopterus australis*) listed as Vulnerable on the BC Act/TSC Act. Recorded.** Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Little Bentwing-Bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. **Profile: Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*) listed as Vulnerable on the BC Act/TSC Act.** Wide-ranging species found across northern and eastern Australia. Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. **Profile: Greater Broad-nosed Bat (*Scoteanax rueppellii*) listed as Vulnerable on the BC Act/TSC Act.** Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. This species usually roosts in tree hollows.	
a) In the case of a threatened species, whether an action is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	One of these species, the Little Bentwing-bat was recorded by Anabat within the study area. The open forest and heath habitats provides foraging, roosting and breeding habitat for these species. 88 hollow-bearing trees recorded throughout the study area which provides roosting and breeding habitat. No hollow-bearing trees will be removed as a result of the project. 0.71 ha of Open Forest habitat and 4.86ha of heath habitat (foraging habitat) will be removed as part of this project. Micro-bat species are insectivorous and the reduction in this extent of foraging and roosting habitat is unlikely to impact on the availability of foraging resources. The project is unlikely to effect on the lifecycle of these species such that of a viable local population, will be placed at risk of extinction.

Hollow-dwelling bats – Seven part Test TSC Act	Response
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable.
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not Applicable.
(d) in relation to the habitat of a threatened species, population or ecological community: *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and* *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*	(i) 0.71 ha of open forest habitat and 4.86 ha of heath habitat will be removed as part of the project. (ii) The project will affect minor existing open forest and heath habitats. However, this is unlikely to fragment or isolate habitat from other areas of habitat of this species than that which is already is occurring. (iii) The open forest and heath habitats to be removed is small compared to the extensive area of habitat that occurs in the Worimi State Conservation Area. Given that no individuals of these species were observed, and large areas of habitat occur within the locality, it is considered that habitats to be removed within the study area are of relatively low importance.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or	The study area is not located near any declared areas of outstanding biodiversity value (AOBV) (previously critical habitat under the TSC Act).

Hollow-dwelling bats – Seven part Test TSC Act	Response
indirectly)	
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There are no recovery plans for these species.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The project has the potential to contribute to nine Key Threatened Processes. In regard to Hollow-dependant micro bats one key threatening processes of Clearing of Native vegetation is of most relevance. The project will remove a minor amount of habitat for these species therefore, it is considered that the contribution to these KTPs will be minor.
Conclusion	The project is unlikely to have a significant impact upon the Eastern False Pipistrelle, Eastern Freetail Bat, Little Bent-wing Bat, Yellow-bellied Sheathtail Bat and Greater Broad-nosed Bat.

Cave-dwelling bats – Seven part Test TSC Act	Response
Profile: Large-eared Pied Bat (*Chalinolobus dwyeri*) listed as Vulnerable on the BC Act/TSC Act. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin, frequenting low to mid-elevation dry open forest and woodland close to these features. Also found in well-timbered areas containing gullies. **Profile: Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*) listed as Vulnerable on the BC Act/TSC Act.** Forages in a range of habitat types. Roosts in caves, derelict mines, culverts and other man-made structures. Form maternity colonies that are faithful to particular caves. **Profile: Southern Myotis (*Myotis macropus*) listed as Vulnerable on the BC Act/TSC Act.** Forages over streams and pools catching insects and small fish by raking their feet across the water surface. Roost close to water in caves, mine shafts, tree hollows and man-made structures.	
a) In the case of a threatened species, whether an action is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	No cave dependant micro bats were recorded within the study area. The forested sections of the study area provide foraging habitat for Eastern Bent-wing Bat and the Large-eared Pied Bat. Limited roosting and breeding habitat for the Southern Myotis however, no aquatic habitat occurs within the study area. No roosting or breeding habitat in the form of caves and other structures such as mine shafts were recorded within the study area. 88 hollow-bearing trees may provide roosting habitat for Southern Myotis. All of the hollow-bearing trees will be retained as part of the project. 0.71ha of Open Forest habitat will be removed as part of this

Cave-dwelling bats – Seven part Test TSC Act	Response
	project. Micro-bat species are insectivorous and the reduction in this extent of foraging and non-preferred roosting habitat is unlikely to impact on the availability of foraging resources significantly. The project is unlikely to effect on the lifecycle of these species such that of a viable local population, will be placed at risk of extinction.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable.
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not Applicable.
(d) in relation to the habitat of a threatened species, population or ecological community: *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and* *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*	(i) 0.71 ha of open forest habitat and 4.86 ha of heath habitat will be removed as part of the project. (ii) The project will affect minor existing open forest and heath habitats. However, this is unlikely to fragment or isolate habitat from other areas of habitat of this species than that which is already is occurring. (iii) The open forest and heath habitats to be removed is small compared to the extensive area of habitat that occurs in the Worimi State Conservation Area. Given that no individuals of these species were observed, and large areas of habitat occur within the locality, it is considered that habitats to be removed within the study area are of relatively low importance.
(e) whether the action proposed is likely to	The study area is not located near any declared areas of

Cave-dwelling bats – Seven part Test TSC Act	Response
have an adverse effect on critical habitat (either directly or indirectly)	outstanding biodiversity value (AOBV) (previously critical habitat under the TSC Act).
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There are no recovery plans for these species.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The project has the potential to contribute to nine Key Threatened Processes. In regard to cave dependant microbats one key threatening processes of Clearing of Native vegetation. The project is unlikely to exacerbate this KTP.
Conclusion	The project is unlikely to have a significant impact upon the Large-eared Pied Bat, Eastern Bent-wing Bat or the Southern Myotis.

Flora

***Diuris praecox* – Seven part Test TSC Act**	**Response**
Profile: *Diuris praecox* is listed as Vulnerable in the BC Act/TSC Act. Grows on hills and slopes of near-coastal districts in open forest, which have a grassy to fairly dense understorey (OEH, 2015a). Known to occur between Bateau Bay and Smiths Lake (OEH, 2015a). Exists as subterranean tubers most of the year, producing leaves and flowering stems in winter (OEH, 2015a). Flowers from July to early September (PlantNet, 2015a).	
a) In the case of a threatened species, whether an action is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	This species was not recorded within the study area, despite targeted surveys in the September within the flowering period for this species. Areas of Smooth-barked Apple – Blackbutt – Old Man Banksia Woodland as well as small clearings immediately adjacent to this community provide potential habitat for this species, although the entire study area was covered during the surveys. 0.71 ha of Smooth-barked Apple – Blackbutt – Old Man Banksia Woodland will be removed as part of the project. Whilst the project will remove some potential habitat for this species, given that no specimens were observed, it is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population will be placed at risk of extinction.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable.
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not Applicable.
(d) in relation to the habitat of a threatened species, population or ecological community:	(i) 0.71 ha of Smooth-barked Apple – Blackbutt – Old Man Banksia Woodland habitat will be removed as part of this

***Diuris praecox* – Seven part Test TSC Act**	**Response**
(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and* *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*	project. (ii) The study area was previously a sand mine and habitat for this species is currently fragmented within the study area. The project will impact upon minor areas of Smooth-barked Apple – Blackbutt – Old Man Banksia Woodland. The project is unlikely to fragment or isolated areas of habitat than is already occurring. (iii) Large areas of high quality habitat occur within the adjoining Worimi State Conservation Area, therefore, protecting the long-term survival of this species. Given, that no individuals were observed and the extent of habitat to be retained and the adjoining Worimi State Conservation Area, it is considered that habitats to be removed or modified within the study area are unlikely to impact on the long-term survival of this species.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	The study area is not located near any declared areas of outstanding biodiversity value (AOBV) (previously critical habitat under the TSC Act).
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is no recovery plan for this species.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The project has the potential to contribute to ten Key Threatened Processes. In regard to this species four key threatening processes of Clearing of Native vegetation, invasion and establishment of *Lantana camara*, invasion of native plant communities by exotic perennial grasses and invasion by native plant communities by *Chrysanthemoides monilifera*. The project could potentially result the spread of these exotic species. Given the implementation of appropriate vegetation management, it is considered that the contribution to these KTPs will be very small.
Conclusion	The project is unlikely to have a significant impact upon *Diuris praecox*.

***Diuris arenaria* – Seven part Test TSC Act**	**Response**
Profile: *Diuris arenaria* is listed as Endangered on the BC Act/TSC Act. Known to occur in the Tomaree peninsula near Newcastle NSW. Occurs in coastal heath and dry grassy eucalypt forest on sandy flats. Grows in gentle undulating country in eucalypt forest with grassy understorey on clay soil.	

Diuris arenaria – Seven part Test TSC Act	Response
a) In the case of a threatened species, whether an action is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	This species was not recorded within the study area, despite targeted surveys in the September within the flowering period for this species. Most of the study area provides potential habitat for this species, and the entire study area was covered as part of the targeted surveys. Whilst the project will remove some potential habitat for this species, given that no specimens were observed, it is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population will be placed at risk of extinction.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable.
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not Applicable.
(d) in relation to the habitat of a threatened species, population or ecological community: *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and* *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species,*	(i) 0.71 ha of Smooth-barked Apple – Blackbutt – Old Man Banksia Woodland habitat, 4.86 ha (25%) of heath habitat and 3.97 ha of exotic grasslands will be removed as part of this project. (ii) The study area was previously a sand mine and habitat for this species is currently fragmented within the study area. The project will impact upon minor areas of potential habitat and the project is unlikely to fragment or isolated areas of habitat than is already occurring. (iii) Large areas of high quality habitat occur within the adjoining Worimi State Conservation Area, therefore, protecting the long-term survival of this species. Given, that no

Diuris arenaria – Seven part Test TSC Act	Response
population or ecological community in the locality	individuals were observed and the extent of habitat to be retained within the study area and the adjoining Worimi State Conservation Area, it is considered that habitats to be removed or modified within the study area are unlikely to impact on the long-term survival of this species.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	The study area is not located near any declared areas of outstanding biodiversity value (AOBV) (previously critical habitat under the TSC Act).
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There are no recovery plans for this species.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The project has the potential to contribute to ten Key Threatened Processes. In regard to this species four key threatening processes of Clearing of Native vegetation, invasion and establishment of *Lantana camara*, invasion of native plant communities by exotic perennial grasses and invasion by native plant communities by *Chrysanthemoides monilifera*. The project could potentially result the spread of these exotic species. Given the implementation of appropriate vegetation management, it is considered that the contribution to these KTPs will be very small.
Conclusion	The project is unlikely to have a significant impact upon the *Diuris arenaria*.

Commersonia prostrata – Seven part Test TSC Act	Response
Profile: *Commersonia prostrata* is listed as Endangered on the BC Act/TSC Act. Ground hugging shrub that forms mats to more than 1m across. Leaves having irregular rounded teeth and scattered star shaped hairs on the lower surface. Occurs in the southern highlands and southern tablelands with a larger population in the Thirlmere Lakes area, and on the Tomago sand beds, including areas that have been subject to sand mining. Also found in VIC. Found on sandy, sometimes peaty soils in a wide variety or habitats including: Snow Gum (*Eucalyptus pauciflora*) Woodland and Ephemeral Wetland floor at Rowes Lagoon; Blue leaved Stringybark (*E. agglomerata*) Open Forest at Tallong; and in Brittle Gum (*E. mannifera*) Low Open Woodland at Penrose; Scribbly Gum (*E. haemostoma*)/ Swamp Mahogany (*E. robusta*) Ecotonal Forest at Tomago. Associated species may include *Imperata cylindrica, Empodisma minus* and *Leptospermum continentale*.	
a) In the case of a threatened species, whether an action is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	This species was not recorded within the study area. Sub-optimal habitat within the Exotic Grassland with scattered shrubs of the study area. This species generally occurs in swamp environments. Several records from the database atlas were recorded in the Tilligerry State Conservation area to the north of the study area. 3.97 ha of disturbed grassland areas will be impacted

Commersonia prostrata – Seven part Test TSC Act	Response
	upon by the proposal. Whilst the project will remove some potential habitat for this species, given that no specimens were observed, it is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population will be placed at risk of extinction.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable.
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not Applicable.
(d) in relation to the habitat of a threatened species, population or ecological community: *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and* *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*	(i) 3.97 ha of disturbed grassland habitat will be impacted upon by the project. (ii) The study area was previously a sand mine and habitat for this species is currently fragmented within the study area. The project will impact upon minor disturbed grassland and the project is unlikely to fragment or isolated areas of habitat than is already occurring. (iii) The habitat to be removed is sub-optimal as no areas of swamp habitat is present within the study area. Highly quality habitat for this species occurs in the Tilligerry State Conservation Area, where this species has previously been recorded (Database Atlas Record, 2016) Given, that no individuals were observed and the extent of habitat to be retained within the Tilligerry State Conservation Area, it is considered that habitats to be removed or modified within the study area are unlikely to impact on the long-term survival of this species.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or	The study area is not located near any declared areas of outstanding biodiversity value (AOBV) (previously

Commersonia prostrata – Seven part Test TSC Act	Response
indirectly)	critical habitat under the TSC Act).
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	A National Recovery Plan for *Commersonia prostrata* (formerly *Rulingia prostrata*) (Carter & Walsh, 2010) outlines eight objectives to assist the recovery of this species as follows: 1. Acquire accurate information as baseline data for ongoing monitoring. 2. Identify habitat that is critical, common or potential. 3. Ensure that all populations and their habitat are protected and managed appropriately. 4. Manage threats to populations. 5. Identify key biological functions. 6. Determine the growth rates and viability of populations. 7. Establish populations in cultivation. 8. Build community support for conservation. Although the project would include removal of a small area of potential habitat for *Commersonia prostrata*, it is unlikely to affect the conservation of *Commersonia prostrata* or interfere with any of the other objectives of the recovery plan.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The project has the potential to contribute to ten Key Threatened Processes. In regard to this species four key threatening processes of Clearing of Native vegetation, invasion and establishment of *Lantana camara*, invasion of native plant communities by exotic perennial grasses and invasion by native plant communities by *Chrysanthemoides monilifera*. The project could potentially result the spread of these exotic species. Given the implementation of appropriate vegetation management, it is considered that the contribution to these KTPs will be very small.
Conclusion	The project is unlikely to have a significant impact upon the *Commersonia prostrata*.

Cryptostylis hunteriana - Leafless Tongue-orchid – Seven part Test TSC Act	Response
Profile: *Cryptostylis hunteriana* - Leafless Tongue-orchid listed as Vulnerable on the BC Act/TSC Act. Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum, Silvertop Ash, Red Bloodwood and Black Sheoak; appears to prefer open areas in the	

***Cryptostylis hunteriana* - Leafless Tongue-orchid – Seven part Test TSC Act**	**Response**
understorey and is often found in association with the Large Tongue Orchid and the Tartan Tongue Orchid.	
a) In the case of a threatened species, whether an action is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	This species was not recorded within the study area, despite targeted surveys during the appropriate flowering season. Most of the study area provides potential habitat for this species, and the entire study area was covered as part of the targeted surveys. Whilst the project will remove some potential habitat for this species, given that no specimens were observed, it is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population will be placed at risk of extinction.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable.
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not Applicable.
(d) in relation to the habitat of a threatened species, population or ecological community: *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed*	(i) 0.71 ha of Smooth-barked Apple – Blackbutt – Old Man Banksia Woodland habitat, 4.86 ha (25%) of heath habitat and 3.97 ha of exotic grasslands will be removed as part of this project. (ii) The study area was previously a sand mine and habitat for this species is currently fragmented. The project will impact upon minor areas habitat. The project is unlikely to fragment or isolated areas of habitat than is already occurring.

***Cryptostylis hunteriana* - Leafless Tongue-orchid – Seven part Test TSC Act**	**Response**
action, and *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*	(iii) The study area was previously a sand mine and habitat for this species is currently fragmented within the study area. The project will impact upon minor areas of habitat. The project is unlikely to fragment or isolated areas of habitat than is already occurring. Large areas of high quality habitat occur within the adjoining Worimi State Conservation Area, therefore, protecting the long-term survival of this species. Given, that no individuals were observed and the extent of habitat to be retained within the study area and the adjoining Worimi State Conservation Area, it is considered that habitats to be removed or modified within the study area are unlikely to impact on the long-term survival of this species.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	The study area is not located near any declared areas of outstanding biodiversity value (AOBV) (previously critical habitat under the TSC Act).
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There are no recovery plans for this species.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The project has the potential to contribute to ten Key Threatened Processes. In regard to this species four key threatening processes of Clearing of Native vegetation, invasion and establishment of *Lantana camara*, invasion of native plant communities by exotic perennial grasses and invasion by native plant communities by *Chrysanthemoides monilifera*. The project could potentially result the spread of these exotic species. Given the implementation of appropriate vegetation management, it is considered that the contribution to these KTPs will be very small.
Conclusion	The project is unlikely to have a significant impact upon the *Cryptostylis hunteriana*.

***Senecio spathulatus* – Seven part Test TSC Act**	**Response**
Profile: *Senecio spathulatus* – Coast Groundsel is listed as Endangered in the BC Act/TSC Act. A small low growing daisy, often forming hummocks. It has fleshy leaves with a yellow flower. Occurs in Nadgee Nature Reserve (Cape Howe) and between Kurnell in Sydney and Myall Lakes National Park. Found on frontal dunes (OEH Threatened Species Profiles).	
a) In the case of a threatened species, whether an action is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be	The hind dunes in the east of the study area provide potential habitat for this species. *Senecio spathulatus* has been recorded in the foredunes to the east of the study area. This species was not recorded within the study area.

***Senecio spathulatus* – Seven part Test TSC Act**	**Response**
placed at risk of extinction	No dune areas will be removed as part of the project. No area of habitat for this species will be removed as part of the project and therefore the project is unlikely to have an adverse effect on the life cycle of this species such that a viable local population will be placed at risk of extinction.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable.
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not Applicable.
(d) in relation to the habitat of a threatened species, population or ecological community: *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and* *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*	(i) No area of hind dunes will be impacted upon by the project. (ii) The habitat will not become fragmented or isolated from other areas of habitat as no habitat will be removed. (iii) No area of habitat will be removed, and the habitat is unlikely to have any indirect impacts due to the distance from the construction footprint.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	The study area is not located near any declared areas of outstanding biodiversity value (AOBV) (previously critical habitat under the TSC Act).
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There are no recovery plans for this species.

Senecio spathulatus – Seven part Test TSC Act	Response
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The project has the potential to contribute to ten Key Threatened Processes. In regard to this species two key threatening processes of Clearing of Native vegetation, and invasion by native plant communities by *Chrysanthemoides monilifera*. The project could potentially result the spread of these exotic species. Given the implementation of appropriate vegetation management, it is considered that the contribution to these KTPs will be very small.
Conclusion	The project is unlikely to have a significant impact upon the *Senecio spathulatus.*

2 ENDANGERED POPULATION

Emu population in the NSW North Coast Bioregion and Port Stephens Local Government Area	Response
Profile: Emu population in the NSW North Coast Bioregion and Port Stephens local government area is listed as an Endangered Population under the BC Act/TSC Act. The Emu population was formerly widespread in North eastern NSW. Emu populations are generally absent from this area and have been restricted on coastal areas between Evans Head and Red Rock and a small population further west in the Bungawalbin area. It is not known if a population of this species still exists within the Port Stephens LGA.	
a) In the case of a threatened species, whether an action is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	No Individuals were recorded within the study area. Two old OEH database records occur within the locality in 1992 at Williamtown and Saltash. 3.97 ha of grassland habitat that provides foraging and nesting habitat for this species will be removed as part of the project. Large areas of potential grassland habitat occur to the west of the study area. Given that no individuals were observed and that large areas of potential habitat occur in the locality it is considered that the project is unlikely to have an adverse effect on the life cycle of this species that constitutes the endangered population such that a viable local population of the species will be placed at risk of extinction.
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not Applicable.
(d) in relation to the habitat of a threatened species, population or ecological community: *(i) the extent to which habitat is likely to*	

Emu population in the NSW North Coast Bioregion and Port Stephens Local Government Area	Response
be removed or modified as a result of the action proposed, and *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and* *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*	(i) 3.97 ha of grassland habitat will be removed as a result of the project. (ii) The project will affect minor existing grassland habitat within the study area. However, this is unlikely to fragment or isolate habitat from other areas of habitat of this species than that which is already is occurring. (iii) The grassland habitat within the study area consists entirely of exotic grass species. There are large areas of grassland to the west of the study area which provides habitat for this species. Given, that no individuals were observed and the extent of habitat that occurs within the locality of the study area, it is considered that habitats to be removed within the study area are of low importance.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	The study area is not located near any declared areas of outstanding biodiversity value (AOBV) (previously critical habitat under the TSC Act).
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There are no recovery plans for this species.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The project has the potential to contribute to nine Key Threatened Processes. In regard, to this species one key threatening process of Clearing of Native vegetation. one key threatening processes of Clearing of Native vegetation. The project is unlikely to exacerbate this KTP.
Conclusion	The project is unlikely to have a significant impact upon the Endangered Population *Emu population in the NSW North Coast Bioregion and Port Stephens LGA*

3 SIGNIFICANCE ASSESSMENTS FOR EPBC ACT SPECIES

Critically Endangered Species

Regent Honeyeater – EPBC Act Assessment	Response
Profile: The Regent Honeyeater is listed as critically endangered and migratory on the EPBC Act. The habitat for this species is within dry open forest and woodland. Particularly box-ironbark woodland and riparian forests of river sheoak. Feeds on the nectar from a wide range of eucalypts mistletoes and invertebrates. The distribution of this species is confined to Victoria and New South Wales. This species breeds in cup-like nests constructed with bark.	
Lead to a long term decrease in size of a population	This species was not recorded within the study area. However, low quality potential foraging habitat occurs throughout forested areas of the study area. 0.71 ha of open forest will be removed as part of the project. The breeding pattern of this species is variable in the timing and movements. The seasonally movements of the Regent Honeyeater can be regular but in some years variability of the timing and pattern of movements and breeding can occur. This is associated with the seasonal patterns in the flowering of key eucalypt species. Whilst the study area does contain foraging habitat for this species, it is likely that it would use the study area on an intermittent basis only. Therefore, it is considered that the project is unlikely to lead to a long term decrease in the size of the population.
Reduce the area of occupancy of the species	The Regent Honeyeater has not been recorded within the study area. 0.71 ha of open forest habitat will be removed as part of the project. Given the extent of potential habitat within the adjoining Worimi State Conservation Area, the project is unlikely to reduce an area of occupancy of this species.
Fragment an existing population into two or more populations	Whilst the project will cause a small reduction in potential habitat, it will not fragment any populations of this species. The project will maintain vegetation connectivity throughout the study area including the creation of wildlife corridors.
Adversely affect critically habitat to the survival of the species	The study area has not been identified as a key breeding area (Regent Honeyeater Recovery Plan, however the Lower Hunter is a known winter foraging area. It is considered that the study area is unlikely to contain habitat critical to the survival of this species. The study area is not listed as critical habitat.
Disrupt the breeding cycle of a population	The Regent Honeyeater recovery plan has identified three key breeding areas in NSW and these include Bundarra-Barraba, Capertee Valley and the Hunter Valley. The project is unlikely to disrupt the breeding cycle of this species, as this species is not

Regent Honeyeater – EPBC Act Assessment	Response
	known to nest in the Port Stephens area.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	0.71 ha of open forest habitat is likely to be impacted upon as part of the project. The project will remove a small area and modify habitat for Asset Protection zones of potential foraging habitat for this species, however the decrease in habitat and habitat quality is small in comparison to the availability of habitat in the surrounding area. It is unlikely to result in the decline of this species.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the critically endangered or endangered species habitat	The project is unlikely to introduce invasive species such as introduced predators that are potentially harmful to the Regent Honeyeater.
Introduce disease that may cause the species to decline	The project is unlikely to introduce disease that will impact upon this species.
Interfere with the recovery of the species	The Department of the Environment has developed a draft recovery plan for this species. The objectives of this recovery plan are as follows: • Reverse the long-term population trend of decline and increase the numbers of regent honeyeaters to a level where there is a viable, wild breeding population, even in poor breeding years; and to • Maintain key regent honeyeater habitat in a condition that maximises survival and reproductive success, and provides refuge during periods of extreme environmental fluctuation. The recovery plan identifies critical foraging habitat of box-ironbark eucalypt forest and river she-oak forests and mistletoe species. None of the critical foraging habitat forest occur within the study area. This project is unlikely to interfere with the recovery of this species.
Conclusion	The project is unlikely to result in a significant impact upon the Regent Honeyeater and a Referral is not required.

Swift Parrot – EPBC Act Assessment	Response
Profile: The Swift Parrot is listed as critically endangered and migratory on the EPBC Act. This species breeds in Tasmania and migrates to south-eastern mainland in Mar-Oct. Winter-flowering trees such as *Eucalyptus robusta, Corymbia maculata, C. gummifera, E. sideroxylon* and *E. albens* provide foraging habitat for this species.	
Lead to a long term decrease in the size of a population	This species was not recorded within the study area. No Swift Parrot feed trees were recorded within the study area. Whilst the study area does contain foraging habitat for this species, it is likely to use the study area on an intermittent basis. This species breeds in Tasmania and the project is unlikely to affect movements of this species to and from the Tasmanian breeding grounds. Whilst the project will remove an area of potential foraging habitat, it is unlikely to lead to a long term decrease in the size of the population.
Reduce the area of occupancy of the species	Swift Parrot has not been recorded within the study area. 0.71 ha of potential open forest habitat will be removed as part of the project. Given the extent of potential foraging habitat to be retained as well as the extent of foraging habitat within the immediate locality, the project is unlikely to reduce an area of occupancy of this species.
Fragment an existing population into two or more populations	Whilst the project will cause a small reduction in potential forging habitat, it will not fragment any populations of this species. The project will maintain vegetation connectivity throughout the study area and to the adjoining Worimi State Conservation Area.
Adversely affect habitat critical to the survival of a species	It is considered that the study area is unlikely to contain habitat critical to the survival of this species. The study area is not listed as critical habitat.
Disrupt the breeding cycle of a population	This species breeds in Tasmania and the project is unlikely to affect movements of this species to and from the Tasmanian breeding grounds.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The project will remove and modify a small area of potential habitat for this species which will result in the decrease in the availability of habitat. 0.71 ha of open forest will be removed as part of the project. A small area of open forest will require removal of understorey for bushfire protection. The decrease and modification of habitat is small in comparison with the availability of habitat in the adjoining Worimi State Conservation Area. Therefore, the project is unlikely to decrease the availability of habitat.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the critically endangered or endangered species habitat	The project is unlikely to introduce invasive species such as introduced predators that are potentially harmful to the Swift Parrot.

Swift Parrot – EPBC Act Assessment	Response
Introduce disease that may cause the species to decline	The project is unlikely to introduce diseases that will impact upon this species.
Interfere with the recovery of the species	The National Recovery Plan for the Swift Parrot outlines four objectives to assist the recovery of this species as follows: • Objective 1: To identify and prioritise habitats and sites used by the species across its range, on all land tenures. • Objective 2: To implement management strategies to protect and improve habitats and sites on all land tenures. • Objective 3: To monitor and manage the incidence of collisions, competition and Beak and Feather Disease (BFD). • Objective 4: To monitor population trends and distribution throughout the range. The project is unlikely to affect the objectives of the national swift parrot recovery plan.
Conclusion	The project is unlikely to result in a significant impact upon the Swift Parrot and a Referral is not required.

Endangered Species

Spotted-tailed Quoll – EPBC Act Assessment	Response
Profile: The Spotted-tailed Quoll is listed as Endangered on the EPBC Act. A variety of vegetation such as rainforest, open forest, woodland, coastal heath, inland riparian forest. Have home ranges 750 - 3500 ha. Den sites may be located in hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky cliffs. The Spotted-tailed Quoll will hunt possums and gliders in tree hollows and prey on roosting birds. A generalist predator with a preference for medium-sized (500g-5kg) mammals. Consumes a variety of prey, including gliders, possums, small wallabies, rats, birds, bandicoots, rabbits, reptiles and insects.	
Lead to a long term decrease in size of a population	This species was not recorded during the field surveys. The study area provides foraging and breeding habitat for the Spotted-tailed Quoll. No den sites were recorded within the study area. 88 hollow-bearing trees were recorded within the study area all of which will be retained. 0.71 ha of Open Forest, 4.86 ha heath and 3.97 ha of grasslands will be removed as part of this project. The project will remove minor areas of habitat for this species however, due to the extent of habitat to be retained and the larger area of intact bushland in the adjoining Worimi State Conservation Area it is considered the project is unlikely to lead to a long term decrease in size of a population.
Reduce the area of occupancy of the species	The project will impact upon a small area of habitat, however the project will not cause any further fragmentation of habitats. It is considered that the project is unlikely to affect the area of occupancy of this species.
Fragment an existing population into two or more populations	An existing access track located in the north of the site traversing heath habitat will be widened. It is unlikely to fragment any existing populations of Spotted-tailed Quoll as the width of the road is small and not fenced. Connectivity in the south of the study area through open forest habitat will not be impacted upon by the project. The project will also maintain vegetation connectivity throughout the study area including the creation of wildlife corridors. Therefore, the project unlikely to fragment an existing population into two or more populations.
Adversely affect critically habitat to the survival of the species	The study area is not critical habitat for the survival of this species.
Disrupt the breeding cycle of a population	The study area does contain habitat for den sites for this species in the form of hollow-bearing trees and fallen timber. The project will retain all of the hollow-bearing trees. Small area of open forest habitat contains fallen timber maybe removed. Mitigation measures such as the relocation of fallen timber are proposed as part of the project. Therefore, the project is not likely to disrupt the breeding cycle of a population.

Spotted-tailed Quoll – EPBC Act Assessment	Response
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The project will remove a small area of potential habitat for the Spotted-tailed Quoll which will result in a small decrease in the availability of habitat. The decrease in habitat is small in comparison to the availability of habitat to be retained within the study area and in the surrounding area. Given the extent of forested areas to be retained and the habitat within the adjoining Worimi State Conservation Area the project is unlikely to significantly modify, destroy, isolate or decrease the availability of the habitat such that the species is likely to decline.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the critically endangered or endangered species habitat	The project is unlikely to introduce invasive species that will impact upon this species.
Introduce disease that may cause the species to decline	The project is unlikely to introduce disease that will impact upon this species.
Interfere with the recovery of the species	A national Recovery Plan for the Spotted-tailed Quoll outlines eleven objectives as follows: 1. Determine the distribution and status of Spotted-tailed Quoll populations throughout the range, and identify key threats and implement threat abatement management practices. 2. Investigate key aspects of the biology and ecology of the Spotted-tailed Quoll to acquire targeted information to aid recovery. 3. Reduce the rate of habitat loss and fragmentation on private land. 4. Evaluate and manage the risk posed by silvicultural practices. 5. Determine and manage the threat posed by introduced predators (foxes, cats, wild dogs) and of predator control practices on Spotted-tailed Quoll populations. 6. Determine and manage the impact of fire regimes on Spotted-tailed Quoll populations. 7. Reduce deliberate killings of Spotted-tailed Quolls. 8. Reduce the frequency of Spotted-tailed Quoll road mortality. 9. Assess the threat Cane Toads pose to Spotted-tailed Quolls and develop threat abatement actions if necessary. 10. Determine the likely impact of climate change on Spotted-tailed Quoll populations. 11. Increase community awareness of the Spotted-tailed Quoll and involvement in the Recovery Program. The project will remove minor habitat for the Spotted-tailed

Spotted-tailed Quoll – EPBC Act Assessment	Response
	Quoll which contribute to one of the recovery actions of reduce the rate of habitat loss and fragmentation. The reduction in habitat as a result of the project is small and unlikely to affect recovery of the species. The project will not interfere with any of the remaining objectives of the draft national recovery plan for the Spotted-tailed Quoll.
Conclusion	The project is unlikely to result in a significant impact upon the Spotted-tailed Quoll and a Referral is not required.

Commersonia prostrata **– Dwarf Kerrawang – EPBC Act Assessment**	**Response**
Profile: *Commersonia prostrata* – Dwarf Kerrawang is listed as Endangered in the EPBC Act. Ground hugging shrub that forms mats to more than 1m across. Occurs in the southern highlands and southern tablelands with a larger population in the Thirlmere Lakes area, and on the Tomago sand beds near Newcastle NSW. Found in a variety of habitats including woodlands, ephemeral wetlands, open forest, low woodland and swamp forest.	
Lead to a long term decrease in the size of a population	This species was not recorded within the study area. 3.97 ha of Exotic Grassland with scattered shrubs will be impacted upon by the project. Whilst the project will remove some potential habitat for this species, given that no specimens were observed, it is considered unlikely to lead to a long term decrease in the size of an important population.
Reduce the area of occupancy of the species	This species was not recorded within the study area. Therefore, the project is unlikely to reduce the area of occupancy of the species.
Fragment an existing population into two or more populations	This species was not recorded within the study area. Therefore, is unlikely to fragment any populations into two or more populations.
Adversely affect habitat critical to the survival of a species	The study area is not critical habitat for the survival of this species.
Disrupt the breeding cycle of a population	This species was not recorded and therefore, the project is unlikely to disrupt the breeding cycle of a population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	This species was not recorded within the study area. 3.97 ha of exotic grassland with scattered shrubs is likely to be impacted upon as part of this project. The habitat to be removed is sub-optimal as no areas of swamp habitat. Highly quality habitat for this species occurs in the Tilligerry State Conservation Area, where this species has previously been recorded (Database Atlas Record, 2016) Given, that no individuals were observed and the extent of habitat to be retained within the Tilligerry State Conservation Area, it is considered that habitat to be removed or modified within the

Commersonia prostrata – Dwarf Kerrawang – EPBC Act Assessment	Response
	study area is unlikely to decrease the availability or quality of habitat to the extent that this species is likely to decline.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the critically endangered or endangered species habitat	No individuals were observed within the study area. The project is unlikely to introduce invasive species such as exotic plant species.
Introduce disease that may cause the species to decline	The project is unlikely to introduce disease that will impact upon this species.
Interfere with the recovery of the species	A National Recovery Plan for *Commersonia prostrata* (formerly *Rulingia prostrata*) (Carter & Walsh, 2010) outlines eight objectives to assist the recovery of this species as follows: 1. Acquire accurate information as baseline data for ongoing monitoring. 2. Identify habitat that is critical, common or potential. 3. Ensure that all populations and their habitat are protected and managed appropriately. 4. Manage threats to populations. 5. Identify key biological functions. 6. Determine the growth rates and viability of populations. 7. Establish populations in cultivation. 8. Build community support for conservation. The project is unlikely to affect the objectives of the national recovery plan for *Commersonia prostrata*.
Conclusion	The project is unlikely to result in a significant impact upon the *Commersonia prostrata* and a Referral is not required.

Vulnerable Species

In accordance with the Matters of National Environmental Significance, Significance Impact Guidelines v1.1 (Department of Environment, 2013) the significance assessment for vulnerable species listed under the EPBC Act requires to assess as to whether the population within the project area is an important population. An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

An assessment as to whether species being assessed are an important population has been conducted for the significance assessments for the project.

EPBC Important Population Criteria for Grey-headed Flying Fox	Answer
Key source populations for either breeding or dispersal	The Grey-headed Flying Fox roosts and breeds in large camps and no camps for this species were identified as occurring within the study area.
Populations that are necessary for maintaining genetic diversity; and/or	The study area provides foraging habitat for the Grey-headed Flying Fox. A small area of foraging habitat will be removed as part of the project. This species would only use the study area for foraging and therefore, the habitat within the study area is not necessary for maintaining genetic diversity.
At or near the limit of the species range.	The Grey-headed Flying Fox occurs from Rockhampton QLD to Adelaide SA and is generally found 200km from the eastern coast of Australia. The study area is not at the limit of this species range.
Is the population important for the Grey-headed Flying Fox	No the population within the study area is not part of an important population

Grey-headed Flying Fox – EPBC Act Assessment	Response
Profile: The Grey-headed Flying-Fox is listed as Vulnerable on the EPBC Act. This species is generally found within 200 km of Australia's eastern coast. Generally it occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are commonly found in gullies, close to water, in vegetation with a	

Grey-headed Flying Fox – EPBC Act Assessment	Response
dense canopy.	
Lead to a long-term decrease in size of an important population	This species was recorded flying over the study area. No camps were observed. The open forest areas are likely to provide suitable foraging habitat for this species. The project is likely to impact upon 0.71 ha of open forest habitat and 4.86 ha of heath habitat. The project will remove a small area of habitat for this species. However, due the extent of the habitat to be retained and the large area of habitat within the adjoining Worimi State Conservation Area, the project is unlikely to lead to a long term decrease in the size of an important population.
Reduce the area of occupancy of an important population	This species is highly mobile and therefore, the project will not reduce the occupancy of an important population.
Fragment an existing important population into two or more populations	This species is highly mobile and therefore, the project will not fragment any populations of this species.
Adversely affect habitat critical to the survival of the species	The study area is not critical habitat for the survival of this species.
Disrupt the breeding cycle of an important population	No breeding camps were recorded in the study area, and Therefore, habitat is considered to be of low importance, and is unlikely to disrupt the breeding cycle of an important population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The open forest and heath habitat to be removed is small compared to the extensive area of habitat that occurs to the north in the Worimi State Conservation Area. Given that no individuals of this species were observed, and large areas of habitat occur within the locality, it is considered that habitats to be removed within the study area are of relatively low importance. Given, that no camps were observed and however the decrease in habitat and habitat quality is small in comparison to the availability of habitat in the surrounding area. It is unlikely to result in the decline of this species.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	The project is unlikely to introduce invasive species that will impact upon this species.
Introduce disease that may cause the species to decline	The project is unlikely to introduce disease that will impact upon this species.
Interfere substantially with the recovery of the species	The Draft National Recovery Plan for the Grey-headed Flying Fox outlines nine objectives to assist the recovery of this species as follows: • Objective 1: To identify protect and enhance native foraging habitat critical to the survival of the Grey-

Grey-headed Flying Fox – EPBC Act Assessment	Response
	headed Flying Fox • Objective 2: Identify, protect and enhance roosting habitat of Grey-headed Flying-fox camps. • Objective 3: Determine population trends in Grey-headed Flying-foxes so as to monitor the species' national distribution and conservation status. • Objective 4: Build community capacity to coexist with flying-foxes and minimise the impacts on urban settlements from existing camps without resorting to dispersal • Objective 5: Increase public awareness and understanding of Grey-headed Flying-foxes and the recovery program, and involve the community in the recovery program where appropriate. • Objective 6: Improve the management of Grey-headed Flying-fox camps in sensitive areas. • Objective 7: Significantly reduce levels of deliberate Grey-headed Flying-fox destruction associated with commercial horticulture. • Objective 8: Support research activities that will improve the conservation status and management of Grey-headed Flying-foxes. • Objective 9: Assess and reduce the impact on Grey-headed Flying-foxes of electrocution on power lines, and entanglement in netting and on barbed-wire. The project is unlikely to affect the objectives of the draft national recovery plan for the Grey-headed Flying-Fox.
Conclusion	The project is unlikely to result in a significant impact upon the Grey-headed Flying-fox and a Referral is not required.

EPBC Important Population Criteria for Greater Glider	Answer
Key source populations for either breeding or dispersal	The Greater Glider was not recorded within the study area. Hollow-bearing trees provide breeding habitat for this species. One record for this species occurs at approximately 4 km to the north at Williamtown. The study area is likely to provide a small area for breeding within the study area. However, high quality habitat occurs in the adjoining Worimi State Conservation Area. Given that the area of habitat within the study area is small and the adjoining Worimi State Conservation Area contains a large area of habitat it is unlikely that the study area is a key source for breed or dispersal.
Populations that are necessary for maintaining genetic diversity; and/or	Large areas of habitat for this species occur within the locality, at the adjoining Worimi State Conservation Area, Worimi National Park and Tilligerry State Conservation Area. Therefore, the habitat within the study area is not necessary for maintaining genetic diversity due to the large areas of habitat within the locality.
At or near the limit of the species range.	The Greater Glider occurs along the eastern coast from Victoria to North Queensland. The study area is at Williamtown and is not at the limit of this species range.
Is the population important for the Greater Glider	No the population within the study area is not part of an important population

Greater Glider – EPBC Act Assessment	Response
Profile: The Greater Glider is listed as Vulnerable on the EPBC Act. The Greater Glider's distribution is along eastern Australia from Victoria to North Queensland. This species is nocturnal and roosts in tree hollows. The Greater Glider occurs in eucalypt forests and woodlands along the east coast of Australia. Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe.	
Lead to a long-term decrease in size of an important population	The study area does not contain an important population. This species was not recorded during the field surveys. The project will remove a small area of open forest foraging, roosting and breeding habitat. Large areas of potential habitat occur within the locality and are likely to contain this species. It is unlikely that the project will lead in long term decrease in size of an important population.
Reduce the area of occupancy of an important population	The study area does not contain an important population. The project will remove a small area of habitat and larger habitat area of habitat is present within the locality. Therefore, project is unlikely to reduce the occupancy of an important population.

Greater Glider – EPBC Act Assessment	Response
Fragment an existing important population into two or more populations	The study area does not contain an important population. The south of the study area is part of a native vegetation corridor from east to west which provides connectivity for Greater Glider movements. This vegetation will be retained as part of the project. The project will affect minor existing open forest habitat. However, this is unlikely to fragment or isolate habitat from other areas of habitat of this species than that which is already is occurring.
Adversely affect habitat critical to the survival of the species	The study area is not critical habitat for the survival of this species.
Disrupt the breeding cycle of an important population	The study area does not contain an important population. 88 hollow-bearing trees recorded throughout the study area may provide roosting and breeding habitat. All of the hollow-bearing trees are to be retained within the study area. Therefore, the project is unlikely to disrupt the breeding cycle of an important population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The project will remove a small area of foraging, breeding and roosting habitat for this species which will result in the decrease in the availability of habitat. The decrease in habitat and habitat quality is small in comparison to the availability of habitat in the surrounding area. It is unlikely to result in the decline of this species.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	The project is unlikely to introduce invasive species that will impact upon this species.
Introduce disease that may cause the species to decline	The project is unlikely to introduce disease that will impact upon this species.
Interfere substantially with the recovery of the species	The project is unlikely to interfere substantially with the recovery of the species
Conclusion	The project is unlikely to result in a significant impact upon the Greater Glider and a Referral is not required.

EPBC Important Population Criteria for New Holland Mouse	Answer
Key source populations for either breeding or dispersal	The New Holland Mouse breeds in small burrows. No burrows were observed during the field surveys. However, the study area does provide breeding habitat within the open forest and heath habitats. OEH database records for this species occur within the locality at Williamtown, Fullerton Cove and Worimi Regional Park. Given that the area of habitat to be removed within the study area is small and high-quality habitat occur within the locality it is unlikely that the study area is a key source for breeding or dispersal.
Populations that are necessary for maintaining genetic diversity; and/or	Large areas of habitat for this species occur within the locality, at the adjoining Worimi State Conservation Area, Worimi National Park and Tilligerry State Conservation Area. Therefore, the habitat within the study area is not necessary for maintaining genetic diversity due to the large areas of habitat within the locality.
At or near the limit of the species range.	The New Holland Mouse occurs in fragmented populations from Tasmania, Victoria, NSW and Queensland. Therefore, this species is not at the limit of its range.
Is the population important for the New Holland Mouse	No the population within the study area is not part of an important population

New Holland Mouse – EPBC Act Assessment	Response
Profile: The New Holland Mouse is listed as Vulnerable on the EPBC Act. This species is generally found within 200 km of Australia's eastern coast. Generally, this species occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths, vegetated sand dunes and swamps as well as urban gardens and cultivated fruit crops. The New Holland Mouse lives in burrows shared with other individuals.	
Lead to a long-term decrease in size of an important population	The study area does not contain an important population. The open forest and heath habitats provide foraging, breeding and sheltering habitat for this species. 0.71 ha of open forest and 4.86 ha of heath habitat will be removed as part of the project. Given that the area of habitat within the study area to be removed is small and the adjoining Worimi State Conservation Area contains a large area of habitat it is unlikely the project will lead to a long-term decrease in size of an important population.

New Holland Mouse – EPBC Act Assessment	Response
Reduce the area of occupancy of an important population	The study area does not contain an important population. The New Holland Mouse is sedentary with a small home range of 0.44 ha to 1.4 ha (Conservation Advice, 2010). The project will remove a small area of habitat which has the potential to be occupied. However as large high-quality habitat occurs within the locality the project is unlikely to reduce the area of occupancy of an important population.
Fragment an existing important population into two or more populations	The study area does not contain an important population. No individuals were caught during the trapping surveys or observed during the field surveys. The project will remove habitat from the edges of the open forest and heath vegetation. The remainder of the habitat will remain intact and will not be fragmented any more than it currently occurring. Therefore, if any populations occur within the study area, the project is unlikely to fragment any potential populations into two or more populations.
Adversely affect habitat critical to the survival of the species	The study area is not critical habitat for the survival of this species.
Disrupt the breeding cycle of an important population	The study area does not contain an important population. No potential breeding burrows were observed during the multiple survey events within the study area. The project will remove a small area of habitat but as large high-quality habitat occurs within the locality the project is unlikely to disrupt the breeding cycle of an important population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The project will remove a small area of breeding, sheltering and foraging habitat for this species which will result in the decrease in the availability of habitat. Given, that the habitat to removed is habitat and habitat quality is small in comparison to the availability of habitat in the surrounding area. It is unlikely to result in the decline of this species.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	The project is unlikely to introduce invasive species that will impact upon this species.
Introduce disease that may cause the species to decline	The project is unlikely to introduce disease that will impact upon this species.
Interfere substantially with the recovery of the species	The project is unlikely to interfere substantially with the recovery of the species
Conclusion	The project is unlikely to result in a significant impact upon the New Holland Mouse and a Referral is not required.

EPBC Important Population Criteria for Koala	Answer
Key source populations for either breeding or dispersal	No Koala feed trees were present within the study area with no scratches or scats recorded during the field surveys. A large population of over 8,000 records for the Koala occurs to the north of the study area from Williamtown to Lemon Tree Passage. Two records occur adjoining the study area are greater than ten years old (1978 and 1986). Therefore, it is likely that the population to the north is a key source for breeding, though not the population that may occur within the study area from time to time.
Populations that are necessary for maintaining genetic diversity; and/or	No Koala feed trees occur within the study area and no individuals, scratches or scats were observed within the study area. As no Koalas were recorded and the main population occurs to the north, the study area is not necessary for maintaining genetic diversity.
At or near the limit of the species range.	The Koala occurs in fragmented populations throughout Australia from North-east Queensland to Eyre Peninsula in SA. In NSW it occurs on the central and north coast with some populations in the west of the Great Divide. The Study Area occurs in Williamtown in NSW and is not at the limit of this species range.
Is the population important for the Koala	No the population within the study area is not part of an important population

Koala – EPBC Act Assessment	Response
Profile: The Koala is listed as Vulnerable on the EPBC Act. Found in eucalypt woodlands and forest foraging on preferred food trees. Koalas will feed almost exclusively on a small number of preferred species. The preferred tree species vary widely on a regional and local basis. Some preferred and supplementary feed tree species in the Hunter Valley region include *Eucalyptus tereticornis, Eucalyptus robusta, Eucalyptus punctata* and *Eucalyptus canaliculata*.	
Lead to a long-term decrease in size of an important population	The study area does not contain an important population. No Koalas, or any evidence of the presence of Koalas, was recorded within the study area during the field surveys. No Koala feed trees were recorded in the study area. As no Koalas were recorded and the main population occurs to the north the project is unlikely to lead to a long term decrease in size of an important population.
Reduce the area of occupancy of an important population	The study area does not contain an important population. The project is unlikely to reduce the occupancy of an important population.

Koala – EPBC Act Assessment	Response
Fragment an existing important population into two or more populations	The study area does not contain an important population. The project is unlikely to fragment an existing important population into two or more populations.
Adversely affect habitat critical to the survival of the species	The study area is not critical habitat for the survival of this species.
Disrupt the breeding cycle of an important population	The study area does not contain an important population. A large Koala population occurs to the north of the study area which is likely to be important for breeding. No Koalas or evidence of Koalas were recorded within the study area. Therefore, the project is unlikely to disrupt the breeding cycle of an important population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The project will remove a small area of potential habitat for this species which will result in the decrease in the availability of habitat. The decrease in habitat is small in comparison to the availability of habitat in the surrounding area. Therefore, the project is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	The project is unlikely to introduce invasive species that will impact upon this species.
Introduce disease that may cause the species to decline	The project is unlikely to introduce disease that will impact upon this species.
Interfere substantially with the recovery of the species	The project will remove a small area of potential habitat and as such this could be seen to interfere with the recovery of this species. However, given the extent of habitat to be retained within the study area as well as the extent of surrounding habitats, the project is not expected to interfere with the recovery of this species.
Conclusion	The project is unlikely to result in a significant impact upon the Koala and a Referral is not required.

EPBC Important Population Criteria for Large-eared Pied Bat	Answer
Key source populations for either breeding or dispersal	The Large-eared Pied Bat roosts and breeds in caves, Fairy Martin nests and other structures such as mine shafts. None of these structures were present within the study area. Therefore, the study area is not a key source for breeding or dispersal.
Populations that are necessary for maintaining genetic diversity; and/or	The project will remove 0.71 ha of open forest which provides foraging habitat for this species. No breeding habitat was recorded within the study area and therefore the potential population within the study area is not necessary for maintaining genetic diversity.
At or near the limit of the species range.	The Large-eared Pied Bat occurs from Rockhampton QLD to the south highlands in NSW. The Study Area occurs near Williamtown in NSW and is not at the limit of this species range.
Is the population important for the Large-eared Pied Bat	No the population within the study area is not part of an important population

Large-eared Pied Bat – EPBC Act Assessment	Response
Profile: Large-eared Pied Bat (*Chalinolobus dwyeri*) listed as Vulnerable on the EPBC Act. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin, frequenting low to mid-elevation dry open forest and woodland close to these features. Also found in well-timbered areas containing gullies.	
Lead to a long-term decrease in size of an important population	The study area does not contain an important population. This species was not recorded within the study area, despite Anabat surveys. The open forest habitat of the study area provides potential foraging habitat. No roosting or breeding habitat in the form of caves, Fairy Martin nests and other structures such as mine shafts were recorded within the study area. 0.71 ha of Open Forest habitat will be removed as part of this project. Micro-bat species are insectivorous and the reduction in this extent of foraging and non-preferred roosting habitat is unlikely to impact on the availability of foraging resources. The project is unlikely to lead to a long term decrease in size of an important population.
Reduce the area of occupancy of an important population	The study area does not contain an important population. This species is not known to currently occupy the study area and therefore, the project is unlikely to reduce the occupancy of an important population.

Large-eared Pied Bat – EPBC Act Assessment	Response
Fragment an existing important population into two or more populations	The study area does not contain an important population. The project will maintain vegetation connectivity throughout the study area. Also, this species is highly mobile and therefore, the project is unlikely to fragment an existing population into two or more populations.
Adversely affect habitat critical to the survival of the species	The study area is not critical habitat for the survival of this species.
Disrupt the breeding cycle of an important population	The study area does not contain an important population. This species is not known to currently occupy the study area. No roosting or breeding habitat in the form of caves, Fairy Martin nests and other structures such as mine shafts were recorded within the study area and Therefore, the project is unlikely to disrupt the breeding cycle of an important population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The project will remove and modify a small area of potential foraging habitat for this species which will result in the decrease in the availability of habitat. The decrease in habitat is small in comparison to the extent of habitat in the surrounding area. Therefore, the project is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	The project is unlikely to introduce invasive species such as exotic plant species that are potentially harmful to this species.
Introduce disease that may cause the species to decline	The project is unlikely to introduce disease that will impact upon this species.
Interfere substantially with the recovery of the species	The Department of Environment and Energy (DEE, 2016) lists recovery objectives, the most relevant of which includes 'Identify priority roost and maternity sites for protection (DEE, 2016). Given that this species was not recorded, that no roosting habitats were identified, the extent of habitat to be retained within the study area as well as the extent of surrounding habitats, the project is not expected to interfere with the recovery of this species.
Conclusion	The project is unlikely to result in a significant impact upon the Large-eared Pied Bat and a Referral is not required.

EPBC Important Population Criteria for *Diuris praecox*	Answer
Key source populations for either breeding or dispersal	This species was not recorded within the project area and it is likely to be wind dispersed and pollinated by small insects. The removal and modification of a small area of habitat is unlikely to impact upon the breeding mechanisms for this species. Therefore, it is unlikely that the project area would be a key

EPBC Important Population Criteria for *Diuris praecox*	Answer
	source for either breeding or dispersal for this species.
Populations that are necessary for maintaining genetic diversity; and/or	This species was not recorded, despite targeted surveys. Large populations of this species occur at Newcastle and other locations within the locality, which are likely to be necessary for maintaining genetic biodiversity. As this species was not recorded and the project will removal of a small area of potential habitat the study area is unlikely to be necessary for maintaining genetic diversity for this species within the locality.
At or near the limit of the species range.	*Diuris praecox* occurs on the east coast of NSW from Batemans Bay to Smith Lakes The study area occurs at Williamtown, NSW and is not at the limit of this species range.
Is the population within the project area part of an important for *Diuris praecox.*	No, the project area does not form part of an important population for this species.

***Diuris praecox* – EPBC Act Assessment**	**Response**
Profile: *Diuris praecox* is listed as Vulnerable in the EPBC Act. Grows on hills and slopes of near-coastal districts in open forest, which have a grassy to fairly dense understorey (OEH, 2015a). Known to occur between Bateau Bay and Smiths Lake (OEH, 2015a). Exists as subterranean tubers most of the year, producing leaves and flowering stems in winter (OEH, 2015a). Flowers from July to early September (PlantNet, 2015a).	
Lead to a long-term decrease in size of an important population	The study area does not contain an important population. This species was not recorded within the study area. The project will remove a small area (0.71 ha) of potential habitat for this species. The potential population with the study area is not an important population therefore, it is unlikely to lead to a long-term decrease in the size of an important population.
Reduce the area of occupancy of an important population	The study area does not contain an important population. This species was not recorded within the study area. Therefore, the project is unlikely to reduce the area of occupancy of an important population.
Fragment an existing important population into two or more populations	The study area does not contain an important population. This species was not recorded within the study area. Therefore, the project is unlikely to fragment an important population into two or more populations.
Adversely affect habitat critical to the survival of the species	The study area is not critical habitat for the survival of this species.
Disrupt the breeding cycle of an important population	The study area does not contain an important population. This species was not recorded within the study area and

Diuris praecox – EPBC Act Assessment	Response
	therefore the project is unlikely to disrupt the breeding cycle.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	0.71 ha of Smooth-barked Apple – Blackbutt – Old Man Banksia Woodland habitat will be removed as part of this project. The study area was previously a sand mine and habitat for this species is currently fragmented within the study area. The project is unlikely to fragment or isolated areas of habitat than is already occurring. Given, that there are large areas of habitat adjoining the study area in Worimi State Conservation Area and in the wider locality it is unlikely that the project will cause this species to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	The project is unlikely to introduce invasive species such as exotic plant species that are potentially harmful to this species.
Introduce disease that may cause the species to decline	The project is unlikely to introduce disease that will impact upon this species.
Interfere substantially with the recovery of the species	The project is unlikely to interfere with the recovery of this species.
Conclusion	The project is unlikely to result in a significant impact upon *Diuris praecox*.

EPBC Important Population Criteria for *Cryptostylis hunteriana*	Answer
Key source populations for either breeding or dispersal	*Cryptostylis hunteriana* was not recorded within the project area. This species is pollinated by wasps and it is likely to be wind dispersed. The removal and modification of a small area of habitat is unlikely to impact upon the breeding mechanisms for this species. Therefore, it is unlikely that the project area would be a key source for either breeding or dispersal for this species.
Populations that are necessary for maintaining genetic diversity	This species was not recorded, despite targeted surveys. Large populations of this species occur at Bulahdelah, which is likely to be necessary for maintaining genetic biodiversity. As this species was not recorded and the project will remove a small area of potential habitat the study area is unlikely to be necessary for maintaining genetic diversity within the locality.
At or near the limit of the species range.	*Cryptostylis hunteriana* occurs in Victoria, NSW and Queensland. The study area occurs at Williamtown, NSW and is not at the limit of this species range.

EPBC Important Population Criteria for *Cryptostylis hunteriana*	Answer
Is the population within the project area part of an important for *Cryptostylis hunteriana?*	No, the project area does not form part of an important population for this species.

Cryptostylis hunteriana – EPBC Act Assessment	Response
Profile: Leafless Tongue-orchid listed as Vulnerable in the EPBC Act. Does not appear to have well defined habitat preferences and is known from a range of communities, including Coastal heath, coastal forests, dry woodlands, lowland forests and on the margins of coastal swamps and sedgelands (Approved Conservation Advice, 2008) The larger populations typically occur in woodland dominated by Scribbly Gum, Silvertop Ash, Red Bloodwood and Black Sheoak; appears to prefer open areas in the understorey and is often found in association with *Cryptostylis subulata* and *Cryptostylis erecta*. This species is cryptic and may not flower every year. Flowering period is between November and February.	
Lead to a long-term decrease in size of an important population	The study area does not contain an important population. This species was not recorded within the study area. The project will remove a small area (0.71 ha) of potential habitat for this species. The potential population with the study area is not an important population therefore, it is unlikely to lead to a long term decrease in the size of an important population.
Reduce the area of occupancy of an important population	The study area does not contain an important population. This species was not recorded within the study area. Therefore, the proposal is unlikely to reduce the area of occupancy of an important population.
Fragment an existing important population into two or more populations	The study area does not contain an important population. This species was not recorded within the study area. Therefore, the project is unlikely to fragment an important population into two or more populations.
Adversely affect habitat critical to the survival of the species	The study area is not critical habitat for the survival of this species.
Disrupt the breeding cycle of an important population	The study area does not contain an important population. This species was not recorded within the study area and therefore the project is unlikely to disrupt the breeding cycle.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	0.71 ha of Smooth-barked Apple – Blackbutt – Old Man Banksia Woodland habitat will be removed as part of this project. The study area was previously a sand mine and habitat for this species is currently fragmented within the study area. Most of the impact will occur on the edges and the project is unlikely to fragment or isolated areas of habitat than is already occurring. Given, that there are large areas of habitat adjoining the study area in Worimi State Conservation Area and in the wider locality it is unlikely that the project will cause this species to decline.

Cryptostylis hunteriana – EPBC Act Assessment	Response
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	The proposal is unlikely to introduce invasive species such as exotic plant species that are potentially harmful to this species.
Introduce disease that may cause the species to decline	The proposal is unlikely to introduce disease that will impact upon this species.
Interfere substantially with the recovery of the species	No recovery plan has been prepared this species. The proposal is unlikely to significantly contribute to or hinder the recovery of the species.
Conclusion	The proposal is unlikely to result in a significant impact upon the *Cryptostylis hunteriana.*

Appendix 8

Bat Analysis Report

Identification of echolocation call sequences recorded at Williamtown.

Data

Data was received by email on the 14/05/2018 and was analysed using AnalookW v4.1t. In total five nights of data containing 703 Anabat sequence files were received from two detectors from the 30th April to the 4th of May 2018. Results per detector night are presented in Table 1.

Reference Library

Call identification for this data set was based on call keys and descriptions for New South Wales (Pennay et al 2004) with reference to descriptions published for southern Queensland (Reinhold et al 2001).

Analysis

The reliability of identification is as follows;

Definite; one or more calls were there is no doubt about the identification of the species

Probable; most likely to be the species named, low probability of confusion with species that use similar calls

Possible; call is comparable with the named species, with a moderate to high probability of confusion with species of similar calls.

Temperature logs recorded by the Anabat at the time of survey indicate temperatures were recorded with as having a high of 25.25 °C and a low of 9.75°C. Temperature has been shown to have a significant effect on microbat foraging activity (see for example Threlfall et. al. 2012 and DEWHA 2010). Interference was evident in the data set and calls were of a generally poor nature.

Table 1 - Anabat recording results	Detector 535			Detector 641				
Species name	20180430	20180502	20180504	20180430	20180501	20180502	20180503	20180504
Definite								
Miniopterus australis							X	
Species composites/groups identified								
Austronomus australis/Saccolaimus flaviventris							*	
Chalinolobus gouldii or Mormopterus species	#	#				#	#	
Mormopterus ridei/M. norfolkensis					#			
Mormopterus ridei/Scoteanax rueppellii/Falsistrellus tasmaniensis/Scotorepens orion							#	
Myotis macropus/Nyctophilus species		#						
Chalinolobus morio/Vespadelus species					#	#	*	
Miniopterus australis/Vespadelus pumilus					#		#	

Probability - Assigned values are discussed in report

probable

* possible

Call Examples (calls have been edited and filtered for reporting purposes)

Section 1.

Species positively identified

Definitely *Miniopterus australis*. The species calls between 54.5 – 64.5 kHz in the North East region with a down- sweeping tail (Pennay, Law and Reinhold 2004).

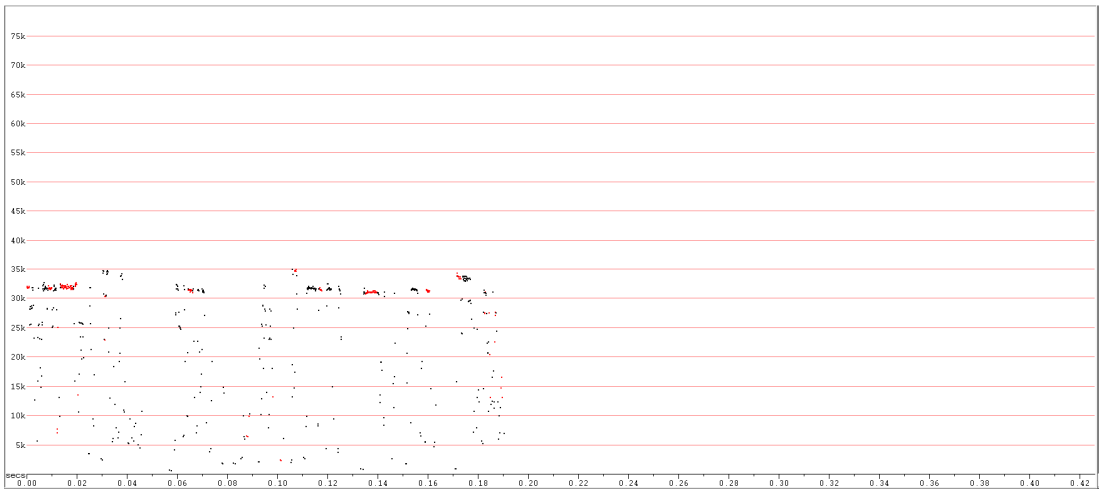
Section 2.

Species composites/groups identified

A species listed here that is not also listed in the species positively identified should be considered as possibly present. Likelihood of occurrence and call identification issues for these species are discussed below each call example.

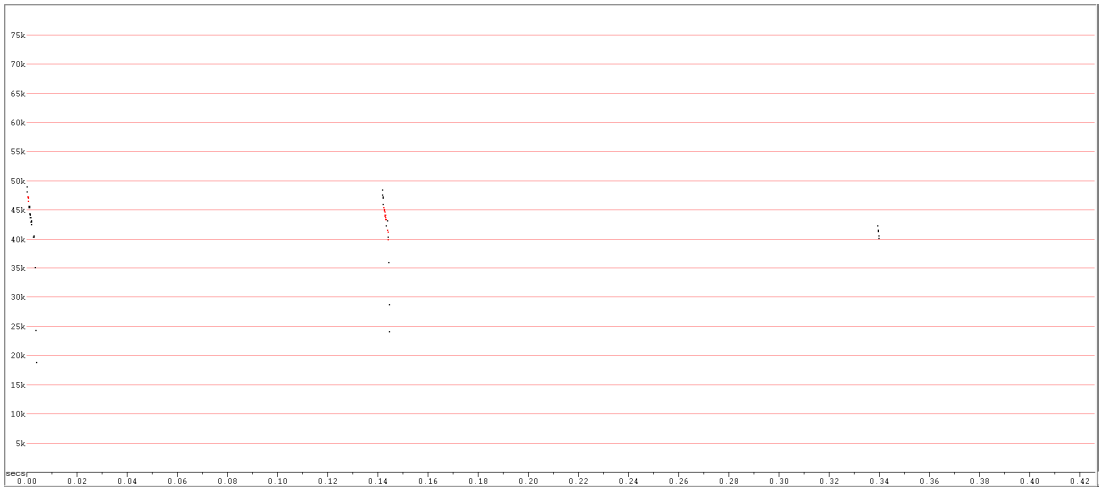
Species not readily identifiable at 20 kHz. These pulses probably belong to the upper end of *Austronomus australis*, flying in clutter or a feeding buzz. *Saccolaimus flaviventris* calls between 17 – 19 kHz in the North East region (Pennay, Law and Reinhold 2004) and has been included as a possibility.

Probably *Chalinolobus gouldii* /*Mormopterus* sp. Frequency ranges overlap in the species, *C. gouldii* usually has steep, curved pulses that alternate in frequency compared to flat or shallow-curved pulses with no alternation in *Mormopterus* species. For example the call above could belong to an attack phase of a *Mormopterus* species or a *Chalinolobus gouldii* call were the upper pulses have dropped out as may occur in more open spaces. Calls in this data set were attributable to both species however a large number of calls were either of low quality (brief and noisy) or displayed intermediate characteristics and could not be reliably identified.



Probably *Mormopterus ridei/M. norfolkensis*. The species overlap at around 30 kHz some alternation is evident in this call sequence suggesting M. norfolkensis however, it is not consistent throughout the call sequence.

Possibly *Scoteanax rueppellii/Falsistrellus tasmaniensis/Scotorepens orion/Mormopterus ridei*. The species overlap at this frequency, and there is insufficient detail in this call sequence to assign a positive identification.



Probably *Myotis macropus/Nyctophilus* species. *M. macropus* calls can be differentiated from Nyctophilus species by having a pulse interval less than 75ms, an initial slope of greater than 400 OPS and often displaying a single change in slope (kink) in the central part of the pulse. *Myotis macropus, Nyctophilus geoffroyi* and *Nyctophilus gouldi* have been recorded in the region (NPWS Atlas and Atlas of Living Australia Data June 2018). This call is uncompressed.

Probably *Chalinolobus morio*/*Vespadelus species*. Calls of insufficient pulse structure detail as above were attributed to *C. morio*/*Vespadelus species* were they overlap in frequency around 50 kHz and include V. pumilus, V. troughtoni and V. vulturnus in the North East region (Pennay, Law and Reinhold 2004).

Probably *Miniopterus australis/Vespadelus pumilus*. The species overlap at this frequency, and there is insufficient detail in tis call sequence to separate the species.

References

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Reinhold, L., Law, B., Ford, G. and Pennay, M. 2001, Key to the bat calls of southeast Queensland and north-east New South Wales. Forest Ecosystem Research and Assessment Technical paper 2001-07, Department of Natural Resources and Mines, Queensland.

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Disclaimer

Appendix 9

CKPoM Koala Habitat Assessment

Koala Habitat Assessment in the Port Stephens LGA

The majority of the study area has been mapped as supplementary Koala Habitat, with a small area being mapped as preferred Koala Habitat and 50 m buffer over cleared land under the CKPoM. Therefore, an assessment in accordance with the CKPoM has been conducted for the subject site. The following assessment has been conducted in accordance with Appendix 6 Guidelines for Koala Habitat Assessment of the CKPoM.

Guidelines for Koala Habitat Assessments

Step 1 Preliminary Assessment

i. Reference to the Koala Habitat Planning Map for the Port Stephens LGA to make a preliminary assessment of the Koala habitat on site of the proposed development and to consider the Koala habitat of the site in the broader local and regional context

Response: Koala Habitat Planning Map has mapped the peripheral parts of the study area as **Supplementary Koala habitat** (Figure 5-3), with very small areas of preferred habitat and 50 m buffer over cleared land in the north-wester corner of the study area (outside of the actual subject site).

ii. Inspection of the site to determine whether the site contains individuals of preferred koala food trees outside areas mapped as Preferred Koala Habitat.

Response: The subject site was inspected during several field surveys as follows:

- 30th April – 4th May 2018 – Fauna trapping and hollow-bearing tree Surveys
- 10th May 2018 – Hollow-bearing tree surveys and opportunistic fauna surveys

The comprehensive fauna surveys and hollow-bearing tree surveys did not record any preferred Koala habitat trees.

Step 2 Vegetation Mapping

i. Vegetation of the site should be mapped and shows the distribution of the vegetation associations within the site.

Response: Vegetation within the study area was consists of the following:

- Coast Tea Tree – Old Man Banksia Coastal Shrubland;

- Smooth-barked Apple – Blackbutt – Old Man Banksia Woodland;
- Exotic grassland with scattered shrubs; and
- Bitou Bush Shrubland.

Figure 4-3 shows the vegetation mapping of the study area.

Lunney *et al* (1998) identified Tall Open Blackbutt and Sydney Red Gum vegetation association as Category C Koala habitat. The Lower Hunter and Central Coast Regional Environmental Management Strategy (2003) and Greater Hunter Vegetation Mapping (OEH 2012) has mapped this vegetation within the study area. This community is commensurate with the Smooth-barked Apple – Blackbutt – Old Man Banksia Woodland mapped by this study. The Coast Tea Tree – Old Man Banksia Coastal Shrubland mapped within as part of this report is a heath community and is classified as excluded from Koala habitat (Lunney *et al* 1998). Therefore, the vegetation within the study area generally aligns with the regional vegetation mapping, albeit with more refined boundaries.

ii. The locations of koala preferred Koala feed trees are to be shown on a map.

Response: No preferred Koala habitat trees were recorded within the study area.

Step 3 Koala Habitat Identification

Step 3a – This step not required as vegetation mapping is aligned with LGA vegetation map. Therefore, the next part of the assessment is Step 3b.

Step 3b Koala Habitat Identification

Portions of the subject site have been mapped as supplementary Koala Habitat by the CKPoM. There are no Koala habitat trees present on the study area and it is unlikely that the site is preferred Koala habitat. However, it could act as a linking corridor to adjoining areas of habitat in the south of the study area between Worimi State Conservation Area in the south and native vegetation to the north. Figure 5-3 shows the Koala habitat mapping, project design and linking corridor through the site. Therefore, an assessment of the project has been conducted for the Koala under the CKPoM.

Step 4 Assessment of the Project

The project is for development of part of the study area (the subject site) for an eco-tourist facility and therefore an assessment under Appendix 4 Performance Criteria for Development Applications (excluding development applications proposal agricultural activities in required).

CKPoM Development assessment

The Koala Habitat Planning Map has been overlaid by the project design in Figure 5-3 and shows that the study area has been mapped as mostly not being Koala habitat, with the peripheral areas being mostly mapped as supplementary habitat.

Proposed development (other than agricultural activities) **must:**

a. Minimise the removal or degradation of native vegetation within Preferred Koala Habitat or Habitat Buffers.

Response: The eco-tourist development has resulted in no removal of preferred Koala Habitat of habitat buffers and a majority of remnant native vegetation and habitat connectivity will be retained post-development.

b. Maximise retention and minimise degradation of native vegetation within Supplementary Koala Habitat and Habitat Linking Areas;

Response: The eco-tourist development aims are to preserve native vegetation for tourism purposes. The subject site has been placed mostly in cleared areas with minimal areas of mapped Supplementary Koala Habitat being impacted.

c. Minimise the removal of any individuals of preferred koala food trees, where ever they occur on a development site. In the Port Stephens LGA these tree species are Swamp Mahogany (*Eucalyptus robusta*), Parramatta Red Gum (*Eucalyptus parramattensis*), and Forest Red Gum (*Eucalyptus tereticornis*), and hybrids of any of these species. An additional list of tree species that may be important to koalas based on anecdotal evidence is included in Appendix 8

Response: No preferred Koala feed trees will be removed as a result of the proposal. Minor removal of the anecdotal Koala tree species, *Angophora costata* and *Eucalyptus pilularis* will occur as part of the project however the vast majority of these tree species will be retained post-development.

d. Make provision, where appropriate, for restoration or rehabilitation of areas identified as Koala Habitat including Habitat Buffers and Habitat Linking Areas over Mainly Cleared Land. In instances where Council approves the removal of koala habitat (in accordance with dot points 1-4 of the above waive clause), and where circumstances permit, this is to include measures which result in a “net gain” of koala habitat on the site and/or adjacent land;

Response: The WLALC Green Team have replanted some of the disturbed sand mine area with locally native species with the aim of regenerating the study area. The WLALC Green Team will continue their work on regeneration and rehabilitation of the Lot 227 within the wider site (i.e. outside APZ areas). The WLALC Green Team will also conduct weed removal operations and environmental education as part of the WLALC eco-tourist project.

e. Make provision for long-term management and protection of koala habitat including both existing and restored habitat;

Response: All areas of mapped supplementary koala habitat will be managed as part of the eco-tourist development to ensure that the Koala habitat is managed for both conservation and eco-tourist.

f. Not compromise the potential for safe movement of koalas across the site. This should include maximising tree retention generally and minimising the likelihood that the proposal would result in the creation of barriers to koala movement, such as would be imposed by certain types of fencing. The preferred option for minimising restrictions to safe koala movement is that there be no fencing (of a sort that would preclude koalas) associated with dog free developments within or adjacent to Preferred or Supplementary Koala Habitat, Habitat Buffers or Habitat Linking Areas. Suitable fencing for such areas could include:

    I. fences where the bottom of the fence is a minimum of 200 mm above ground level that would allow koalas to move underneath;

    II. fences that facilitate easy climbing by koalas; for example, sturdy chain mesh fences, or solid style fences with timber posts on both sides at regular intervals of approximately 20m;
    or

    III. open post and rail or post and wire (definitely not barbed wire on the bottom strand).

However, where the keeping of domestic dogs has been permitted within or adjacent to Preferred or Supplementary Koala Habitat, Habitat Buffers or Habitat Linking Areas, fencing of a type that would be required to contain dogs (and which may also preclude koalas) should be restricted to the designated building envelope. Fences which are intended to preclude koalas should be located away from any trees which now or in the future could allow koalas to cross the fence.

Response Connectivity: The native vegetation within the eastern portion of the study area will be retained and connectivity through this area will not be impacted by the project (Figure 5-1 and 5-2). This will maintain the current movement corridor for the Koala. The project has been placed in areas of mostly cleared and disturbed vegetation to minimise the impact on native vegetation.

Response Fencing: Limited fencing currently occurs within the study area. A single rope fence adjoins the western boundary of the study area. The remainder of study area contained old fencing strand wire timber post fencing which had fallen down. Evidence of dogs in the form of footprints were observed within the study area. No fencing is proposed for the study area to preclude Koalas from dog attacks. If fencing is to occur within the future it will adhere to the guidelines for Koala fencing above.

g. Be restricted to identified envelopes which contain all buildings and infrastructure and fire fuel reduction zone. Generally, there will be no clearing on the site outside these envelopes. In the case of applications for subdivision, such envelopes should be registered as a restriction on the title, pursuant to the *Conveyancing Act 1919*; and

Response: No clearing will be conducted outside of the identified subject site, which incorporates all likely direct and indirect impacts of the project. No go zone fencing or boundary definition will be implemented during construction works to prevent accidental clearing outside of approved clearing boundaries.

h. Include measures to effectively minimise the threat posed to koalas by dogs, motor vehicles and swimming pools by adopting the following minimum standards.

    I. The development must include measures that effectively abate the threat posed to koalas by dogs through prohibitions or restrictions on dog ownership. Restrictions on title may be appropriate.

Response: Dogs will be prohibited as part of the eco-tourist development.

    II. The development must include measures that effectively minimise the threat posed to koalas from traffic by restricting vehicle speeds, to 40kph or less.

Response: Vehicle access will be restricted to parking areas for visitors of the subject site with a 20kph speed limit. Quad bike riding will be part of the eco-tourist activities and these will be limited to 10 kph.

    III. The development must reduce the risk of koala mortality by drowning in backyard swimming pools. Appropriate measures could include: trailing a length of stout rope (minimum diameter of 50mm), which is secured to a stable poolside fixture, in the swimming pool at all times; designing the pool in such a way that

koalas can readily escape; or enclosing the pool with a fence that precludes koalas. This last option should include locating the fence away from any trees which koalas could use to cross the fence.

Response: No swimming pools are proposed as part of the eco-tourist development.

Conclusion

Based on the assessment above it is concluded that the project will not impact upon any Koala feed trees, will retain the majority of the native vegetation and connectivity. A small area of mapped supplementary Koala habitat will be impacted upon, however this is unlikely to have a significant impact upon the potential Koala population that may utilise or adjoin the study area. Therefore, it is concluded that the consent for this development should not be withheld on Koala habitat grounds.