

**Central Coast Quarter
26 Mann Street Gosford**

Biodiversity Development Assessment Report

Prepared for SH Gosford Residential Pty Ltd | 29 August 2019



Document control

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Executive summary

Context

SH Gosford Residential Pty Ltd is proposing to undertake mixed-use development (the Project) at Gosford, within the Central Coast Local Government Area.

The project site (the Site) is approximately 0.85 hectares in size on land currently comprising cleared areas where former development has been demolished. The majority of the Site will be occupied by the Project and associated infrastructure, however, in accordance with the Secretary's Environmental Assessment Requirements (SEARs) the *Ficus rubiginosa* on the corner of Vaughan Street and Mann Street will be retained.

The Site consists of cleared areas with planted native trees along the western and south-western boundaries and planted and naturally occurring native vegetation along the eastern boundary. Numerous exotic species occur in the vegetated areas of the Site.

Aims

Niche Environment and Heritage Pty Ltd (Niche) was commissioned by SH Gosford Residential Pty Ltd to address the biodiversity components of the SEARs for the preparation of an Environmental Impact Statement for the Project. This report addresses the following biodiversity components of the SEARs:

17. Biodiversity

Assess any biodiversity impacts associated with the proposal in accordance with the requirements of the Biodiversity Conservation Act 2016, including the preparation of a Biodiversity Development Assessment Report, where required.

In accordance with the requirements of the SEARs, a Biodiversity Development Assessment Report (BDAR) is required to support the development application. The Project has been assessed in accordance with the BAM 'streamlined assessment module' for small area development that requires consent.

Survey overview

An ecological survey in accordance with the BAM was undertaken for the Project, and consisted of:

- Biodiversity Assessment on the 13th August 2019 which included BAM plot/transect collection, habitat assessment and a walking meander.

Native vegetation assessment

The majority of the Site does not align to any native vegetation community as it comprises cleared areas. Vegetation along the western and south-western boundaries comprises a row of planted native trees along the fenceline and the vegetation along the eastern boundary comprises native canopy species with an understorey dominated by exotic species, including numerous high threat weeds and declared priority weeds.

One Plant Community Type (PCT) was identified on the Site:

- 1556 - Tallowood - Smooth-barked Apple - Blackbutt grass tall open forest of the Central and lower North Coast.

Avoid, minimise and mitigate impacts

Measures to reduce the impact of the Project on local flora and fauna include:

- Implement tree protection measures around the *Ficus rubiginosa* that is to be retained
- Inclusion of endemic tree and shrub species in landscaping.

Credit calculations and offsetting

The PCT identified within the Site generated a requirement of two ecosystem credits.

No species credits are required for the Project.

Glossary and list of abbreviations

Term or abbreviation	Definition
BAM	Biodiversity Assessment Methodology
BDAR	Biodiversity Development Assessment Report
BAM Calculator	Biodiversity Credit Calculator
BC Act	<i>Biodiversity Conservation Act 2016 (NSW)</i>
BOS	NSW Biodiversity Offsets Scheme
CEEC	Critically Endangered Ecological Community
DPIE	NSW Department of Planning, Infrastructure and Environment (formerly OEH)
DNG	Derived Native Grassland
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)</i>
EP&A Act	<i>Environmental Planning and Assessment Act 1979 (NSW)</i>
FM Act	<i>Fisheries Management Act 1994</i>
FFMP	Flora and Fauna Management Plan
ha	Hectare/s
IBRA	Interim Biogeographic Regionalisation for Australia
Locality	The site and surrounds, nominally a 10 km radius from the site.
MNES	Matters of National Environmental Significance (from the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>).
M	Metre/s
m ²	Metres square
OEH	Office of Environment and Heritage (formerly DECCW, DECC, DEC)
Site	Means the site where surveys were conducted.
PCT	Plant Community Type

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1. Biodiversity Assessment

1.1 Introduction

Niche Environment and Heritage Pty Ltd (Niche) was commissioned by SH Gosford Residential Pty Ltd to assess the ecological values and impacts associated with proposed mix use development (the Project) at 26-32 Mann Street, Gosford (the Site, Figure 1).

The primary objective of this report is to use the Biodiversity Assessment Methodology (BAM) (OEH 2017) to describe and assess the ecological values within the Site and surrounds, and determine how the Project is likely to have an impact on threatened biodiversity listed under the NSW *Biodiversity Conservation Act 2016* (BC Act). This report addresses the following biodiversity components of the Secretary's Environmental Assessment Requirements (SEARs):

17. Biodiversity

- *Assess any biodiversity impacts associated with the proposal in accordance with the requirements of the Biodiversity Conservation Act 2016, including the preparation of a Biodiversity Development Assessment Report, where required.*

1.2 The Project

SH Gosford Residential Pty Ltd is proposing to undertake a mixed use development incorporating commercial, retail (including food and drink premises), hotel accommodation and residential accommodation (the Project) in Gosford (Figure 1, Figure 4).

The Project is classified as State Significant Development (SSD) under State Environmental Planning Policy (State and Regional Development) 2011 and is subject to assessment and determination by the NSW Minister for Planning or the Planning Assessment Commission, as appropriate.

1.3 The Site

The Site is located at 26-32 Mann Street, Gosford (Lot 469 in DP 821073; Lots 2 -7 in DP 14761; Lot 1 DP 1235203), within the Central Coast Local Government Area. The Site is approximately 0.85 hectares on land currently comprising cleared areas where former development has been demolished. The majority of the Site will be occupied by the Project and associated infrastructure, however, in accordance with the SEARs the *Ficus rubiginosa* on the corner of Vaughan Street and Mann Street will be retained.

The Site consists of cleared areas with planted native trees along the western and south-western boundaries and planted and naturally occurring native vegetation along the eastern boundary. Numerous exotic species occur in the vegetated areas of the Site.

1.4 Approval and assessment process

1.4.1 State approval and assessment process - Application of the BAM

The BAM is a framework for assessment of biodiversity impacts and determination of offsetting requirements under the NSW Biodiversity Offsets Scheme (BOS).

This Biodiversity Development Assessment Report (BDAR) describes the biodiversity values present within the Site and identifies impacts from the Project on these values. This assessment has used the BAM Calculator (version 1.2.4.00).

The Project has been assessed in accordance with the BAM 'streamlined assessment module for small area development that requires consent'. The module uses a specific version of the BAM Calculator and has

different survey and reporting requirements to a regular BDAR. The Project is eligible to be assessed in accordance with the streamlined assessment module as:

- The Site does not occur in the shaded area of the Biodiversity Values Map.
- The proposed area of vegetation clearing (0.094 ha (excluding the Port Jackson Fig)) does not exceed the maximum area limit for application of the small area development module (≤ 1 ha).

1.4.2 Commonwealth approval and assessment process

Matters of National Environmental Significance (MNES) are protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The BAM requires proponents to identify and assess the impacts on all nationally listed threatened species and threatened ecological communities that may be present on or near the Site. Therefore, the BAM has partly been used to perform assessment of impacts under the EPBC Act.

1.5 Assessment objectives and format

The primary objective of this assessment is to use the guidelines and methodology provided in the BAM to determine the impact the Project would have on biodiversity, avoid and mitigate these impacts and then calculate the Project's biodiversity offset requirement.

This BDAR has two broad stages consistent with the BAM methodology:

Stage 1 – Biodiversity Assessment

- assessment of landscape features
- assessment of native vegetation
- assessment of threatened species and populations

Stage 2 – Impact Assessment

- avoid and minimise impacts on biodiversity values
- consider impact and offset thresholds
- determine and calculate offset requirements

1.6 Assessment resources and assessor qualifications

This BDAR has been prepared by the following accredited assessors:

- Evelyn Craigie – Senior Ecologist/Accredited Biodiversity Assessor: flora and fauna field survey, data management, data entry, credit calculations, review of credit calculations, report preparation.

Other specialist staff involved in preparing the assessment include:

- Yogesh Nair –Ecologist/Accredited Biodiversity Assessor: report preparation
- Sian Griffiths – Senior Ecologist/Accredited Biodiversity Assessor: peer review
- Matthew Harris – GIS Specialist: mapping.

1.7 Landscape assessment

1.7.1 Methods:

As detailed in section 4 of the BAM (OEH 2017a), a landscape assessment for the Project is required, which was conducted within the BAM Calculator. Landscape value is an assessment of a number of factors including:

- native vegetation cover

- rivers, streams and estuaries
- areas of geological significance
- habitat connectivity.

For each factor the current state of the landscape is assessed then compared with the state of the landscape if the Project were to proceed.

1.7.2 Landscape features and scoring

Table 1 provides details of the landscape settings and scored landscape features for the Project.

Table 1: Landscape features and scoring under the NSW BAM

Landscape features	Description	Figure reference
IBRA bioregion/subregion	The Project is located in the Wyong subregion which is within the Sydney Interim Biogeographic Regionalisation for Australia (IBRA) bioregion.	Figure 2
Mitchell Landscapes	The Mitchell Landscape found within the Site is: • Sydney – Newcastle Coastal Alluvial Plains	Figure 2
Rivers, streams and estuaries and Strahler stream order	There are no rivers or streams within or adjacent to the Site.	Figure 1 Figure 2
Wetlands within and adjacent to development	There are no wetlands within or adjacent to the Site. Brisbane Water estuary occurs approximately 100 m from the Site.	Figure 1
Connectivity features	Vegetation within the Site occurs within an urban environment and is not connected to or within 100 m of other areas of native vegetation in moderate to good condition. .	-
Buffer area (percent native vegetation cover)	A 1,500m buffer was applied to the Site resulting in an overall buffer area of 764 ha. The majority of native vegetation in the buffer area is part of Rumbalara Reserve and Presidents Hill. Woody vegetation cover The native vegetation extent and cover of woody vegetation was determined via aerial photography interpretation based on canopy cover. For woody vegetation 20% of the buffer area was determined to support native woody vegetation with benchmark cover.	Figure 2
Site context	Site based assessment.	-
Geological significance and soils	There are no karst, caves, crevices, cliffs or other areas of geological significance within the Site. There are no high hazard soil areas.	-

1.8 Native vegetation and flora assessment

1.8.1 Methods – data review

NSW Bionet Atlas Database

A review of spatial records of threatened flora within a 10 km radius of the Site was undertaken using data obtained from the NSW Bionet Atlas. Records were obtained prior to field survey. Results were considered during field survey and likelihood of occurrence analysis.

EPBC Act Protected Matters Search

A Protected Matters Search (EPBC Act) was carried out for a 10 km area around the Site. Results were considered during field survey and likelihood of occurrence analysis.

1.8.2 Methods – field survey

Plot/transect surveys and targeted threatened species surveys were conducted throughout the Site with results used within the BAM Calculator to generate credit requirements. Plant community types across the Site were recorded and mapped using a combination of vegetation quadrats, transects and walking meanders.

The BAM plot requirements were determined using the BAM (OEH 2017a). The number of plots conducted and required for each Plant Community Type (PCT) and zone is provided in Table 3 and the location of completed plots is illustrated in Figure 3. Plot/transect surveys for use within the BAM Calculator were conducted on 13th August 2019.

1.8.3 Survey Effort

Native vegetation and flora survey was undertaken on 13th August 2019 and consisted of the following:

- One BAM plot/transect (Figure 3).
- A walking meander throughout the Site. Given the relatively small size of the Site, a random meander was able to thoroughly cover the entire area.

1.8.4 Plant community delineation and mapping

The majority of the Site does not align to any native vegetation community as it comprises cleared areas. Vegetation along the western and south-western boundaries comprises a row of planted native trees along the fenceline, the majority of which are *Lophostemon confertus* (Brush Box). This tree is not native to the area and is commonly used in landscaping. The vegetation along the eastern boundary comprises native canopy species with an understorey dominated by exotic species, including numerous high threat weeds and declared noxious weeds. The native canopy in this area comprises *Eucalyptus saligna* (Sydney Blue Gum), *Eucalyptus microcorys* (Tallowwood), *Ficus rubiginosa* (Port Jackson Fig) and Brush Box. Native understorey species are sparse and include *Melaleuca linariifolia* (Flax-leaved Paperbark) and *Glochidion ferdinandi* (Cheese Tree).

It is difficult to determine an appropriate PCT for the Site due to the altered condition of the vegetation and landscape. The Department of Planning, Infrastructure and Environment (DPIE) has previously advised that, where there is native vegetation on the Site that does not conform to a PCT, the vegetation should be assessed against the best-fit PCT. The best-fit PCT was identified based on the species present, the landscape position of the Site and its geographic location. On this basis, one PCT was identified on the Site:

- 1556 - Tallowwood - Smooth-barked Apple - Blackbutt grass tall open forest of the Central and lower North Coast (Figure 3).

This PCT was selected due to the presence of Tallowwood in the canopy and Cheese Tree in the understorey, its landscape position on coastal flats, its location on the Central Coast and the known occurrence of this PCT in the former Gosford LGA. Only one condition class was given to the PCT, given similar structure and quality occurred across the Site (Table 2 and Table 3).

Table 2: Vegetation mapping and alignment for vegetation types within the development envelope

Plant Community Type Name (OEH BAM Calculator)	Vegetation Type Abbreviation for this Assessment (Niche)	TEC Status (NSW/ Commonwealth)	Vegetation Formation (Keith 2004)	Vegetation Class (Keith 2004)	PCT % cleared
1556 - Tallowwood - Smooth-barked Apple - Blackbutt grass tall open forest of the Central and lower North Coast	Tallowwood Forest	Not a TEC	Wet Sclerophyll Forests (Grassy sub-formation)	Northern Hinterland Wet Sclerophyll Forests	41

Table 3: Proposed development envelope per vegetation zone and associated plot/transect survey requirement

Zone number	PCT – best fit	Condition	Plots required (BAM)	Proposed development envelope (ha)
1	1556 - Tallowwood - Smooth-barked Apple - Blackbutt grass tall open forest of the Central and lower North Coast	Moderate	1	0.8

1.8.5 Plant community descriptions

Refer to Appendix 1 for plant community descriptions and diagnostic species for PCT 1556.

1.8.6 Site values

Flora

Floristic data recorded from floristic plot performed within the identified vegetation zone is included within Appendix 2. Twenty-eight species were recorded comprising 11 native species and 17 exotic species.

Plot and transect values

The results of the plot data and species list obtained during the field assessment is provided in Appendix 3.

Site value scores

The Site value assessment was carried out by entering plot data into the BAM Calculator. The data provides quantitative measures of composition, structure and function for each vegetation zone (Appendix 3). The BAM Calculator compares the values recorded with the benchmark for the vegetation class to provide the Site value score. This score represents the overall condition of the vegetation compared against the benchmark (out of 100).

The score from these inputs, coupled with data in the following section of this report, is used to determine the number of ecosystem credits that are required for development.

Patch size for both vegetation zones was given the lowest score in the BAM (<5 hectares), as the native vegetation in the study area is not directly connected to, or within 100 m of other native vegetation that is in moderate or good condition. Areas of urban canopy occur in the vicinity of the Site comprise parkland and roadside vegetation. The vegetation integrity score from the BAM calculator for PCT 1566 was 38.7 (Table 4).

Table 4: Vegetation zones and current and future vegetation integrity scores

Vegetation zone	Area	Patch size	Current vegetation integrity score	Future vegetation integrity score
PCT 1556	0.13	1 (the lowest value that can be entered in the BAMC)	38.7	0.7

The future integrity scores for the direct impact zones was not reduced to zero as the Port Jackson Fig is to be retained. The future vegetation integrity score was obtained by creating two separate management zones for PCT1556 (Figure 5):

- MZ1: PCT 1556 excluding the Port Jackson Fig (future integrity scores reduced to zero)
- MZ2: the Port Jackson Fig (future integrity scores for trees were reduced to the existing scores for the Port Jackson Fig only).

1.8.7 High threat and priority weeds

During the field surveys 11 high threat weeds were recorded. The high threat weed species are sporadically distributed throughout the Site, particularly where a high levels of soil disturbance and nutrient enrichment have occurred. High threat weeds recorded on Site include the following: *Bidens pilosa*, *Anredera cordifolia*, *Cinnamomum camphora*, *Asparagus aethiopicus*, *Ligustrum lucidum*, *Ochna serrulata*, *Lantana camara*, *Cestrum parqui*, *Hedera helix*, *Tecoma stans*, *Ehrharta erecta*.

Priority weeds under the NSW Biosecurity Act 2015 for the Central Coast LGA recorded on Site include *Cestrum parqui*, *Asparagus aethiopicus*, *Lantana camara*, *Asparagus aethiopicus*.

1.8.8 Threatened ecological communities

In the BAM Calculator, PCT 1556 is associated with the River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions threatened ecological community (TEC). However, the majority of the vegetation is not characteristic of the TEC and the Site has undergone significant disturbance so that the naturally occurring landforms and soils no longer occur. Therefore, it is considered the vegetation on Site does not comprise the TEC.

1.8.9 Threatened flora

No threatened flora were detected during field survey and are considered unlikely to occur due to the low overall native species richness and cover at the Site. A likelihood of occurrence assessment was undertaken for predicted and candidate species generated via the BAM Calculator and is provided in Appendix 4. All are assumed to be absent from the Site based on non-detection of the species during targeted searches conducted during the survey.

1.9 Fauna assessment

1.9.1 Methods – data review

NSW Bionet Atlas Database

A review of spatial records of threatened fauna within a 10 km radius of the Site was undertaken using data obtained from the NSW Bionet Atlas. Records were obtained prior to field survey. Results were considered during field survey and likelihood of occurrence analysis.

EPBC Act Protected Matters Search

A Protected Matters Search (EPBC Act) was carried out for a minimum 10 km radius around the Site by inputting the Site centroid coordinates into the EPBC Act Protected Matters Search Tool and applying a 10 km buffer. Results were considered during field survey and likelihood of occurrence analysis.

1.9.2 Methods – field survey

Habitat assessments were undertaken at the Site. Targeted fauna survey was not undertaken for this assessment and were not considered to be required due to the lack of fauna habitat at the Site.

1.9.3 Assessment of threatened species and populations

Threatened species predicted or potentially occurring within the IBRA subregion were reviewed. This list was refined post field survey for the development envelope within the BAM Calculator on the basis of the vegetation types, condition and habitat features as well as the results of field survey. The list of predicted and candidate species generated via the BAM Calculator is in Table 5. A status for each species is provided which represents the basis for deciding whether a species was present or absent from the development envelope. No ecosystem credit species were omitted from the BAM Calculator, despite there being very limited or no habitat present within the Site for many of the predicted species.

Table 5: List of predicted and candidate threatened species for the Project

Common Name	Scientific Name	Status
Predicted threatened species (ecosystem credit species)		
Eastern Bentwing-bat	<i>Miniopterus schreibersii oceanensis</i>	Assumed present
Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>	Assumed present
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	Assumed present
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	Assumed present
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	Assumed present
Koala	<i>Phascolarctos cinereus</i>	Assumed present
Little Bentwing-bat	<i>Miniopterus australis</i>	Assumed present
Little Lorikeet	<i>Glossopsitta pusilla</i>	Assumed present
Masked Owl	<i>Tyto novaehollandiae</i>	Assumed present
Powerful Owl	<i>Ninox strenua</i>	Assumed present
Regent Honeyeater	<i>Anthochaera phrygia</i>	Assumed present
Scarlet Robin	<i>Petroica boodang</i>	Assumed present
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	Assumed present
Square-tailed Kite	<i>Lophoictinia isura</i>	Assumed present
Swift Parrot	<i>Lathamus discolor</i>	Assumed present
Turquoise Parrot	<i>Neophema pulchella</i>	Assumed present
Varied Sittella	<i>Daphoenositta chrysoptera</i>	Assumed present
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	Assumed present
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	Assumed present
Candidate species (species credit species)		
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	No, the native vegetation at the Site provides limited foraging habitat for mobile species only as it occurs within an urban environment with limited key features such as hollows. The only hollows observed at the Site occur in the Port Jackson Fig, which will be retained. The vegetation at the Site comprises a small patch that is not connected to the nearest area of remnant native vegetation.

Common Name	Scientific Name	Status
Eastern Pygmy-possum	<i>Cercartetus nanus</i>	No, the native vegetation at the Site provides limited foraging habitat for mobile species only as it occurs within an urban environment with limited key features such as hollows and native understorey vegetation. The only hollows observed at the Site occur in the Port Jackson Fig, which will be retained. The vegetation at the Site comprises a small patch that is not connected to the nearest area of remnant native vegetation.
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	No, the native vegetation at the Site provides limited foraging habitat for mobile species only as it occurs within an urban environment with limited key features such as hollows and native understorey vegetation. The only hollows observed at the Site occur in the Port Jackson Fig, which will be retained. The vegetation at the Site comprises a small patch that is not connected to the nearest area of remnant native vegetation.
Leafless Tongue Orchid	<i>Cryptostylis hunteriana</i>	No, suitable habitat does not occur at the Site.
Rough Doubletail	<i>Diuris praecox</i>	No, suitable habitat does not occur at the Site.
Pale-headed Snake	<i>Hoplocephalus bitorquatus</i>	No, the native vegetation at the Site provides limited foraging habitat for mobile species only as it occurs within an urban environment with limited key features such as hollows and native understorey vegetation. The only hollows observed at the Site occur in the Port Jackson Fig, which will be retained. The vegetation at the Site is not connected to the nearest area of remnant native vegetation. The vegetation at the Site comprises a small patch that is not connected to the nearest area of remnant native vegetation.
Swift Parrot	<i>Lathamus discolor</i>	No, the native vegetation at the Site provides limited foraging habitat for mobile species only as it occurs within an urban environment with limited key features such as hollows and native understorey vegetation. The only hollows observed at the Site occur in the Port Jackson Fig, which will be retained. The vegetation at the Site comprises a small patch that is not connected to the nearest area of remnant native vegetation.
Green-thighed Frog	<i>Litoria brevipalmata</i>	No, suitable habitat does not occur at the Site.
Square-tailed Kite	<i>Lophoictinia isura</i>	No, the native vegetation at the Site provides limited foraging habitat for mobile species only as it is within an urban environment with limited native habitat features. The vegetation at the Site comprises a small patch that is not connected to the nearest area of remnant native vegetation.
Little Bentwing-bat	<i>Miniopterus australis</i>	No, the native vegetation at the Site provides limited foraging habitat for mobile species only as it occurs within an urban environment with limited native habitat features. Breeding habitat does not occur at the Site. The vegetation at the Site comprises a small patch that is not connected to the nearest area of remnant native vegetation.
Eastern Bentwing-bat	<i>Miniopterus schreibersii oceanensis</i>	No, the native vegetation at the Site provides limited foraging habitat for mobile species only as it occurs within an urban environment with limited native habitat features. Breeding habitat does not occur at the Site. The vegetation at the Site comprises a small patch that is not connected to the nearest area of remnant native vegetation.
Giant Barred Frog	<i>Mixophyes iteratus</i>	No, suitable habitat does not occur at the Site.
Southern Myotis	<i>Myotis macropus</i>	No, the native vegetation at the Site provides limited foraging habitat for mobile species only as it occurs within an urban environment with limited key features such as hollows. The only

Common Name	Scientific Name	Status
		hollows observed at the Site occur in the Port Jackson Fig, which will be retained. The vegetation at the Site comprises a small patch that is not connected to the nearest area of remnant native vegetation.
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	No, the native vegetation at the Site provides limited foraging habitat for mobile species only as it is within an urban environment with limited native habitat features. The vegetation at the Site comprises a small patch that is not connected to the nearest area of remnant native vegetation.
Powerful Owl	<i>Ninox strenua</i>	No, the native vegetation at the Site provides limited foraging habitat for mobile species as it is within an urban environment with limited key features such as hollows. The only hollows observed at the Site occur in the Port Jackson Fig, which will be retained. The vegetation at the Site comprises a small patch that is not connected to the nearest area of remnant native vegetation.
Squirrel Glider	<i>Petaurus norfolcensis</i>	No, the native vegetation at the Site provides limited foraging habitat for mobile species as it is within an urban environment with limited key features such as hollows and native understorey vegetation. The only hollows observed at the Site occur in the Port Jackson Fig, which will be retained. The vegetation at the Site comprises a small patch that is not connected to the nearest area of remnant native vegetation.
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>	No, the native vegetation at the Site provides limited foraging habitat for mobile species as it is within an urban environment with limited key features such as hollows and native understorey vegetation. The only hollows observed at the Site occur in the Port Jackson Fig, which will be retained. The vegetation at the Site comprises a small patch that is not connected to the nearest area of remnant native vegetation.
Koala	<i>Phascolarctos cinereus</i>	No, the native vegetation at the Site provides limited foraging habitat for mobile species as it is within an urban environment with limited native habitat features. The vegetation at the Site comprises a small patch that is not connected to the nearest area of remnant native vegetation.
Common Planigale	<i>Planigale maculata</i>	No, the native vegetation at the Site provides limited foraging habitat for mobile species as it is within an urban environment with limited native habitat features. The vegetation at the Site comprises a small patch that is not connected to the nearest area of remnant native vegetation.
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	No, the native vegetation at the Site provides limited foraging habitat for mobile species as it is within an urban environment with limited native habitat features. The vegetation at the Site comprises a small patch that is not connected to the nearest area of remnant native vegetation.
Masked Owl	<i>Tyto novaehollandiae</i>	No, the native vegetation at the Site provides limited foraging habitat for mobile species only as it is within an urban environment with limited key features such as hollows, native understorey vegetation, fallen logs or aquatic habitats. The only hollows observed at the Site occur in the Port Jackson Fig, which will be retained. The vegetation at the Site is not connected to the nearest area of remnant native vegetation.
Regent Honeyeater	<i>Anthochaera phrygia</i>	No, the native vegetation at the Site provides limited foraging habitat for mobile species as it is within an urban environment with limited native habitat features. The vegetation at the Site

Common Name	Scientific Name	Status
		comprises a small patch that is not connected to the nearest area of remnant native vegetation.
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	No, the native vegetation at the Site provides limited foraging habitat for mobile species only as it is within an urban environment with limited key features such as hollows, native understorey vegetation, fallen logs or aquatic habitats. The only hollows observed at the Site occur in the Port Jackson Fig, which will be retained. The vegetation at the Site is not connected to the nearest area of remnant native vegetation.
Red-backed Button-quail	<i>Turnix maculosus</i>	No, the native vegetation at the Site provides limited foraging habitat for mobile species as it is within an urban environment with limited native habitat features. The vegetation at the Site comprises a small patch that is not connected to the nearest area of remnant native vegetation.
Scrub Turpentine	<i>Rhodamnia rubescens</i>	No, suitable habitat does not occur at the Site.

1.9.4 Fauna habitats

Habitat condition within the Site has been influenced by previous clearing of vegetation, grading, filling, construction and demolition. The native vegetation at the Site provides limited foraging habitat for mobile species as it is within an urban environment with limited native understorey vegetation, fallen logs or aquatic habitats. Hollows occur in the Port Jackson Fig, however, this tree is adjacent to a road and is unlikely to provide suitable habitat for threatened species. Further, the Port Jackson Fig is to be retained, so no hollow-bearing trees would be removed as part of the Project.

2. Impact Assessment

The Impact Assessment forms Stage 2 of the BDAR as detailed in the BAM.

2.1 Avoid and minimise impacts

In accordance with the BAM, proponents must demonstrate the measures employed to avoid, mitigate and offset impacts of a Project on biodiversity values. This section of the report outlines the avoidance, management and mitigation measures that SH Gosford Residential Pty Ltd has incorporated into the Project design or will employ during construction, operation or completion of the Project to reduce impacts on biodiversity values.

2.1.1 Avoidance measures (pre-construction)

The proposed design of the Project does not allow for avoidance of all vegetation clearing, however, the majority of the Site has already been cleared and the remaining native vegetation is degraded. In accordance with the SEARs, the Port Jackson Fig is to be retained.

2.1.2 Mitigation measures (construction and post construction)

Management and mitigation measures will be further developed and implemented during the construction and operation phases of the Project, as detailed in Table 6.

Table 6: Mitigation measures

Mitigation measure	Responsibility
Pre-construction	
Ensuring that the Project does not impose on the drip lines of the Port Jackson Fig and trees on neighbouring properties. Exclusion fencing is to be installed around the Port Jackson Fig.	Project manager
Construction	
Implementation of erosion and sediment controls for the duration of construction works. Regular maintenance of erosion and sediment controls during construction and until excavated areas are vegetated. This will be detailed in a Stormwater Management Plan.	Project manager
Post construction	
Landscape planting focusing on naturally occurring endemic tree and shrub species to compensate for loss of foraging habitat due to the removal of trees.	Project manager/ Project ecologist
Management and removal of all waste from the Site	Project manager

3. Quantifying offset requirements

The BAM identifies the BAM Calculator as the appropriate tool for quantifying the offsets required in both ecosystem credit and species credit terms. A calculation of the nature and extent of biodiversity credits required due to ecological impacts associated with the Project has been undertaken using the BAM Calculator. The calculations have assumed all native vegetation would be removed, excluding the Port Jackson Fig (Figure 6).

3.1.1 Summary of ecosystem credits required

The results of the BAM Calculator in terms of vegetation integrity scoring for the vegetation zone and associated ecosystem credit requirements are shown in Table 7. The report generated by the BAM Calculator is provided in Appendix 5.

Table 7: Ecosystem credit requirements

PCT – best fit	Vegetation Zone/Project Stage	Cleared area (ha)	Vegetation Integrity Score	Future vegetation integrity score	Change in vegetation integrity score	Biodiversity risk weighting	Required credits
1556 - Tallowwood - Smooth-barked Apple - Blackbutt grass tall open forest of the Central and lower North Coast	Vegetation Zone 1	0.13	38.7	0.7	-38	1.5	2

3.1.2 Summary of species credits required

No species credits are required for the Project.

References

OEH (2017a) Biodiversity Assessment Methodology, State of NSW and Office of Environment and Heritage.

OEH (2018a) Biodiversity Assessment Method Operational Manual – Stage 1, State of NSW and Office of Environment and Heritage.

OEH (2018b) NSW Bionet Vegetation Classification. Available online:

<http://www.environment.nsw.gov.au/research/Visclassification.htm> Accessed 20 July 2018.

Figures



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Appendix 1 – Plant community descriptions (only plant communities within the Site are described)

1556 - Tallowwood - Smooth-barked Apple - Blackbutt grass tall open forest of the Central and lower North Coast

The majority of the Site does not align to any native vegetation community as it comprises cleared areas (Plate 1, Plate 2). Vegetation along the western and south-western boundaries comprises a row of planted native trees along the fenceline, the majority of which are *Lophostemon confertus* (Brush Box). This tree is not native to the area and is commonly used in landscaping. The vegetation along the eastern boundary comprises native canopy species with an understorey dominated by exotic species, including numerous high threat weeds and declared priority weeds. The native canopy in this area comprises *Eucalyptus saligna* (Sydney Blue Gum), *Eucalyptus microcorys* (Tallowwood), *Ficus rubiginosa* (Port Jackson Fig) and Brush Box. Native understorey species are sparse and include *Melaleuca linariifolia* (Flax-leaved Paperbark) and *Glochidion ferdinandi* (Cheese Tree).

It is difficult to determine an appropriate PCT for the Site due to the altered condition of the vegetation and landscape. The Department of Planning, Infrastructure and Environment (DPIE) has previously advised that, where there is native vegetation on the Site that does not conform to a PCT, the vegetation should be assessed against the best-fit PCT. The best-fit PCT was identified based on the species present, the landscape position of the Site and its geographic location. On this basis, one PCT was identified on the Site:

- 1556 - Tallowwood - Smooth-barked Apple - Blackbutt grass tall open forest of the Central and lower North Coast.

This PCT was selected due to the presence of Tallowwood in the canopy and Cheese Tree in the understorey, its landscape position on coastal flats, its location on the Central Coast and the known occurrence of this PCT in the former Gosford LGA. Only one condition class was given to the PCT given similar structure and quality occurred across the Site (Table 2 and Table 3).

Structure/Characteristics: The PCT consists of a mixed native canopy with a degraded understorey. The trees along the western boundary comprise a single row of planted native species with no understorey. The vegetation on the eastern boundary of the Site comprises a mixed canopy, with no species dominant. The native canopy in this area comprises Sydney Blue Gum, Tallowwood, Port Jackson Fig and Brush Box. Native understorey species are sparse and include *Melaleuca linariifolia* (Flax-leaved Paperbark) and *Glochidion ferdinandi* (Cheese Tree). The understorey is dominated by weeds such as *Lantana camara*, *Cestrum parqui* and *Hedera helix*.

Distribution within Site: PCT 1556 occurs in a patch on the eastern boundary of the Site and along the western and south-western boundary fence.

Condition and Presence of Weeds: PCT 1556 is degraded as it occurs as a very small patch in an urban environment. Numerous weeds occur at the Site, including high threat weeds (in accordance with the BAM) and priority weeds under the *Biosecurity Act 2015*.

High threat weeds recorded on Site include the following: *Bidens pilosa*, *Anredera cordifolia*, *Cinnamomum camphora*, *Asparagus aethiopicus*, *Ligustrum lucidum*, *Ochna serrulata*, *Lantana camara*, *Cestrum parqui*, *Hedera helix*, *Tecoma stans*, *Ehrharta erecta*.

Priority weeds under the NSW *Biosecurity Act 2015* for the Central Coast LGA recorded on Site include *Cestrum parqui*, *Asparagus aethiopicus*, *Lantana camara*, *Asparagus aethiopicus*.

Conservation Status: PCT The vegetation at the Site does not comprise a TEC under the BC Act or the EPBC Act. PCT 1556 is associated with the River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions threatened ecological community (TEC). However, the majority of the vegetation is not characteristic of the TEC and the Site has undergone significant disturbance so that the naturally occurring landforms and soils no longer occur. Therefore, it is considered the vegetation on Site does not comprise the TEC.

Stratum	Height (m)	% cover*	Dominant Species
Tree	10 – 20	66.5	Brush Box
Midstorey	4	5	<i>Melaleuca linariifolia</i>
Shrub layer	-	-	-
Ground layer	0.15	30	<i>Cynodon dactylon</i>

*Projected foliage cover



Plate 1: Vegetation on the western boundary



Plate 2: Vegetation on the eastern boundary

Appendix 2 – Floristic plot data

Plot	Species name	Cover (%)	Abundance (stems)
5245-ec1	<i>Conyza bonariensis</i>	1	
	<i>Cassia pendula</i>	0.2	
	<i>Sida rhombifolia</i>	0.5	
	<i>Eriobotrya japonica</i>	0.1	
	<i>Kennedia rubicunda</i>	0.1	
	<i>Onopordum acanthium</i>	0.1	
	<i>Bidens pilosa</i>	0.5	
	<i>Anredera cordifolia</i>	2	
	<i>Cinnamomum camphora</i>	0.5	1
	<i>Asparagus aethiopicus</i>	0.5	3
	<i>Ligustrum lucidum</i>	1	
	<i>Ochna serrulata</i>	0.5	
	<i>Lantana camara</i>	3	
	<i>Cestrum parqui</i>	5	
	<i>Hedera helix</i>	7	
	<i>Tecoma stans</i>	5	
	<i>Paspalum dilatatum</i>	5	
	<i>Archontophoenix cunninghamiana</i>	0.5	1
	<i>Stephania japonica</i>	1	2
	<i>Melaleuca linariifolia</i>	3	
	<i>Acacia longifolia</i>	2	
	<i>Lophostemon confertus</i>	20	
	<i>Eucalyptus saligna</i>	8	
	<i>Eucalyptus microcorys</i>	10	
	<i>Ficus rubiginosa</i>	10	
	<i>Cupaniopsis anacardioides</i>	0.5	
	<i>Casuarina glauca</i>	15	
	<i>Glochidion ferdinandi</i>	3	
	<i>Ehrharta erecta</i>	1	
	<i>Cynodon dactylon</i>	30	

Appendix 3 – Plot transect scores

Plot no.	PCT code	PCT abbreviated name and condition	Species richness						Cover (%)						
			Tree species	Shrub species	Grass species	Forb species	Fern species	Other species	Tree	Shrub	Grass	Forb	Fern	Other	High threat weed
5245-ec1	1556	Tallowwood Forest_Moderate	7	2	1	0	0	2	66.5	5	20	0	0	1.5	31

Plot no.	Tree regeneration	Large trees (count)	Trees with hollows (count)	Litter cover (%)	Fallen logs (m)	Tree composition				
						Stems 5 to 10 cm	Stems 10 to 20cm	Stems 20 to 30 cm	Stems 30 to 50 cm	Stems 50 to 80 cm
5245-ec1	Present	2	1	51	0	Present	Present	Present	Present	Present

Appendix 4 - Threatened species matrix, status and likelihood of occurrence

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Credit type
Amphibians						
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V	The Giant Burrowing Frog has been recorded breeding in a range of water bodies associated with sandy environments of the coast and adjacent ranges from the Sydney Basin south the eastern Victoria. It breeds in hanging swamps, perennial non-flooding creeks and occasionally permanent pools, but permanent water must be present to allow its large tadpoles time to reach metamorphosis.	None	Species
<i>Litoria aurea</i>	Green and Golden Bell Frog	E	V	Inhabits a very wide range of water bodies including marshes, dams and streams, particularly those containing emergent vegetation such as bullrushes or spikerushes. It also inhabits numerous types of man-made water bodies including quarries and sand extraction sites. Optimum habitat includes water-bodies that are un-shaded, free of predatory fish such as Plague Minnow, have a grassy area nearby and diurnal sheltering sites available.	None	Species
<i>Litoria brevipalmata</i>	Green-thighed Frog	V	-	Green-thighed Frogs occur in a range of habitats from rainforest and moist eucalypt forest to dry eucalypt forest and heath, typically in areas where surface water gathers after rain. It prefers wetter forests in the south of its range, but extends into drier forests in northern NSW and southern Queensland.	None	Species
<i>Litoria littlejohni</i>	Littlejohn's Tree Frog	V	V	Occurs in wet and dry sclerophyll forests and heathland associated with sandstone outcrops between 280 and 1000 m on the eastern slopes of the Great Dividing Range from the Central Coast down into Victoria. Individuals have been collected from a wide range of water bodies that includes semi-permanent dams, permanent ponds, temporary pools and permanent streams, with calling occurring from fringing vegetation or on the banks. Individuals have been observed sheltering under rocks on high exposed ridges during summer and within deep leaf litter adjacent to the breeding site. Calling occurs in all months of the year, often in association with heavy rains. The tadpoles are distinctive, being large and very dark in colouration.	None	Species
<i>Mixophyes balbus</i>	Stuttering Frog	E	V	Associated with streams in dry sclerophyll and wet sclerophyll forests and rainforests of more upland areas of the Great Dividing Range of NSW and down into Victoria. Breeding occurs along forest streams with permanent water where eggs are deposited within nests excavated in riffle zones by the females and the tadpoles swim free into the stream when large enough to do	None	Species

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Credit type
				so. Outside of breeding, individuals range widely across the forest floor and can be found hundreds of metres from water.		
<i>Mixophyes iteratus</i>	Giant Barred Frog	E	E	Giant Barred Frogs are found along freshwater streams with permanent or semi-permanent water, generally (but not always) at lower elevation. Moist riparian habitats such as rainforest or wet sclerophyll forest are favoured for the deep leaf litter that they provide for shelter and foraging, as well as open perching sites on the forest floor. However, Giant Barred Frogs will also sometimes occur in other riparian habitats, such as those in drier forest or degraded riparian remnants, and even occasionally around dams.	None	Species
<i>Pseudophryne australis</i>	Red-crowned Toadlet	V	-	Occurs on wetter ridge tops and upper slopes of sandstone formations on which the predominant vegetation is dry open forests and heaths. This species typically breeds within small ephemeral creeks that feed into larger semi-perennial streams. After rain these creeks are characterised by a series of shallow pools lined by dense grasses, ferns and low shrubs and usually contain leaf litter for shelter. Eggs are terrestrial and laid under litter, vegetation or rocks where the tadpoles inside will reach a relatively late stage of development before waiting for flooding waters before hatching will occur.	None	Species
Reptiles						
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	V	-	The Pale-headed Snake is a highly cryptic species that can spend weeks at a time hidden in tree hollows. Found mainly in dry eucalypt forests and woodlands, cypress forest and occasionally in rainforest or moist eucalypt forest. In drier environments, it appears to favour habitats close to riparian areas. Shelter during the day between loose bark and tree-trunks, or in hollow trunks and limbs of dead trees.	Low	Species
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E	V	Occurs almost exclusively in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they spend most of the year sheltering in and under rock crevices and exfoliating rock. However, some individuals will migrate to tree hollows to find shelter during hotter parts of summer.	None	Species
Birds						
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	CE	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. There are only three known key	Low	Species/Ecosystem

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Credit type
				breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. In some years flocks converge on flowering coastal woodlands and forests.		
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	E	The Australasian Bittern is widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly 32ulrushes and spikerushes.	None	Ecosystem
<i>Calidris ferruginea</i>	Curlew Sandpiper	E	CE, M	It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. It generally occupies littoral and estuarine habitats, and in New South Wales 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. Northern hemisphere breeding.	None	Species/Ecosystem
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	-	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. Also occur in subalpine snow gum woodland and occasionally in temperate or regenerating forest. In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. It requires tree hollows in which to breed.	Low	Species/Ecosystem
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V	-	Inhabits forest with low nutrients, characteristically with key Allocasuarina spp. Tends to prefer drier forest types with a middle stratum of Allocasuarina below Eucalyptus or Angophora. Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead. Endangered population in the Riverina.	Low	Species/Ecosystem
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	-	Inhabits wide variety of dry eucalypt forests and woodlands, usually with either shrubby under storey or grassy ground cover or both, in all climatic zones of Australia. Usually in areas with rough-barked trees, such as stringybarks or ironbarks, but also in paperbarks or mature eucalypts with hollows.	Low	Ecosystem
<i>Dasyornis brachypterus</i>	Eastern Bristlebird	E	E	Found in coastal woodlands, dense scrub and heathlands, particularly where it borders taller woodlands.	None	Species
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	-	Distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range in NSW, extending westwards to the vicinity of	Low	Ecosystem

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Credit type
				Albury, Parkes, Dubbo and Narrabri. Mostly occur in dry, open eucalypt forests and woodlands. They feed primarily on nectar and pollen in the tree canopy. Nest hollows are located at heights of between 2 m and 15 m, mostly in living, smooth-barked eucalypts. Most breeding records come from the western slopes.		
<i>Grantiella picta</i>	Painted Honeyeater	V	V	The Painted Honeyeater is nomadic 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. During the winter it is more likely to be found in the north of its distribution. Inhabits boree, brigalow and box-gum woodlands and box-ironbark forests.	Low	Ecosystem
<i>Haematopus longirostris</i>	Pied Oystercatcher	E	-	The Pied Oystercatcher inhabits marine littoral habitats, including islands. It occupies muddy, sandy, stony or rocky estuaries, inlets and beaches, particularly intertidal mudflats and sandbanks in large marine bays.	None	Species
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V	MA	Inhabits coastal and near coastal areas, building large stick nests, and feeding mostly on marine and estuarine fish and aquatic fauna.	Low	Species/Ecosystem
<i>Hieraeetus morphnoides</i>	Little Eagle	V	-	Most abundant in lightly timbered areas with open areas nearby. Often recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. May nest in farmland, woodland and forest in tall trees.	Low	Species/Ecosystem
<i>Hirundapus caudacutus</i>	White-throated Needletail	-	M, MA	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges.	Low	-
<i>Ixobrychus flavicollis</i>	Black Bittern	V	-	Usually found on coastal plains below 200 m. Often found along timbered watercourses, in wetlands with fringing trees and shrub vegetation. The sites where they occur are characterized by dense waterside vegetation.	None	Ecosystem
<i>Lathamus discolor</i>	Swift Parrot	E	CE	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability.	Low	Species/Ecosystem
<i>Lophoictinia isura</i>	Square-tailed Kite	V	-	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia. In NSW it is often associated with ridge and gully forests dominated	Low	Species/Ecosystem

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Credit type
				by Woollybutt, Spotted Gum, River Peppermint or Gully Gum. Individuals appear to occupy large hunting ranges of more than 100km ² . They require large living trees for breeding, particularly near water with surrounding woodland-forest close by for foraging habitat. Nest sites are generally located along or near watercourses, in a tree fork or on large horizontal limbs.		
<i>Neophema pulchella</i>	Turquoise Parrot	V	-	Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Usually seen in pairs or small, possibly family, groups and have also been reported in flocks of up to thirty individuals. Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter.	Low	Ecosystem
<i>Ninox connivens</i>	Barking Owl	V	-	Generally found in open forests, woodlands, swamp woodlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country.	Low	Species/Ecosystem
<i>Ninox strenua</i>	Powerful Owl	V	-	Occupies wet and dry eucalypt forests and rainforests. Can occupy both unlogged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas. It is most commonly recorded within turpentine tall open forests and black she-oak within open forests. Large mature trees with hollows at least 0.5 m deep are required for nesting. Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials. Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm.	Low	Species/Ecosystem
<i>Numenius madagascariensis</i>	Eastern Curlew	-	CE, MA, M	A primarily coastal distribution. Found in all states, particularly the north, east, and south-east regions including Tasmania. Rarely recorded inland. Mainly forages on soft sheltered intertidal sand flats or mudflats, open and without vegetation or cover. Breeds in the northern hemisphere.	None	Species/Ecosystem
<i>Pandion cristatus</i> , <i>Pandion haliaetus</i>	Eastern Osprey	V	M, MA	Ospreys are found right around the Australian coast line, except for Victoria and Tasmania. They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water.	Low	Species/Ecosystem
<i>Petroica boodang</i>	Scarlet Robin	V	-	The Scarlet Robin is found from SE Queensland to SE South Australia and also in Tasmania and SW Western Australia. In NSW, it occurs from	Low	Ecosystem

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Credit type
				the coast to the inland slopes. The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs.		
<i>Rostratula australis</i>	Australian Painted Snipe	E	E, MA	In NSW, this species has been recorded at the Paroo wetlands, Lake Cowell, Macquarie Marshes and Hexham Swamp. Most common in 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. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds.	None	Ecosystem
<i>Turnix maculosus</i>	Red-backed Button-quail	V	-	Inhabit grasslands, open and savannah woodlands with grassy ground layer, pastures and crops of warm temperate areas, typically only in regions subject to annual summer rainfall greater than 400 mm. In NSW, said to occur in grasslands, heath and crops. Said to prefer sites close to water, especially when breeding. The species has been observed associated with the following grasses (in various vegetation formations): speargrass <i>Heteropogon</i> , Blady Grass <i>Imperata cylindrica</i> , Triodia, Sorghum, and Buffel Grass <i>Cenchrus ciliaris</i> .	None	Species
<i>Tyto novaehollandiae</i>	Masked Owl	V	-	Inhabits a diverse range of wooded habitat that provide tall or dense mature trees with hollows suitable for nesting and roosting. Mostly recorded in open forest and woodlands adjacent to cleared lands. Nest in hollows, in trunks and in near vertical spouts or large trees, usually living but sometimes dead. Nest hollows are usually located within dense forests or woodlands. Masked Owls prey upon hollow-dependent arboreal marsupials, but terrestrial mammals make up the largest proportion of the diet.	Low	Species/Ecosystem
<i>Tyto tenebricosa</i>	Sooty Owl	V	-	Often found in tall old-growth forests, including temperate and subtropical rainforests. In NSW mostly found on escarpments with a mean altitude less than 500 metres. Nests and roosts in hollows of tall emergent trees, mainly eucalypts often located in gullies. Nests have been located in trees 125 to 161 centimetres in diameter.	Low	Species/Ecosystem
Mammals						
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V	-	Inhabits rainforest through to sclerophyll forest and tree heath. Banksias and myrtaceous shrubs and trees are a favoured food source. Will often nest in tree hollows, but can also construct its own nest. Because of its small size it is able to utilise a range of hollow sizes including very small hollows. Individuals will use a number of different	None	Species

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Credit type
				hollows and an individual has been recorded using up to 9 nest sites within a 0.5ha area over a 5 month period.		
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Located in a variety of drier habitats, including the dry sclerophyll forests and woodlands to the east and west of the Great Dividing Range. Can also be found on the edges of rainforests and in wet sclerophyll forests. This species roosts in caves and mines in groups of between 3 and 37 individuals.	Low	Species
<i>Dasyurus maculatus maculatus</i>	Spotted-tailed Quoll	V	E	Spotted-tailed Quoll are found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Queensland. Only in Tasmania is it still considered common. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	None	Ecosystem
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	-	Inhabit sclerophyll forests, preferring wet habitats where trees are more than 20 m high. Two observations have been made of roosts in stem holes of living eucalypts. There is debate about whether or not this species moves to lower altitudes during winter, or whether they remain sedentary but enter torpor. This species also appears to be highly mobile and records showing movements of up to 12 km between roosting and foraging sites.	Low	Ecosystem
<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat	V	-	Occur 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 or in man-made structures.	Low	Ecosystem
<i>Miniopterus australis</i>	Little Bentwing-bat	V	-	Coastal north-eastern NSW and eastern Queensland. The Little Bentwing-bat is an insectivorous bat that roost in caves, in old mines, in tunnels, under bridges, or in similar structures. They breed in large aggregations in a small number of known caves and may travel hundreds of kilometres from feeding home ranges to breeding sites. They have a preference for moist eucalypt forest, rainforest or dense coastal banksia scrub where it forages below the canopy for insects.	Low	Species/Ecosystem
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V	-	Eastern Bentwing-bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young.	Low	Species/Ecosystem
<i>Myotis macropus</i>	Southern Myotis	V	-	The Southern Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. Generally roost in	Moderate	Species

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Credit type
				groups of 10 – 15 close to water in caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage.		
<i>Petauroides volans</i>	Greater Glider	-	V	The Greater Glider is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows.	None	Species
<i>Petaurus australis</i>	Yellow-bellied Glider	V	-	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south. Found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria.	None	Ecosystem
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	-	Generally occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range. Requires abundant hollow bearing trees and a mix of eucalypts, banksias and acacias. There is only limited information available on den tree use by Squirrel gliders, but it has been observed using both living and dead trees as well as hollow stumps. Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked. Endangered population in the Wagga Wagga LGA.	None	Species
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E	V	Found in rocky areas in a wide variety of habitats including rainforest gullies, wet and dry sclerophyll forest, open woodland and rocky outcrops in semi-arid country. Commonly sites have a northerly aspect with numerous ledges, caves and crevices.	None	Species
<i>Phascolarctos cinereus</i>	Koala	V	V	Inhabits eucalypt forests and woodlands. The suitability of these forests for habitation depends on the size and species of trees present, soil nutrients, climate and rainfall.	None	Species
<i>Planigale maculata</i>	Common Planigale	V	-	Common Planigales inhabit rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, and usually close to water.	None	Species
<i>Potorous tridactylus</i>	Long-nosed Potoroo	V	V	Inhabits coastal heath and wet and dry sclerophyll forests. Generally found in areas with rainfall greater than 760 mm. Requires relatively thick ground cover where the soil is light and sandy.	None	Ecosystem

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Credit type
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	-	V	The New Holland Mouse currently has a disjunct, fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes.	None	Ecosystem
<i>Pseudomys gracilicaudatus</i>	Eastern Chestnut Mouse	V	-	In NSW the Eastern Chestnut Mouse mainly occurs north from the Hawkesbury River area as scattered records along to coast and eastern fall of the Great Dividing Range extending north into Queensland. There are however isolated records in the Jervis bay area. In NSW the Eastern Chestnut Mouse is mostly found, in low numbers, in heathland and is most common in dense, wet heath and swamps. In the tropics it is more an animal of grassy woodlands. Optimal habitat appears to be in vigorously regenerating heathland burnt from 18 months to four years previously. By the time the heath is mature, the larger Swamp Rat becomes dominant, and Eastern Chestnut Mouse numbers drop again.	None	Ecosystem
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Bats commute daily to foraging areas, usually within 15 km of the day roost although some individuals may travel up to 70 km.	Low	Species/Ecosystem
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheathtail-bat	V	-	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country.	Low	Ecosystem
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	-	Prefer moist gullies in mature coastal forests and rainforests, between the Great Dividing Range and the coast. They are only found at low altitudes below 500 m. In dense environments they utilise natural and human-made opening in the forest for flight paths. Creeks and small rivers are favoured foraging habitat. This species roosts in hollow tree trunks and branches.	Low	Ecosystem
Flora						
<i>Acacia bynoeana</i>	Bynoe's Wattle	E	V	Grows mainly in heath and dry sclerophyll forest in sandy soils. Mainly south of Dora Creek-Morriset area to Berrima and the Illawarra region, west to the Blue Mountains, also recorded from near Kurri Kurri in the Hunter Valley and from Morton National Park.	Low	Species

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Credit type
<i>Acacia pubescens</i>	Downy Wattle	V	V	Concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. Occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravelly soils, often with ironstone. Grows in open woodland and forest, in a variety of plant communities, including Cooks River-Castlereagh Ironbark forest, Shale-Gravel Transition forest and Cumberland Plain woodland.	Low	Species
<i>Asterolasia elegans</i>		E	E	Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby local government areas. Also likely to occur in the western part of Gosford local government area. Known from only seven populations, only one of which is wholly within a conservation reserve. Occurs on Hawkesbury sandstone in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest.	None	Species
<i>Caladenia tessellata</i>	Thick-lip Spider Orchid	E	V	The Tessellated Spider Orchid is found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil. Known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct.	Low	Species
<i>Callistemon linearifolius</i>	Netted Bottle Brush	V	-	Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Recorded in 2000 at Coalcliff in the northern Illawarra. For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River. Grows in dry sclerophyll forest on the coast and adjacent ranges.	Low	Species
<i>Cryptostylis hunteriana</i>	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 She-oak and appears to prefer open areas in the understorey of this community.	Low	Species
<i>Cynanchum elegans</i>	White-flowered Wax Plant	E	E	Recorded from rainforest gullies scrub and scree slopes from the Gloucester district to the Wollongong area and inland to Mt Dangar.	Low	Species
<i>Darwinia biflora</i>		V	V	Recorded in Ku-ring-gai, Hornsby, Baulkham Hills and Ryde local government areas. The northern, southern, eastern and western limits of the range are at Maroota, North Ryde, Cowan and Kellyville, respectively. Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury	Low	Species

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Credit type
				Sandstone. The vegetation structure is usually woodland, open forest or scrub-heath.		
<i>Diuris praecox</i>	Rough Doubletail	V	V	Grows on hills and slopes of near-coastal districts in open forests which have a grassy to fairly dense understorey.	Low	Species
<i>Epacris purpurascens var. purpurascens</i>		V	-	Recorded from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South. Found in a range of habitat types, most of which have a strong shale soil influence.	Low	Species
<i>Eucalyptus camfieldii</i>	Heart-leaved Stringybark	V	V	Restricted distribution in a narrow band with the most northerly records in the Raymond Terrace Area south to Waterfall. Poor coastal country in shallow sandy soils overlying Hawkesbury sandstone. Coastal heath mostly on exposed sandy ridges. Occurs mostly in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas.	Low	Species
<i>Genoplesium baueri</i>	Bauer's Midge Orchid	E	E	Grows in dry sclerophyll forest and moss gardens over sandstone. Flowers February to March. Has been recorded between Ulladulla and Port Stephens. Currently the species is known from just over 200 plants across 13 sites. The species has been recorded in Berowra Valley Regional Park, Royal National Park and Lane Cove National Park and may also occur in the Woronora, O'Hares, Metropolitan and Warragamba Catchments.	Low	Species
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	V	V	Grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. Scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north.	None	Species
<i>Melaleuca deanei</i>	Deane's Melaleuca	V	V	Grows in wet heath on sandstone in coastal districts from Berowra to Nowra.	Low	Species
<i>Persoonia hirsuta</i>	Hairy Geebung	E	E	Distributed from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west. A large area of occurrence, but occurs in small populations, increasing the species' fragmentation in the landscape. Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone. Usually present as isolated individuals or very small populations. Probably killed by fire (as other <i>Persoonia</i> spp. are) but will regenerate from seed.	Low	Species
<i>Pimelea curviflora var. curviflora</i>		V	V	Confined to the coastal area of Sydney between northern Sydney in the south and Maroota in the north-west. Former range extended south to the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly. Occurs on shale-lateritic soils over sandstone and shale-sandstone transition soils on ridgetops and upper slopes amongst woodlands.	None	Species

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Credit type
<i>Prostanthera askania</i>	Tranquility Mintbush	E	E	Occurs in moist sclerophyll forest and warm temperate rainforest communities, and the ecotone between them. These communities are generally tall forests with a mesic understorey; Sydney Blue Gum Eucalyptus saligna and Turpentine Syncarpia glomulifera are usually present, though canopy species present can be highly variable.	Low	Species
<i>Prostanthera junonis</i>	Somersby Mintbush	E	E	The species is restricted to the Somersby Plateau. It occurs on both the Somersby and Sydney Town soil landscapes on gently undulating country over weathered Hawkesbury sandstone within open forest/low woodland/open scrub. It occurs in both disturbed and undisturbed sites.	Low	Species
<i>Rhizanthella slateri</i>		V	E	Habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest.	None	Species
<i>Rhodamnia rubescens</i>		CE	-	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	Low	Species
<i>Rutidosis heterogama</i>		V	V	Grows in heath on sandy soils and moist areas in open forest, and has been recorded along disturbed roadsides.	None	Species
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	E	V	Found only in NSW, in a narrow, linear coastal strip from Bulahdelah to Conjola State forest. On the south coast the species occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral rainforest. On the central coast it occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	None	Species
<i>Tetradlea glandulosa</i>		V	-	Associated with shale-sandstone transition habitat where shale-cappings occur over sandstone, with associated soil landscapes such as Lucas Heights, Gympie, Lambert and Faulconbridge. Topographically, the plant occupies ridgetops, upper-slopes and to a lesser extent mid-slope sandstone benches. Soils are generally shallow, consisting of a yellow, clayey-sandy loam. Stony lateritic fragments are also common in the soil profile on many of these ridgetops. Vegetation structure varies from heaths and scrub to woodlands-open woodlands, and open forest.	Low	Species
<i>Tetradlea juncea</i>		V	V	Confined to the northern portion of the Sydney Basin bioregion and the southern portion of the North Coast bioregion in the local government areas of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock. It is usually found in low open	None	Species

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Credit type
				forest-woodland with a mixed shrub understorey and grassy groundcover. The majority of populations occur on low nutrient soils associated with the Awaba Soil Landscape. Cryptic species that requires survey in September-October.		

Appendix 5 – Ecosystem and species credit requirements for the Project

Contact Us

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Sydney
Illawarra
Central Coast
Newcastle
Mudgee
Port Macquarie
Brisbane
Cairns



Our services

Ecology and biodiversity

Terrestrial
Freshwater
Marine and coastal
Research and monitoring
Wildlife Schools and training

Heritage management

Aboriginal heritage
Historical heritage
Conservation management
Community consultation
Archaeological, built and landscape values

Environmental management and approvals

Impact assessments
Development and activity approvals
Rehabilitation
Stakeholder consultation and facilitation
Project management

Environmental offsetting

Offset strategy and assessment (NSW, QLD, Commonwealth)
Accredited BAM assessors (NSW)
Biodiversity Stewardship Site Agreements (NSW)
Offset site establishment and management
Offset brokerage
Advanced Offset establishment (QLD)