Excellence in your environment

niche Environment and Heritage

510 Beach Road, Berry

Biodiversity Development Assessment Report

Prepared for Allen Price & Scarratts Pty Ltd | 4 March 2020

niche-eh.com

Excellence in your environment

Document control

Project number	Client	Project manager	LGA
5595	Allen Price & Scarratts Pty Ltd	Stephen Bloomfield	Shoalhaven City Council

Version	Author	Review	Status	Date
Rev0	Stephen Bloomfield, Simon Tweed	Amanda Griffith	Draft	5 February 2020
Rev1	Stephen Bloomfield, Simon Tweed		Draft	4 March 2020

Enquiries should be addressed to:

Sydney Head Office
Niche Environment and Heritage
02 9630 5658
info@niche-eh.com
PO Box 2443 North Parramatta
NSW 1750 Australia

Executive summary

Context

Allen Price & Scarratts Pty Ltd is preparing a Development Application (DA) for the subdivision and development 510 Beach Road (Lot 4 DP 834254), Berry (the Project), within the Shoalhaven Local Government Area. This Biodiversity Development Assessment Report (BDAR) has been prepared for submission with the DA under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The Project site (the Site) is approximately 29 hectares in size on land previously used as a dairy farm, which is currently being grazed by cattle. The majority of the Site consists of cleared exotic grassland, with isolated native trees, small patches of native woodland and a linear stand of trees adjacent to Beach Road. Landscape plantings are present in association with the existing dwelling and driveway in the north-west of the Site.

Currently, the Site is zoned entirely RU1 (Primary Production), however it is proposed to be rezoned to include areas of E2 (Environmental Conservation), E3 (Environmental Management) and R5 (Large Lot Residential). The majority of the Site will be occupied by the Project and associated infrastructure, however, areas of native vegetation will be retained as part of the proposed E2/E3 zoning areas.

Aims

Niche Environment and Heritage Pty Ltd (Niche) was commissioned to assess the ecological values and impacts associated with the Project. The primary objective of this report is to use the methodology provided in the Biodiversity Assessment Methodology (BAM) (NSW Office of Environment and Heritage [OEH] 2017) to describe and assess ecological values within the Site, and determine how the Project is likely to impact on threatened biodiversity listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The BAM and associated Biodiversity Development Assessment Report (BDAR) requirement has been triggered via clearing exceeding the relevant native vegetation clearing threshold.

Survey overview

An ecological survey of the Site was undertaken on the 20th, 22nd and 23rd January.

Field survey included:

- Application of the BAM to map and quantify the condition of Plant Community Types (PCTs) within the Site
- Threatened flora and fauna habitat assessment
- Opportunistic fauna observations
- Targeted survey for the Green and Golden Bell Frog (*Litoria aurea*).

Native vegetation assessment

Three native vegetation types (totalling 1.89 ha) were identified within the Site:

- PCT 838: *Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion*
- PCT 1232: *Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion*

- PCT 694: *Blackbutt - Turpentine - Bangalay moist open forest on sheltered slopes and gullies, southern Sydney Basin Bioregion*.

The remainder of the Site (26.9 ha) constituted exotic pasture.

The native vegetation present comprised the following Endangered Ecological Communities under the BC Act:

- Illawarra Lowlands Grassy Woodland (PCT 838) - 0.21 ha
- Swamp Oak Floodplain Forest (PCT 1232) - 0.35 ha.

Within the Site these communities consisted of mixed regenerating and mature species.

While both these vegetation types are listed under the EPBC Act, the condition of the PCTs within the Site did not meet the criteria for classification under the EPBC Act. Therefore, no referral under EPBC Act is required.

No threatened flora occur within the Site and none are considered likely to occur. One threatened fauna species, Grey-headed Flying Fox (*Pteropus poliocephalus*) (vulnerable under the BC and EPBC Acts) was recorded. Threatened fauna habitat was generally limited to mobile species such as bats and birds.

Avoid, minimise and mitigate impacts

The subdivision layout has been designed to impact predominantly exotic grassland and retain areas of important native habitat previously identified (Biosis 2017), including Jim's Forest and Coomonderry Swamp (which contains threatened ecological communities) in the south of the property.

Measures to reduce the impact of the Project on biodiversity values are detailed within the report.

Offset requirements

Clearing of native vegetation communities identified within the Site generates a requirement of 20 ecosystem credits, broken down as:

- 1 credit for PCT 838: *Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion*
- 5 credit for PCT 1232: *Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion*
- 20 credits for PCT 694: *Blackbutt - Turpentine - Bangalay moist open forest on sheltered slopes and gullies, southern Sydney Basin Bioregion*.

No species credits are required for the Project.

Recommendations

It is recommended that two pertinent conditions of consent be imposed by Shoalhaven City Council, these being:

- A Biodiversity Management Plan be prepared for the site.
- Evidence of credit retirement be provided to Shoalhaven City Council prior to the commencement of clearing works.

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	*Biodiversity Conservation Act 2016* (NSW)
BMP	Biodiversity Management Plan
BOS	NSW Biodiversity Offsets Scheme
CEEC	Critically Endangered Ecological Community
cm	Centimetre
DEE	Department of Environment and Energy (Commonwealth)
DPI	Department of Primary Industries (NSW)
DPIE	Department of Planning, Industry and Environment (NSW)
EEC	Endangered Ecological Community
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
ha	Hectare/s
IBRA	Interim Biogeographic Regionalisation for Australia
ILGW	Illawarra Low Grassy Woodland
Km	Kilometre
LGA	Local Government Area
Locality	The Site and surrounds, nominally a 10 km radius from the Site.
MNES	Matters of National Environmental Significance (from the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*).
m	Metre/s
m2	Metres square
NPWS	National Parks and Wildlife Service (NSW)
OEH	Office of Environment and Heritage (NSW)
Site	Means the Site where surveys were conducted.
PCT	Plant Community Type
SOFF	Swamp Oak Floodplain Forest
TBDC	Threatened Biodiversity Data Collection

Table of Contents

List of Figures

List of Plates

List of Tables

1. Biodiversity Assessment

1.1 Introduction

Niche Environment and Heritage Pty Ltd (Niche) was commissioned by Allen Price & Scarratts Pty Ltd, to assess the ecological values and impacts associated with the proposed residential subdivision and development (the Project) of 510 Beach Road, Berry (the Site, Figure 1).

The primary objective of this report is to use the Biodiversity Assessment Method (BAM) (Office of Environment and Heritage [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) and Commonwealth *Environment Protection and Biodiversity Act 1999* (EPBC Act).

This Biodiversity Development Assessment Report (BDAR) is to be submitted with the Project's Development Application to Shoalhaven City Council for assessment under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

1.2 The Project

1.2.1 General description of Site and surrounds

The Site is located at 510 Beach Road, Berry within the Shoalhaven Local Government Area (LGA) (Figure 1). It constitutes the northern portion of Lot 4 DP 834254 (Figure 1). The Site was previously used as a dairy farm and is currently being grazed by beef cattle. It is around 29 hectares (ha) in size.

The majority of the Site consists of cleared grassland areas with isolated trees, however small patches of native woodland do occur as does a linear stand of native trees adjacent to Beach Road. None of these patches of native vegetation are connected to any larger areas of native vegetation within the surrounding locality. Landscaped plantings are present in association with the existing dwelling and driveway in the north-east of the Site (Figure 2).

Currently, the Site is zoned entirely RU1 (Primary Production), however it is proposed to be rezoned to include areas of E2 (Environmental Conservation), E3 (Environmental Management) and R5 (Large Lot Residential) (Figure 3).

The majority of the Site will be occupied by the Project and associated infrastructure, however, some areas will be retained and not directly impacted within the E2/E3 proposed zoning areas.

The property (the Site resides in) is around 74 ha in size, of which approximately 20 ha constitute Coomonderry Swamp; this being present in the southern portion of the property. Coomonderry Swamp is part of a larger patch of native vegetation that extends to the north-east and south-east of the property forming Seven Mile Beach National Park. The zoning of this portion of the property is proposed to be changed from E2 to E1 (National Parks and Nature Reserves).

A large stand of native woodland known as 'Jim's Forest' is around 4.1 ha and is to be retained within the E2 zone of the Site.

1.2.2 Construction and operational footprint

Construction of the Project would require the installation of primary components comprising of:

- Subdivision of Lot 4 DP 834254 into 32 lots
    - Lots 1-31 will be developed for residential purposes and will all include a dwelling site (600 m^2) and an effluent disposal area (830 m^2). A number of these lots are of mixed zoning (R5 and E2/E3).
    - Lot 32 will be zoned E1 and dedicated to the NPWS as an extension to Seven Mile Beach National Park that occurs to the east). As such, this Lot does not form part of the study site.
- Construction of new public roads and other infrastructure.
- Roadworks including intersections/bus bays/widening where required on Beach Road
- Electricity and communications services.

As part of the Project the existing farm dams will require removal.

A plan of the proposed subdivision has been provided in Figure 2.

1.3 Approval and assessment process

1.3.1 State approval and assessment process - application of the Biodiversity Assessment Method

The BAM is the framework for assessment of biodiversity impacts and determination of offsetting requirements under the NSW Biodiversity Offsetting Scheme (BOS). Clearing of native vegetation or threatened species habitat triggers the BAM/BOS requirement via any of the following pathways:

- The amount of native vegetation being cleared exceeds relevant clearing thresholds; or
- The development has any impact within an area mapped on the Biodiversity Values Map; or
- The development is 'likely to significantly affect threatened species' using the test of significance in the BC Act (Five Part Test); or
- The development is to be carried out in a declared Area of Outstanding Biodiversity Value.

The Project triggers the BOS via exceeding the relevant native vegetation clearing threshold.

This 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 16).

1.3.2 Commonwealth approval and assessment process

Matters of National Environmental Significance (MNES) are protected under the 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.

1.4 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, describe project avoidance and mitigation measures and 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.

1.5 Assessment resources and assessor qualifications

This BDAR has been prepared by the following accredited assessors:

- Simon Tweed – Senior Ecologist/Ecology Team Leader/Accredited Biodiversity Assessor: review of credit calculations, report preparation, quality assurance.
- Stephen Bloomfield – Ecologist/ Accredited Biodiversity Assessor: flora and fauna field survey, data management, data entry, credit calculations, report preparation.

Other specialist staff involved in preparing the assessment include:

- Dave Wilkinson –Ecologist: field assistant
- Amanda Griffith – Senior Ecologist/Accredited Biodiversity Assessor: peer review
- Greg Tobin – GIS Specialist: mapping.

1.6 Landscape assessment

1.6.1 Methods

As detailed in section 4 of the BAM (OEH 2017), 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.

1.6.2 Landscape features and scoring

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

1.7 Native vegetation and flora assessment

1.7.1 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 (DPIE 2020a). Records were obtained prior to field survey. Results were considered during field survey and a likelihood of occurrence analysis undertaken (Appendix 4).

EPBC Act Protected Matters Search

A Protected Matters Search (EPBC Act) was carried out for a 10 km area around the Site (DEE 2020a). Results were considered during field survey and a likelihood of occurrence analysis undertaken (Appendix 4).

Table 1: Landscape features and scoring under the NSW BAM

Landscape features	Description	Figure reference
IBRA bioregion/subregion	The Project is located in the Illawarra IBRA subregion which is within the Sydney IBRA bioregion.	Figure 1
Mitchell Landscapes	Mitchell Landscapes found within the Site include: • Kiama Coastal Slopes (28.5 ha) • Seven Mile Barrier (0.5 ha).	Figure 1
Rivers, streams and estuaries and Strahler stream order	One unnamed first order stream is mapped as traversing the central portion of the Site in a northerly direction. Hydrology of the mapped stream has been previously impacted through clearing of native vegetation and land contouring within its upper catchment.	Figure 1 Figure 4
Wetlands within and adjacent to development	There are no natural wetlands within the Site. There are four farm dams within the Site, and Coomonderry Swamp is located around 400 m to the south.	Figure 4
Cleared areas	The majority of native vegetation within the Site and surrounding buffer area has been cleared and/or pasture improved. This has been factored into calculations of native vegetation.	Figure 1 Figure 5
Connectivity features	None of the patches of native vegetation within the Site are connected to any larger areas of native vegetation within the surrounding locality.	Figure 1
Buffer area (percent native vegetation cover)	A 1500 m buffer was applied to the Site resulting in an overall buffer area of 1115 ha. The majority of native vegetation in the buffer area is part of Coomonderry Swamp and Seven Mile Beach National Park. The extent and cover of native woody and non-woody vegetation was determined via experience of the Site, aerial photography interpretation based on canopy cover, and vegetation mapping (OEH 2013). ***Woody vegetation cover*** 27% of the buffer area was determined to support native woody vegetation with benchmark cover (305 ha). ***Non-woody vegetation cover*** A large area (118 ha) of non-woody vegetation occurs in association with Coomonderry Swamp to the south of the Site; this represents around 11% of the buffer area. Other areas of natural grassland or marshland are limited and correspond with wetter depression areas, of which heavy pasture improvement is a feature, and is conservatively estimated to equate to approximately 2%. As such, 13% of the buffer area contains naturally occurring non-woody vegetation that is predominantly native. ***Total native vegetation cover*** Combining the estimated woody and non-woody vegetation cover resulted in 40% of the buffer area supporting native vegetation. This falls into the 30-70% category within the BAM Calculator.	Figure 1
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. The Site has been mapped as Class 2 and 5 Acid Sulfate Soils in the Shoalhaven Local Environmental Plan (2014) (NSW Government 2020).	-

1.7.2 Methods – field survey

Plot 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 (PCTs) across the Site were recorded and mapped using a combination of vegetation quadrats and walking meanders.

The BAM plot requirement was determined using the BAM (OEH 2017). The number of plots conducted and required for each PCT and zone is provided in Table 2 and the location of completed plots is illustrated in Figure 5. Plots for use within the BAM Calculator were conducted on 20th, 22nd and 23rd January 2020.

Table 2: Area, condition and plot survey requirement for vegetation at the Site

Zone number	PCT – best fit	Condition	Proposed development envelope (ha)	Plots required (BAM) / plots undertaken
1	**838** - Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion	Low	0.24	1 / 1
2	**1232** - Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion	Low	0.35	1 / 2
3	**694** - Blackbutt - Turpentine - Bangalay moist open forest on sheltered slopes and gullies, southern Sydney Basin Bioregion	Low	1.37	1 / 2
4	Cleared land	Poor	26.9	0 / 2 (plots were conducted to attain species richness)

1.7.3 Survey effort

Native vegetation and flora survey consisted of the following:

- Five BAM plots were carried out within the Site (Figure 5) and used for site scoring within the BAM Calculator.
- Two flora composition plots (20 m x 20 m) were undertaken within the grassland area to illustrate the introduced nature of this plant community. These plots were not used within the BAM Calculator.
- Walking meanders were carried out at in accordance to the Department of Planning, industry and Environment's (DPIE) working draft *Threatened Biodiversity Survey and assessment - Guidelines for Developments and Activities* (DEC 2004). The walking meanders were used to survey for potential threatened flora and fauna habitat across the Site.
- Targeted searches for threatened flora were not conducted due to the lack of suitable habitat (see Section 1.7.9 for details).

1.7.4 Plant community delineation and mapping

Sources consulted during a review of vegetation mapping included:

- NSW Landscapes (Mitchell) version 3.1 (DPIE 2020b)
- Biometric vegetation types of the Shoalhaven, Eurobodalla and Bega Valley local government areas (a compilation map). Version 2.1. VIS_ID 3900 (OEH 2013)
- 510 Beach Road, Berry. Flora and fauna assessment (Biosis 2017).

All vegetation within the Site was validated via field survey with new mapping created to reflect vegetation observed and surveyed during field assessment. Vegetation community descriptions and species used to aid in determining vegetation types are provided in Appendix 1.

With reference to the vegetation mapping undertaken for the Shoalhaven region, none of the vegetation present within the Site has been mapped as native vegetation (OEH 2013).

However, a flora and fauna assessment prepared for the property by Biosis (2017) to assist in the rezoning process identified three different native PCTs as occurring within the Site, these being:

- Bangalay Sand Forest (PCT 659)
- Derived Swamp Oak Forest (PCT 1232)
- Red Gum Grassy Woodland (PCT 838) – in low and moderate condition.

The majority of the Site has been mapped by Biosis (2017) as Cleared/Exotic Pasture.

Plant community descriptions from Biosis (2017) were used as the initial basis for mapping of vegetation within the Site. These communities were aligned with PCTs used in the BAM Calculator as tabled below (Table 3). Three native vegetation types were identified within the Site.

Table 3: Vegetation mapping and alignment for vegetation types within the site

PCT (OEH BAM Calculator)	Vegetation type abbreviation for this assessment (Niche)	TEC status (NSW/ Commonwealth)	Vegetation formation (Keith 2004)	Vegetation Class (Keith 2004)	PCT % cleared
838 - Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion	Red Gum forest	**BC Act:** EEC (*Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion [ILGW]*) **EPBC Act:** CEEC (*Illawarra and south coast lowland forest and woodland ecological community*[1])	Grassy Woodlands	Coastal Valley Grassy Woodlands	85
1232 - Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion	Swamp Oak forest	**BC Act: EEC** (*Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregion [SOFF]*) **EPBC Act:** EEC (*Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland*)	Forested Wetlands	Coastal Swamp Forests	95
694 - Blackbutt - Turpentine - Bangalay moist open forest on sheltered slopes and gullies, southern Sydney Basin Bioregion	Blackbutt – Bangalay forest	-	Wet Sclerophyll Forests (Shrubby sub-formation)	North Coast Wet Sclerophyll Forests	50

[1] Hereafter referred to as ILGW

Different condition classes were given to vegetation where differences in structure and quality occurred. Vegetation zones were established for each combination of vegetation type and condition (Table 2 and Table 3).

1.7.5 Plant community descriptions

The BioNet Vegetation Classification database (DPIE 2020c) was utilised when assigning a PCT to each vegetation zone recorded within the Site.

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

1.7.6 Site values

Flora

Floristic data recorded from the seven floristic plots is included within Appendix 2 and Appendix 3. Sixty-eight species were recorded comprising 42 native species and 26 exotic species.

Plot values

The results of the plot data and species list obtained during the field assessment is provided in Appendix 2.

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 each vegetation zone was given the lowest score in the BAM (<5 ha), as the native vegetation in the Site is not directly connected to, or within 100 m of other native vegetation that is in moderate or good condition. The vegetation integrity scores from the BAM calculator are presented in Table 4.

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

Vegetation zone	Area (ha)	Patch size	Current vegetation integrity score (VIS)	Future vegetation integrity score (VIS)
PCT 838	0.24	1 (the lowest value that can be entered in the BAMC)	58.4	0
PCT 1232	0.35	1	32.4	0
PCT 694	1.37	1	39.8	0
Exotic grassland	26.9	N/A	N/A	N/A

The future VIS for the impact on each PCT is reduced to zero as all native vegetation and flora and fauna habitats are expected to be removed.

1.7.7 High threat and priority weeds

During the field surveys, 10 high threat weeds (HTW) as listed under the NSW *Biosecurity Act 2015* were recorded. These included the following: Lantana (*Lantana camara*), Cobbler's Pegs (*Bidens pilosa*), Paspalum (*Paspalum dilatatum*), Kikuyu Grass (*Cenchrus clandestinum*), Fireweed (*Senecio*

madagascariensis), Panic Veldtgrass (*Ehrharta erecta*), Giant Parramatta Grass (*Sporobolus fertilis*), Blackberry (*Rubus fruticosus sp. agg.*), Moth Vine (*Araujia sericifera*) and Camphor Laurel (*Cinnamomum camphora*).

The HTW grass species are distributed throughout the Site particularly where high levels of soil disturbance and cattle grazing occurs. The other species occur as sporadic, isolated individuals, predominantly along Beach Road and near the existing dwelling. While Giant Parramatta Grass is the most common HTW present within the Site, none are prolific or dominant within the area to be impacted by the development.

Priority weeds under the NSW *Biosecurity Act 2015* for the South East region include Lantana, Blackberry and Giant Parramatta Grass (DPI 2020).

1.7.8 Threatened ecological communities

The following Threatened Ecological Communities (TECs) were identified as being present within the Site:

- ILGW (PCT 838): EEC under the BC Act.
  ILGW is listed as a CEEC under the EPBC Act. However, with reference to the Threatened Species Scientific Committee (2016), given the size (it is less than the minimum 0.5 ha) and condition of the ILGW stand present, it does not meet the condition thresholds required to classify it as the EEC under the EPBC Act.
    - ILGW occurs as a narrow linear stand adjacent to Beach Road in the north of the Site and occupies less than 1% of the native vegetation present (Figure 5).
- SOFF (PCT 1232): EEC under the BC Act.
  This community is also listed as an EEC under the EPBC Act. However, with reference to the Threatened Species Scientific Committee (2016), given the small patch size of the Swamp Oak stands present within the Site (it is less than the minimum 0.5 ha) it does not meet the condition thresholds required to classify it as the EEC under the EPBC Act.
    - SOFF occurs as a small patch in the south of the Site and a linear stand adjacent to Beach Road in the north-west and occupies around 1% of the native vegetation present (Figure 5).

1.7.9 Threatened flora

No threatened flora was detected during the field survey nor are any considered likely to occur. The vegetation present throughout the Site was generally in poor condition due to consistent disturbance historically, which contributes to the low likelihood of occurrence for any threatened flora.

Threatened flora generated by the BAM Calculator, are presented in Table 6 and Appendix 4. All are assumed to be absent from the Site based on the poor quality of habitat present.

1.8 Fauna assessment

1.8.1 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 (DPIE 2020a). Records were obtained prior to field survey. Results were considered during field survey and a likelihood of occurrence analysis undertaken (Appendix 4).

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 (DEE 2020a). Results were considered during field survey and a likelihood of occurrence analysis undertaken (Appendix 4).

1.8.2 Methods – field survey

Based on the desktop and habitat assessments undertaken at the Site, the Green and Golden Bell Frog was the only species identified with the potential to occur. This was due to the presence of records within close proximity to the Site (i.e. 180 m to the west and 430 m east), the presence of aquatic habitat at the Site, and the potential for this species to travel distances of up to 5 kilometres (possibly 10 km) in a night (DEE 2020b). As such, targeted surveys were undertaken. The methods and survey effort relating to the Green and Golden Bell Frog are presented in Table 5 and illustrated in Figure 6.

Table 5: Fauna survey methods, timing and effort

Method	Target species	Timing	Effort (x2 researchers)	Total Effort
Amphibian survey (diurnal) – habitat assessment	Green and Golden Bell Frog	20 January 2020	15 mins	30 mins
Amphibian survey (nocturnal) – call playback, spotlighting	Green and Golden Bell Frog	20 January 2020	3 sites x 3 nights	9 nights
		22 January 2020	3 sites x 3 nights	9 nights
		23 January 2020	3 sites x 3 nights	9 nights

Survey was undertaken during optimal conditions[2] as prescribed by State and Federal guidelines (Department of Environment and Climate Change 2009, Department of the Environment, Water, Heritage and the Arts 2010) for the Green and Golden Bell Frog.

Targeted survey for other fauna was not undertaken for this assessment and were not considered to be required due to the lack of fauna habitat at the Site (see Likelihood of Occurrence Assessment, Appendix 3).

1.8.3 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 Site 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 presented in Table 6. A status for each species is provided which represents the basis for deciding whether a species was present or absent from the Site. 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 6: List of predicted and candidate threatened species for the Project

Common Name	Scientific Name	Status
Predicted threatened species (ecosystem credit species)		
Australasian Bittern	*Botaurus poiciloptilus*	Assumed present
Australian Painted Snipe	*Rostratula australis*	Assumed present
Black Bittern	*Ixobrychus flavicollis*	Assumed present
Blue-billed Duck	*Oxyura australis*	Assumed present
Dusky Woodswallow	*Artamus cyanopterus*	Assumed present
Eastern Coastal Free-tailed Bat	*Micronomus norfolkensis*	Assumed present

[2] These are warm and windless conditions, and within one week of heavy rainfall (i.e. >50 mm in seven days) between September–March.

Common Name	Scientific Name	Status
Eastern Osprey	*Pandion cristatus*	Assumed present
Flame Robin	*Petroica phoenicea*	Assumed present
Freckled Duck	*Stictonetta naevosa*	Assumed present
Gang-gang Cockatoo	*Callocephalon fimbriatum*	Assumed present
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	Assumed present
Golden-tipped Bat	*Phoniscus papuensis*	Assumed present
Grey-headed Flying-fox	*Pteropus poliocephalus*	Assumed present
Koala	*Phascolarctos cinereus*	Assumed present
Large Bent-winged Bat	*Miniopterus orianae oceanensis*	Assumed present
Little Bent-winged Bat	*Miniopterus australis*	Assumed present
Little Eagle	*Hieraaetus morphnoides*	Assumed present
Little Lorikeet	*Glossopsitta pusilla*	Assumed present
Masked Owl	*Tyto novaehollandiae*	Assumed present
Powerful Owl	*Ninox strenua*	Assumed present
Regent Honeyeater	*Anthochaera phrygia*	Assumed present
Scarlet Robin	*Petroica boodang*	Assumed present
Spotted Harrier	*Circus assimilis*	Assumed present
Square-tailed Kite	*Lophoictinia isura*	Assumed present
Swift Parrot	*Lathamus discolor*	Assumed present
Turquoise Parrot	*Neophema pulchella*	Assumed present
Varied Sittella	*Daphoenositta chrysoptera*	Assumed present
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	Assumed present
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	Assumed present
Candidate species (species credit species)		
Bush Stone-curlew	*Burhinus grallarius*	There are limited records (3 since 1980) for this species within the IBRA subregion and the species is considered vagrant within the locality. No Bush Stone-curlews were observed or heard calling during the survey. The species is considered absent and no further assessment is required.
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	Given the isolated nature and small patch sizes of the vegetation present the habitat is considered too degraded for the breeding of Glossy Black-Cockatoo.
Eastern Pygmy-possum	*Cercartetus nanus*	There are 13 records for this species within the IBRA subregion according to the BioNet NSW Wildlife Atlas. The species is considered unlikely to occur within the Site based on a lack of its necessary habitat requirements. The Site is devoid of shrubs that

Common Name	Scientific Name	Status
		provide a food source for the species. Therefore, habitat is degraded and the species is not considered to occur.
Large-eared Pied Bat	*Chalinolobus dwyeri*	The Site is not within 2 km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within 2 km of old mines or tunnels. No suitable habitat is present for breeding. Species considered absent.
White-flowered Wax Plant	*Cynanchum elegans*	Suitable habitat does not occur at the Site. The species is considered absent due to degraded habitat.
Swift Parrot	*Lathamus discolor*	Consultation with Biodiversity Conservation Division pending for mapped important areas to determine if species must be included as a species credit species.
Square-tailed Kite	*Lophoictinia isura*	No Square-tailed Kites were detected during the field survey. The species is not considered to breed within the Site. No further assessment is required.
Little Eagle	*Hieraaetus morphnoides*	No Little Eagles were detected during the field survey. The species is not considered to breed within the Site. No further assessment is required.
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	No Sea-Eagles, or their typical nests, were observed. The vegetation and trees present are not considered suitable. Species is considered absent.
Chorizema parviflorum Benth. in the Wollongong and Shellharbour Local Government Areas		Suitable habitat does not occur at the Site. The species is considered absent due to degraded habitat.
Lespedeza juncea subsp. *sericea* in the Wollongong Local Government Area		Not listed as an endangered population in the Shoalhaven LGA. Suitable habitat does not occur at the Site. The species is considered absent due to degraded habitat.
Large Bent-winged Bat	*Miniopterus orianae oceanensis*	No caves or other suitable roosting structures occur within the Site. Species is considered absent as a species credit species (present as ecosystem credit species).
Southern Myotis	*Myotis macropus*	None of the hollow-bearing trees present on Site occur within 200 m of a suitable riparian zone or waterbody. The species is considered absent due to degraded habitat.
Squirrel Glider	*Petaurus norfolcensis*	There are limited records (8 since 1980) for this species within the IBRA subregion and the species is considered vagrant within the locality. The Site is considered degraded. Species is considered absent.
Koala	*Phascolarctos cinereus*	Koala density within the IBRA subregion is relatively low, with only 17 records since 1980. With reference to State Environmental Planning Policy (SEPP) 44, the Site does not constitute breeding or potential habitat. Species is considered absent.
Pimelea curviflora var. *curviflora*	*Pimelea curviflora var. curviflora*	Suitable habitat does not occur at the Site. The species is considered absent due to degraded habitat.
Spiked Rice-flower	*Pimelea spicata*	Suitable habitat does not occur at the Site. The species is considered absent due to degraded habitat.
Grey-headed Flying-fox	*Pteropus poliocephalus*	No breeding habitat (Flying-fox camps) are present within the Site.
Illawarra Greenhood	*Pterostylis gibbosa*	Suitable habitat does not occur at the Site. The species is considered absent due to degraded habitat.

Common Name	Scientific Name	Status
Masked Owl	*Tyto novaehollandiae*	There are 11 records for this species within the IBRA subregion according to the BioNet NSW Wildlife Atlas. The one record within 10 km of the Site is from 1980. Potential large hollows present. No sign of nesting or roosting beneath potential habitat trees. Species considered absent due to degraded habitat.
Regent Honeyeater	*Anthochaera phrygia*	Breeding habitat constitutes mapped important areas. There are no such mapped areas over the Site and the species is not known or likely to breed within the locality. No further assessment is required. Species considered absent.
Illawarra Zieria	*Zieria granulata*	Suitable habitat does not occur at the Site. The species is considered absent due to degraded habitat.
Gang-gang Cockatoo	*Callocephalon fimbriatum*	The following habitat was present within the Site: • Eucalypt tree species with hollows greater than 9 cm diameter. No Gang-gang Cockatoos were detected during the field survey. The species is not considered to breed within the Site. No further assessment is required.
Southern Brown Bandicoot (eastern)	*Isoodon obesulus*	The Site is consistently being grazed by livestock and the native vegetation patches present lack a dense ground cover. Therefore, habitat is degraded and the species is not considered to occur.
Little Bent-winged Bat	*Miniopterus australis*	No caves or other suitable roosting structures occurred within the Site. Species is considered absent as a species credit species (present as ecosystem credit species).
Orange-bellied Parrot	*Neophema chrysogaster*	Not known to breed in NSW (breeds in Tasmania) and is currently thought to be vagrant in NSW. Species considered absent.
Powerful Owl	*Ninox strenua*	Potential large hollows present, however the trees are considered too young. TBDC states: "…nest in large tree hollows…that are at least 150 years old" (DPIE 2020d). Additionally, the habitat is too sparse to provide the guarding male protection. No sign of nesting or roosting beneath potential habitat trees. Species considered absent due to degraded habitat.
Eastern Osprey	*Pandion cristatus*	No Ospreys, or their typical nests, were observed. Species is considered absent.
Pink Robin	*Petroica rodinogaster*	Species considered absent due to lack of necessary habitat requirements and degraded nature of Site.
Red-crowned Toadlet	*Pseudophryne australis*	Species considered absent due to lack of necessary habitat requirements.
Solanum celatum	*Solanum celatum*	Suitable habitat does not occur at the Site. The species is considered absent due to degraded habitat.
Scrub Turpentine	*Rhodamnia rubescens*	Suitable habitat does not occur at the Site. The species is considered absent due to degraded habitat.

1.8.4 Fauna habitats

The majority of the Site consists of exotic pasture which provides little in the way of important habitat for native fauna species. Habitat condition has been influenced within the Site via previous clearing of vegetation, grazing of livestock, pasture improvement or fertilising. The extent of previous clearing of the Site is indicated by aerial photography.

A small area of remnant trees occurs adjacent to Beach Road and near the dwelling. Some of these trees contained hollows (Figure 6). Hollow-bearing trees also occur at other locations within the Site. Patches of regrowth vegetation and isolated paddock trees occurs throughout the Site and along the boundary fences (Figures 4 and 5), the majority of which are not old enough to support large hollows.

The native vegetation at the Site provides limited foraging habitat for mobile species as it is situated within a rural environment dominated by cleared paddocks. Native understorey vegetation is limited, while large fallen branches/logs (i.e. >30 cm diameter) were absent.

Four aquatic dams are present within the Site, three of which are connected by an ephemeral drainage line. This drainage line is identified as a first order watercourse (Strahler 1952), and present limited potential as a dispersal corridor for the Green and Golden Bell Frog.

All portions of the development site have been impacted by weeds, primarily introduced grasses and forbs.

1.8.5 Fauna recorded from field surveys

A total of 32 fauna species were recorded during field surveys at the Site, comprising two native mammals, 22 native birds, four frogs and four exotic species. A complete species list is provided in Appendix 5.

The majority of the species were recorded opportunistically whilst traversing the Site. The frogs were recorded during the targeted Green and Golden Bell Frog surveys (as described in Section 1.8.2).

The results of the above surveys are consistent with BioNet NSW Atlas of Wildlife records for the area in that threatened species observations within the Site surrounds are limited to mobile species of birds and bats.

1.8.6 Threatened fauna

One threatened species, the Grey-headed Flying Fox (*Pteropus poliocephalus*), listed as vulnerable under both the EPBC and BC Acts, was detected within the Site (Figure 6). This species was observed foraging within the planted vegetation that is present near the dwelling. The Grey-headed Flying Fox is a dual credit species (i.e. ecosystem and credit). As no Flying Fox camps are present within, or adjacent to the Site, the species credit component for this species does not apply. The ecosystem credit portion for this species will be included within the ecosystem offsets associated with the vegetation clearing.

The Green and Golden Bell Frog did not respond during the call playback, nor were any heard calling or observed during the spotlighting or diurnal searches.

The Biosis report (2017) did not record any threatened fauna at the Site.

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 have been incorporated into the Project design or will be employed 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 native vegetation to be impacted is of low condition.

The Biosis (2017) report identified areas of vegetation that are of value (i.e. Jim's Forest) which informed the current Project design. These areas are outside the proposed development footprint (to be protected and managed within the proposed E2 zone) and will not to be impacted by the current Project.

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 7.

Table 7: Mitigation measures

Mitigation measure	Responsibility
Pre-construction	
Establishment of robust fencing around woodland areas adjacent to the Site, with fencing maintained throughout the construction phase of the Project - the Site boundary is to be clearly demarcated	Project manager
Development of a Biodiversity Management Plan [BMP] (refer to Section 2.2.3)	Project manager/ Project ecologist
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
Implementation of a BMP	Project manager/ Project ecologist
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

2.2 Impact summary

The Project would affect biodiversity, including threatened biodiversity through both direct and indirect impacts during construction and operation. The majority of impacts on biodiversity would occur during construction from clearing of a small amount of native vegetation (1.33 ha) and removal of habitat for a limited range of flora and fauna. Direct impacts have been largely avoided or else mitigated.

2.2.1 Direct impacts

For the purpose of this assessment the clearing area is considered to include:

- the entire subdivision area excluding a portion of the vegetation that occurs along the northern boundary of the property
- the two intersection zones with Beach Road (to be reconsidered regarding traffic)
- the bus bays and associated widening of Beach Road.

The following residual direct impacts would result from the Project and are illustrated on Figure 7:

- clearing of 0.05 ha of ILGW TEC vegetation (Table 8)
- clearing of 0.3 ha of SOFF TEC vegetation (Table 8)
- clearing of 1.14 ha of Blackbutt – Bangalay forest non-TEC vegetation (Table 8)
- clearing of associated threatened species habitat
- removal of up to 13 hollow-bearing trees.

The majority of vegetation likely to be affected by the Project has been subject to historic clearing and other agricultural activities such as grazing and is therefore thinned, and is highly modified by exotic pasture grasses, forbs and herbs.

With reference to Figure 7 all of the impacted areas are required to be offset.

2.2.2 Indirect Impacts

Indirect impacts would occur within and adjacent to the proposed development as a result of construction and operation of the Project. The main indirect impact from the Project would be via increased anthropogenic pressures on the adjacent PCTs. These and additional potential indirect impacts include:

- Facilitation of weed spread via construction activities (managed via a BMP and household dumping of waste containing weeds within adjacent woodland areas
- Migration of sediments to waterways from construction (managed via BMP/erosion and sediment control plan)
- Increased potential for predation from cats and dogs within the adjacent PCTs.
- Increased lighting around the edge of the Site near stands of vegetation to be retained (Jim's Forest).

The above impacts would be mitigated via the BMP (see below) with an incorporated sediment and erosion control plan.

2.2.3 Biodiversity Management Plan

A BMP would be prepared prior to the commencement of construction to inform and manage various activities throughout the life of the Project in order to protect and manage important biodiversity values. Key commitments to be covered by the BMP include:

- Pest and weed prevention measures for construction activities and management of any priority pests or weeds within the Site.
- Vegetation management plan with specific focus on areas adjacent to the woodland stands.

- An erosion and sediment control plan.
- Hollow-bearing tree removal protocol.

2.2.4 Serious and irreversible impacts

There are no candidate species which have potential to experience serious and irreversible impacts (SAII) as a result of the Project.

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.

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 8. Three vegetation zones identified within the Site generated ecosystem credit requirements. Ecosystem credit species will be offset via offsetting of associated vegetation types. It is likely that this credit obligation would be satisfied via payments into the NSW Biodiversity Conservation Fund. The report generated by the BAM Calculator is provided in Appendix 6.

Table 8: Ecosystem credit requirements

Niche vegetation mapping	PCT – best fit	Impact area (ha)	Vegetation Integrity Score	Required credits
Red Gum forest	838	0.05	58.4	1
Swamp Oak forest	1232	0.3	32.4	5
Blackbutt – Bangalay forest	694	1.14	39.8	20
Exotic pasture and trees	Cleared land	26.07	Not applicable	N/A
Total[3]		**1.49**		**26**

3.1.2 Summary of species credits required

No species credits are required for the Project.

It is recommended that evidence of credit retirement be provided to Shoalhaven City Council prior to the commencement of clearing works.

[3] Does not include cleared land area.

References

Biosis (2017). *510 Beach Road, Berry; Flora and fauna assessment*. Report prepared for Richard Hall by Biosis Pty Ltd, Wollongong, NSW.

DEC (2004). *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities*. NSW Department of Environment and Conservation, Sydney.

DECC (2009). *Threatened species survey and assessment guidelines: field survey methods for fauna: Amphibians*. https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/amphibians-field-survey-methods-090213.pdf (Accessed January 2020) Department of Environment and Climate Change.

DEE (2020a). *Protected Matters Search Tool*. https://www.environment.gov.au/epbc/pmst/index.html (Accessed January 2020) Department of the Environment and Energy.

DEE (2020b). *Species Profile and Threats Database*. http://www.environment.gov.au/cgi-bin/sprat/public/sprat.plDEWHA (2010). *Survey guidelines for Australia's threatened frogs Guidelines for detecting frogs listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999*. https://www.environment.gov.au/system/files/resources/ff3eb752-482d-417f-8971-f93a84211518/files/survey-guidelines-frogs.pdf (Accessed January 2020) Department of the Environment, Water, Heritage and the Arts.

DPIE (2019). *Guidance to assist a decision-maker to determine a serious and irreversible impact*, State of NSW and Office of Environment and Heritage. Department of Planning, Industry and Environment.

DPIE (2020a). *NSW BioNet Atlas Records: species sightings search*. NSW Department of Planning, Industry and the Environment. https://www.environment.nsw.gov.au/atlaspublicapp/UI_Modules/ATLAS_/AtlasSearch.aspx?who=21d5d459-a149-49be-a8a3-b0c45f15ec39 (Accessed January 2020).

DPIE (2020b). *NSW (Mitchell) Landscapes - version 3.1*. https://datasets.seed.nsw.gov.au/dataset/nsw-mitchell-landscapes-version-3-1 (Accessed January 2020).

DPIE (2020c). *NSW BioNet Vegetation Classification*. Available online: https://www.environment.nsw.gov.au/NSWVCA20PRapp/default.aspx. (Accessed January 2020).

DPIE (2020d) Descriptive text & photos https://www.environment.nsw.gov.au/AtlasApp/UI_Modules/TSM_/LinksEdit.aspx?pId=10562&pType=SpeciesCode&a=1 (Accessed January 2020).

DPI (2020). *NSW WeedWise, Priority Weeds for the South East*. https://weeds.dpi.nsw.gov.au/WeedBiosecurities?AreaId=10 (Accessed January 2020) Department of Primary Industries.

Keith (2004). *Ocean Shores to Desert Dunes: The Native Vegetation of New South Wales and the ACT*. Published by Department of Environment and Conservation, Hurstville, NSW.

NSW Government (2020). *Legislation: Shoalhaven Local Environmental Plan 2014* https://www.legislation.nsw.gov.au/#/view/EPI/2014/179 (Accessed February 2020).

OEH (2013). Compilation map: Biometric vegetation types and endangered ecological communities of the Shoalhaven, Eurobodalla & Bega Valley local government areas. A living map. Version 2.0. Technical Report. NSW Office of Environment & Heritage, Queanbeyan, ACT.

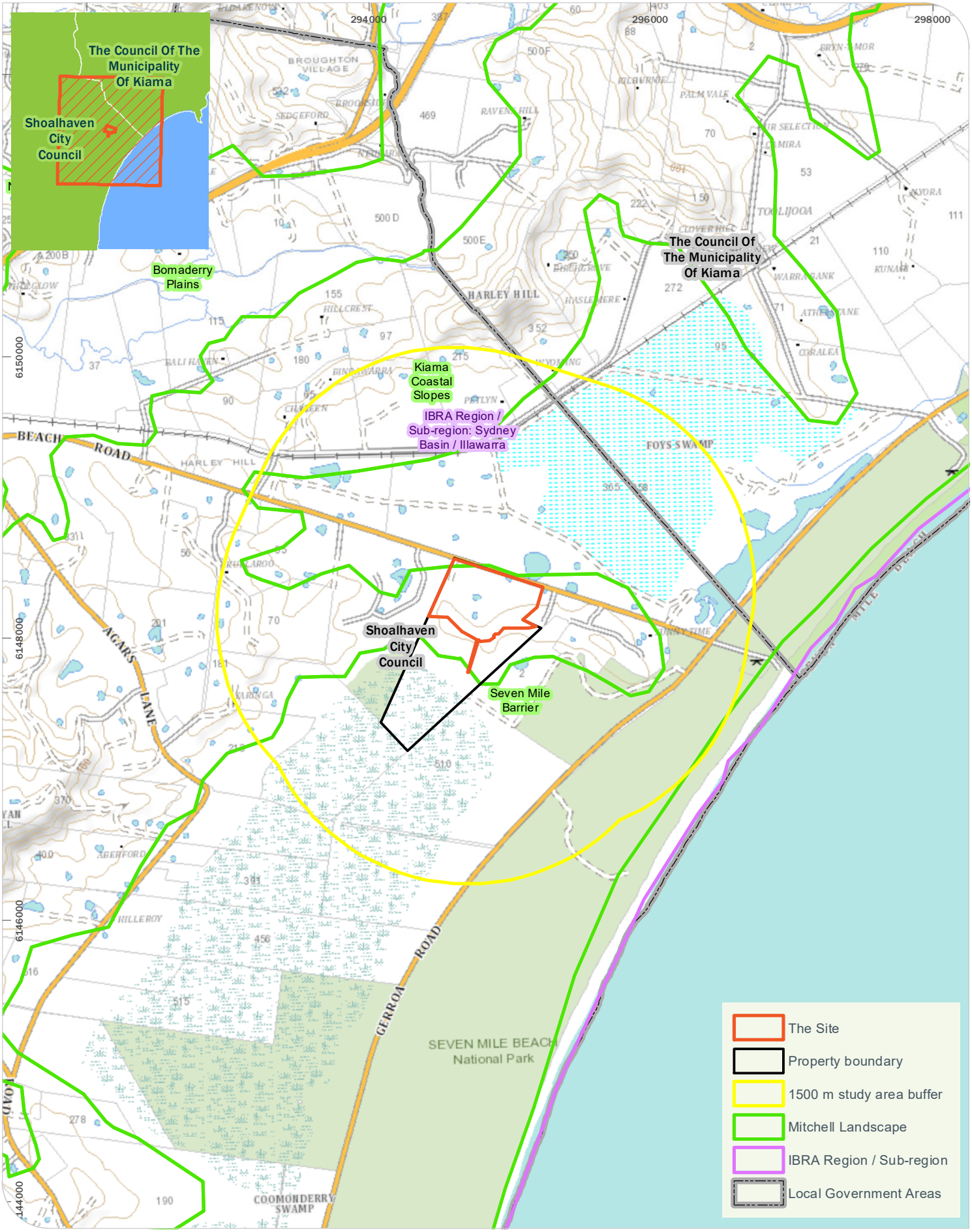
OEH (2017). *Biodiversity Assessment Methodology - NSW Biodiversity Offsets Policy for Major projects*. State of NSW and Office of Environment and Heritage.

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

Strahler, A.N. (1952). Dynamic basis of geomorphology, *Bull. Geol. Soc. Am.*, 63, 923–938.

Threatened Species Scientific Committee (2016) *Approved Conservation Advice (incorporating listing advice) for the Illawarra and south coast lowland forest and woodland ecological community*. http://www.environment.gov.au/biodiversity/threatened/communities/pubs/144-conservation-advice.pdf In effect under the EPBC Act from 16-Sep-2016. (Accessed January 2020).

Figures



niche Environment and Heritage

0 800

m

GDA 1994 MGA Zone 56

Niche PM: Stephen Bloomfield
Niche Proj. #: 5595
Client: Allen Price & Scarratts Pty Ltd

Location Map

510 Beach Road, Berry BDAR

Figure 1

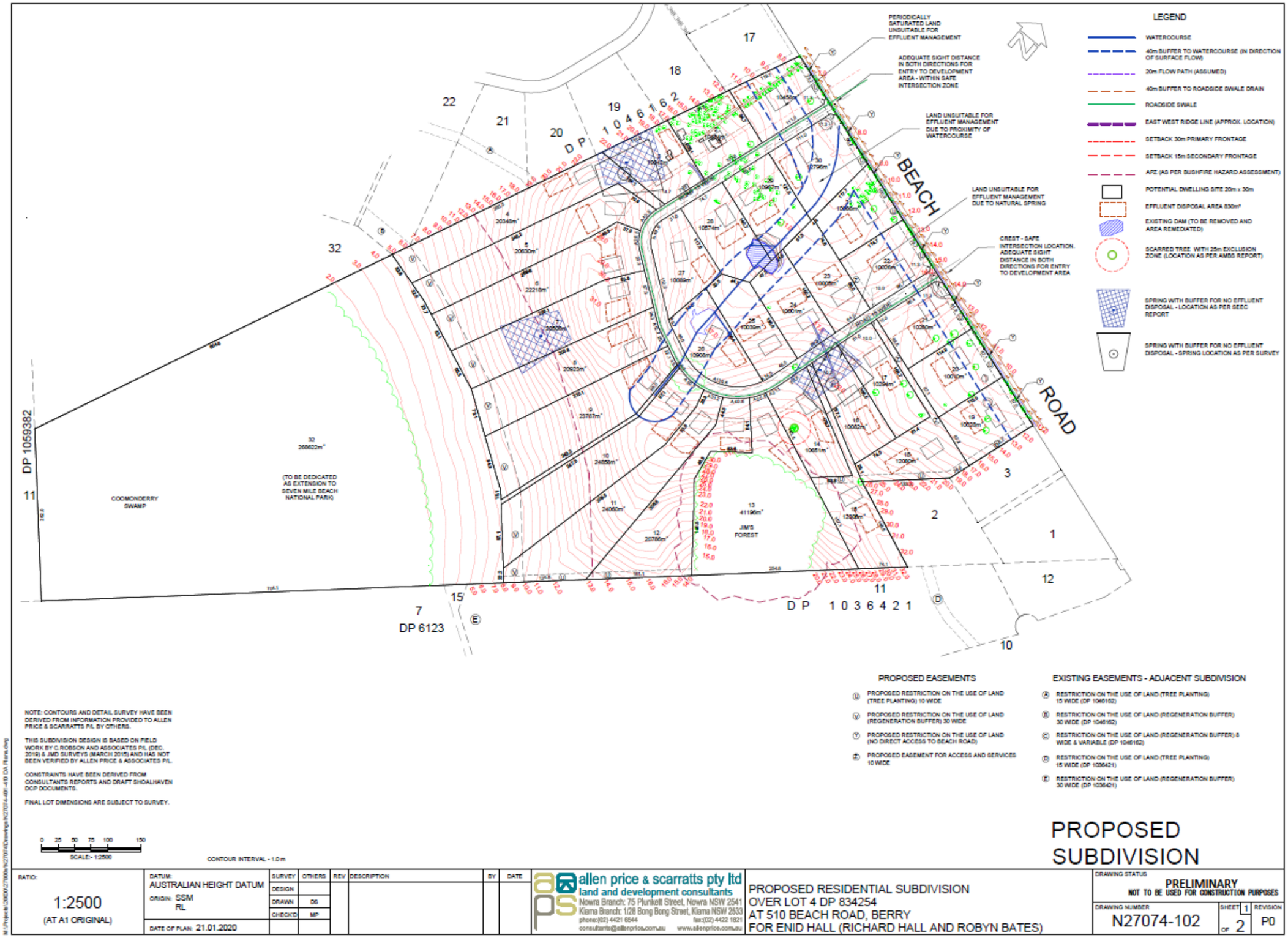
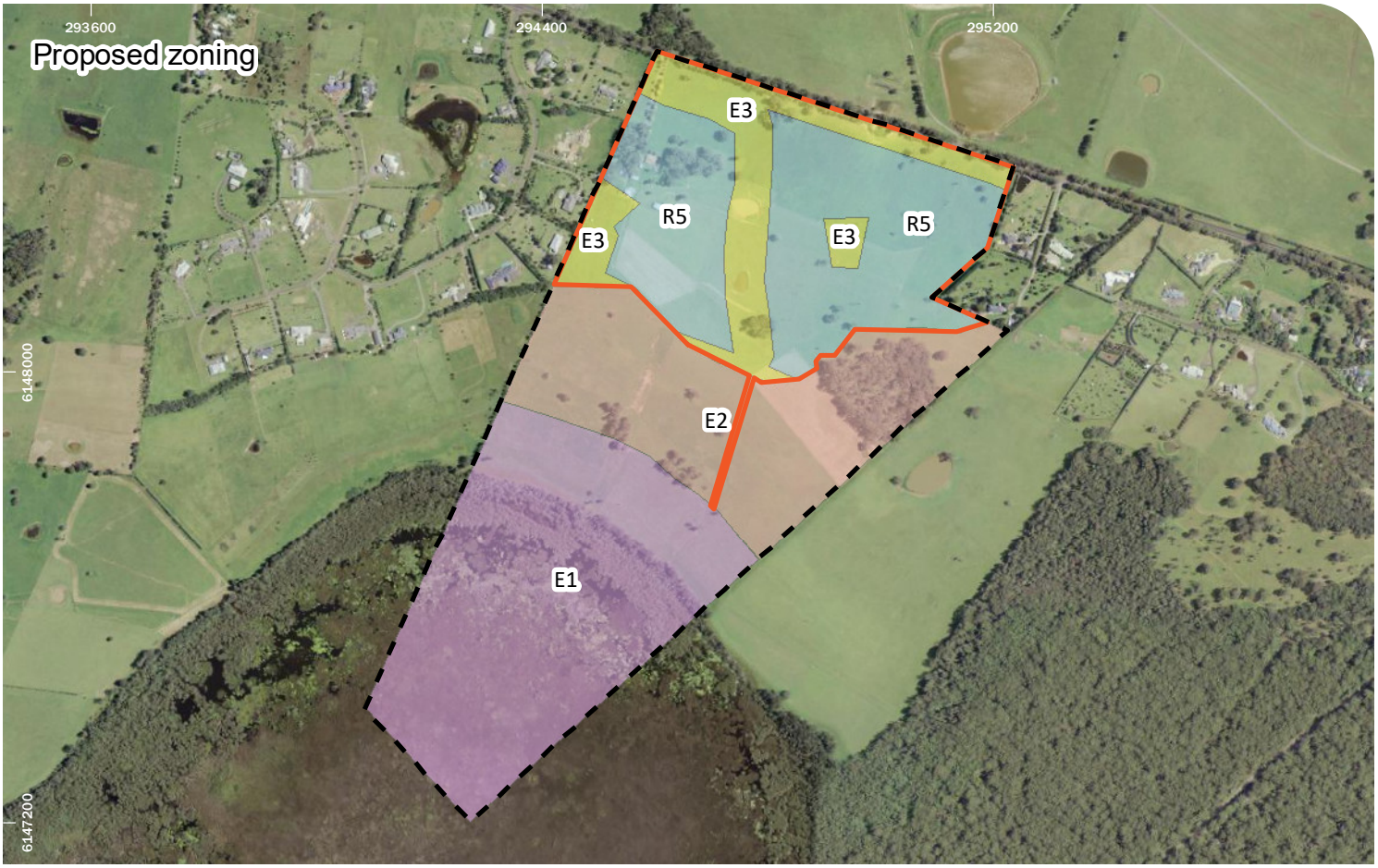
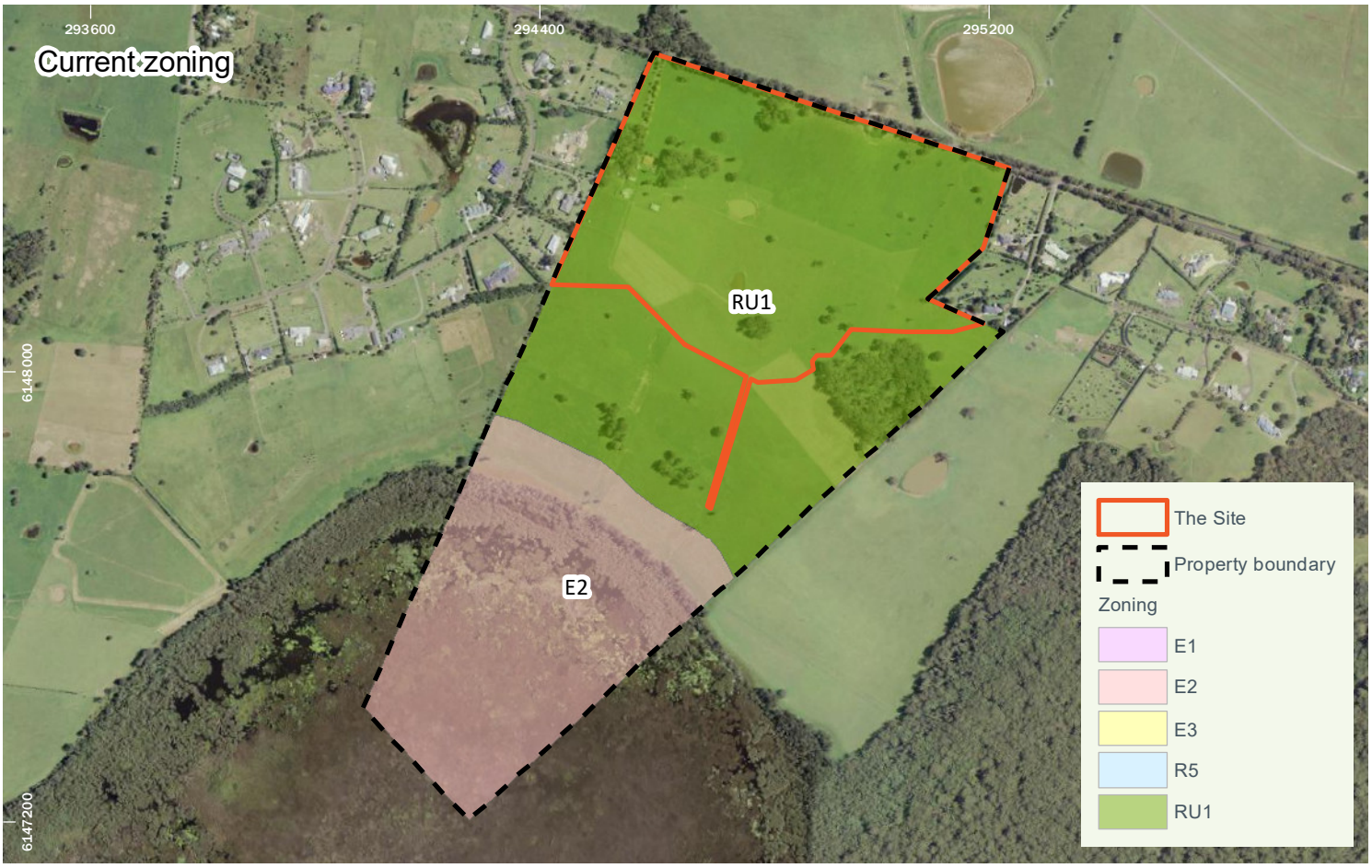


Figure 2. Subdivision layout





Drawn by: GT File: T:\spatial\projects\a6500\a6595_510_BeachRoad_Berry_BDAR\Maps\report\5595_Figure_3_Zoning2.mxd Last updated: 05-Feb-20 3:44:29 PM

niche Environment and Heritage

0 300
m
GDA 1994 MGA Zone 56

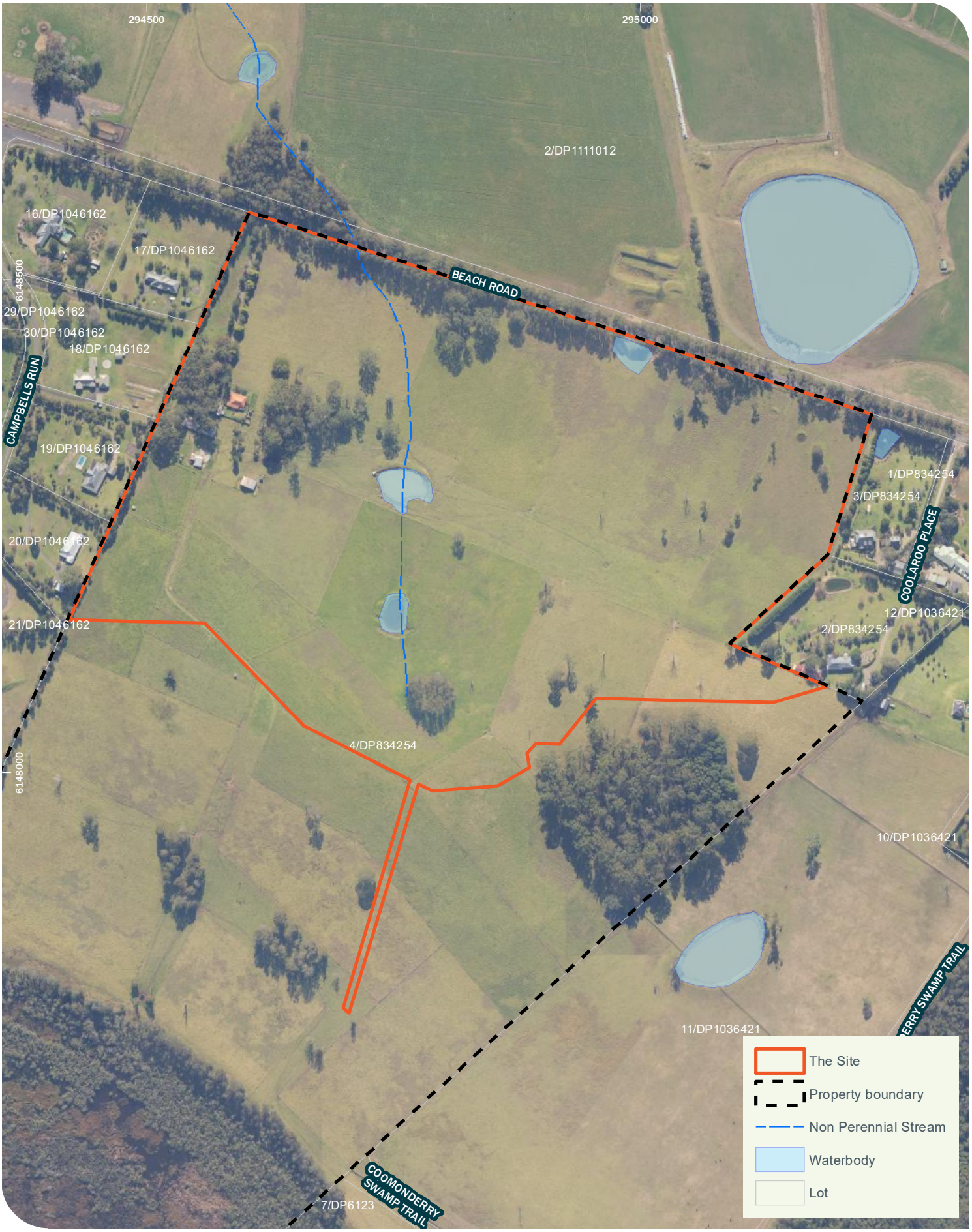
Niche PM: Stephen Bloomfield
Niche Proj. #: 5595
Client: Allen Price & Scarratts Pty Ltd

Current and proposed zoning
510 Beach Road, Berry BDAR

Figure 3

public/NSW_Imagery:

v2.0



Drawn by: GT File: T:\spatial\projects\a0500\a0595_510_BeachRoad_Berry_BDAR\Maps\report\5595_Figure_4_SiteMap.mxd Last updated: 05-Feb-20 2:05:53 PM

niche Environment and Heritage

0 100
m
GDA 1994 MGA Zone 56

Niche PM: Stephen Bloomfield
Niche Proj. #: 5595
Client: Allen Price & Scarratts Pty Ltd

Site Map
510 Beach Road, Berry BDAR

Figure 4

public/NSW_Imagery:

v2.0

niche Environment and Heritage

0 100
m
GDA 1994 MGA Zone 56

Vegetation zones and plot locations
510 Beach Road, Berry BDAR

Niche PM: Stephen Bloomfield
Niche Proj. #: 5595
Client: Allen Price & Scarratts Pty Ltd

Figure 5

niche Environment and Heritage

0 100
m
GDA 1994 MGA Zone 56

Niche PM: Stephen Bloomfield
Niche Proj. #: 5595
Client: Allen Price & Scarratts Pty Ltd

Fauna survey effort and results
510 Beach Road, Berry BDAR

Figure 6

niche Environment and Heritage

0 100
m
GDA 1994 MGA Zone 56

Niche PM: Stephen Bloomfield
Niche Proj. #: 5595
Client: Allen Price & Scarratts Pty Ltd

Area to be impacted
510 Beach Road, Berry BDAR

Figure 7

Appendix 1 – Plant community descriptions

PCT 838 - Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion

Habitat: This community predominantly occurs on lower slopes in coastal rainshadow valleys, below 350 m ASL, from Wollongong to Milton and west to Yalwal.

Structure/Characteristics: Grassy Woodland with an open shrub layer and a continuous grassy groundcover.

Distribution within Site: Approximately 0.21 ha of this PCT was recorded within the Site adjacent to Beach Road (Figure 5); around 0.01 ha occurs within the Site.

Condition and Presence of Weeds: PCT 838 at the Site is in poor condition, due to its size, linear nature and location i.e. located between a road and cleared pasture. The canopy is native with few midstorey species and a diverse layer of groundcover species.

High Threat Weeds recorded within this PCT include Lantana, Camphor Laurel, Moth Vine, Kikuyu Grass and Panic Veldtgrass. Of these, Lantana is listed as a priority weed under the NSW *Biosecurity Act 2015* for the South East region (DPI 2020).

Conservation Status: Aligns to *Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion* (ILGW) which is Endangered under the BC Act PCT 838 is also recognised as a threatened ecological community under the EPBC Act (*Illawarra and south coast lowland forest and woodland ecological community)*, however, the quality of the patches present did not meet the condition thresholds for classification under the EPBC Act.

Characteristic species used for identification of PCT: The overstorey species recorded within the Site that align with the dominant species listed as characterising this PCT include: *Eucalyptus tereticornis, Eucalyptus longifolia, Angophora floribunda* and *Eucalyptus globoidea*.

The mid-storey species recorded within the study area that align with the dominant species listed for the PCT include: *Allocasuarina littoralis*, *Breynia oblongifolia, Pandorea pandorana* and *Pittosporum undulatum*.

Groundcover species recorded that align with species listed for the PCT include: *Dichondra repens, Commelina cyanea, Desmodium rhytidophyllum, Dianella revoluta, Lomandra multiflora, Rubus parvifolius* and *Echinopogon ovatus*.

Justification of evidence used to identify the PCT: The stated distribution, species composition and habitat information for the PCT, as given in the OEH BioNet Vegetation Classification database, is highly consistent with the geographic location, habitat and floristics of the PCT at the Site. The key matching characteristic is its distribution within the lower slopes of coastal rainshadow valleys.

Plate 1: PCT 838 - Forest Red Gum - Thin-leaved Stringybark grassy woodland

PCT 1232 - Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion

Habitat: This community occurs on coastal floodplains of NSW, below 20 m (rarely above 10 m) elevation, and is found in close proximity to rivers and estuaries generally on soils with a saline influence.

Structure/Characteristics: Forest with an open shrub layer and a varying density groundcover with a composition that is dependent on groundwater salinity.

Distribution within Site: Approximately 0.35 ha of this PCT was recorded within the Site, occurring at two locations - in the southern portion of the Site (Plot 4) and adjacent to Beach Road (Plot 5) (Figure 5). Around 0.2 ha occurs within the Site.

Condition and Presence of Weeds: PCT 1232 at the Site is in poor condition, due to its size and location and historical disturbance. The canopy is native but there is no midstorey vegetation present. The patch in the south has a groundcover that is predominantly exotic, while adjacent to Beach Road the groundcover consists of a wider range of native species with greater per cent cover; presumably as no grazing occurs in this area.

High Threat Weeds recorded within this PCT include Blackberry, Cobblers Pegs, Moth Vine, Fireweed, Kikuyu Grass and Panic Veldtgrass. Of these Blackberry and Fireweed are listed as priority weeds under the NSW *Biosecurity Act 2015* for the South East region (DPI 2020).

Conservation Status: Aligns to *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregion* (SOFF) which is Endangered under the BC Act. PCT 1232 is also recognised as a threatened ecological community under the EPBC Act (*Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland)*, however, the quality of the patches present did not meet the condition thresholds for classification under the EPBC Act.

Characteristic species used for identification of PCT: The key overstorey species recorded within the Site that align with the dominant species listed as characterising this PCT included *Casuarina glauca*.

Groundcover species recorded that align with species listed for the PCT include: *Oplismenus imbecillis, Parsonsia straminea, Commelina cyanea, Centella asiatica, Geitonoplesium cymosum, Dichondra repens* and *Juncus usitatus*.

Justification of evidence used to identify the PCT: The stated distribution, species composition and habitat information for the PCT, as given in the OEH BioNet Vegetation Classification database, is highly consistent with the geographic location, habitat and floristics of the PCT in the study area. The key matching characteristics are its distribution on the coastal floodplain and proximity to other stands of SOFF.

Plate 2: PCT 1232- Swamp Oak floodplain swamp forest (Plot 4)

Plate 3: PCT 1232 - Swamp Oak floodplain swamp forest (Plot 5)

PCT 694 - Blackbutt - Turpentine - Bangalay moist open forest on sheltered slopes and gullies, southern Sydney Basin Bioregion

Habitat: Occurs from the Hacking River catchment along the Illawarra escarpment south to Mt Keira, on coastal lowlands near Berry, and scattered through coastal foothills and lowlands from Nowra south to Batemans Bay below 200 m ASL.

Structure/Characteristics: Grassy Woodland with no shrub layer and a continuous grassy groundcover.

Distribution within Site: Approximately 1.33 ha of this PCT was recorded within the Site adjacent to Beach Road and east and west of the dwelling (Figure 5); around 0.9 ha occurs within the Site.

Condition and Presence of Weeds: The Blackbutt – Bangalay forest stand present is in poor condition, due to its size, lack of structural complexity and history of disturbance. The canopy is native with few midstorey species and a mixed groundcover of native and exotic species.

High Threat Weeds recorded within this PCT include Cobblers Pegs, Giant Parramatta Grass, Kikuyu Grass, Moth Vine and Panic Veldtgrass. Of these Giant Parramatta Grass is listed as a priority weed under the NSW *Biosecurity Act 2015* for the South East region (DPI 2020).

Conservation Status: PCT 694 is not listed as a threatened ecological community under the EPBC or BC Acts.

Characteristic species used for identification of PCT: The overstorey species recorded within the Site that align with the dominant species listed as characterising this PCT include: *Eucalyptus pilularis, Eucalyptus botryoides* and *Eucalyptus paniculata*.

The mid-storey species recorded within the Site that align with the dominant species listed for the PCT include *Acmena smithii*.

Groundcover species recorded that align with species listed for the PCT include: *Dichondra repens, Commelina cyanea* and *Oplismenus imbecillis*.

Justification of evidence used to identify the PCT: The stated distribution, species composition and habitat information for the PCT, as given in the OEH BioNet Vegetation Classification database, is highly consistent with the geographic location, habitat and floristics of the PCT in the study area. The key matching characteristic is its distribution on the coastal lowlands near Berry.

Plate 4: PCT 694 - Blackbutt - Turpentine - Bangalay moist open forest

Exotic grassland (no PCT)

Habitat: This community is dominant within the locality as a result of past clearing for agricultural purposes.

Structure/Characteristics: A cleared landscape consisting of a continuous exotic grassy groundcover (Plate 6).

Distribution within Site: Approximately 26.9 ha of this community was recorded within the Site (Figure 5).

Condition and Presence of Weeds: This plant community was considered to be in poor condition, with little to no resilience, given the dominance of weed species and absence of structural layers in the vegetation.

High Threat Weeds recorded within this PCT include Paspalum, Giant Parramatta Grass and Kikuyu Grass. Of these Giant Parramatta Grass is listed as a priority weed under the NSW *Biosecurity Act 2015* for the South East region (DPI 2020).

Conservation Status: The exotic grassland community is not listed under the EPBC or BC Acts.

A description of the grassland: A canopy and shrub layer are absent while the groundcover is dense and composed of predominantly exotic species. Dominant plants included Kikuyu Grass, Perennial Ryegrass, Paspalum, Giant Parramatta Grass, Catsear and Paddy's Lucerne.

One native species , *Dichondra repens*, was recorded within the plots undertaken, however *Juncus usitatus* was observed in other areas of the exotic grassland not sampled.

Justification of evidence used to identify the community as a non-conforming PCT: The key characteristics that classify this community as exotic and non-native are its species composition (approximately 94% of the species recorded within the plots carried out within this community were exotic), absence of structural layers and its low resilience.

Plate 5: Exotic grassland

Appendix 2 – Floristic plot data

Family	Species	Common Name	Plot 1 Cover	Plot 1 Abundance	Plot 2 Cover	Plot 2 Abundance	Plot 3 Cover	Plot 3 Abundance	Plot 4 Cover	Plot 4 Abundance	Plot 5 Cover	Plot 5 Abundance	Plot 6 Cover	Plot 6 Abundance	Plot 7 Cover	Plot 7 Abundance
Apiaceae	*Centella asiatica*	Indian Pennywort	0.1	1	0.1	20					0.1	100				
Apiaceae	*Cyclospermum leptophyllum**	Slender Celery									0.1	10				
Apocynaceae	*Araujia sericifera**	Moth Vine			0.1	2					0.1	5	0.1	5		
Apocynaceae	*Parsonsia straminea*	Common Silkpod							0.1	4	50		3	50		
Asteraceae	*Bidens pilosa**	Cobbler's Pegs	0.1	3	0.1	2					0.1	5				
Asteraceae	*Cirsium vulgare**	Spear Thistle									0.1	1				
Asteraceae	*Conyza bonariensis**	Flaxleaf Fleabane	0.1	1	0.1	5					0.1	5	0.1	2	0.1	3
Asteraceae	*Hypochaeris glabra**	Smooth Catsear	0.1	1												
Asteraceae	*Hypochaeris radicata**	Catsear			0.1	10									0.5	200
Asteraceae	*Senecio madagascariensis**	Fireweed	0.2	10					0.1	1						
Asteraceae	*Taraxacum officinale**	Dandelion			0.1	1									0.1	1
Bignoniaceae	*Pandorea pandorana*	Wonga Vine									0.1	5	0.2	10		
Casuarinaceae	*Allocasuarina littoralis*	Black She-Oak											0.5	2		
Casuarinaceae	*Casuarina glauca*	Swamp Oak							35	18	80					
Chenopodiaceae	*Atriplex spp.*	A Saltbush							0.1	5						
Chenopodiaceae	*Einadia hastata*	Berry Saltbush	0.1	20	0.1	2										
Commelinaceae	*Commelina cyanea*	Native Wandering Jew	0.1	10	0.1	10					0.5	100	0.1	50		
Convolvulaceae	*Dichondra repens*	Kidney Weed	0.1	50	0.1	100					0.1	100	0.1	50	0.1	20
Cyperaceae	*Cyperus spp.*				0.1	5										
Cyperaceae	*Gahnia spp.*										10					
Dilleniaceae	*Hibbertia scandens*	Climbing Guinea Flower	0.1	1												
Fabaceae (Faboideae)	*Desmodium rhytidophyllum*												0.1	2		
Fabaceae (Mimosoideae)	*Acacia longifolia*												1	2		
Geraniaceae	*Geranium homeanum*										0.1	1				
Juncaceae	*Juncus usitatus*		0.1	10	0.1	5					0.1	10				
Lauraceae	*Cinnamomum camphora**	Camphor Laurel											0.2	1		
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush											30			
Lomandraceae	*Lomandra multiflora subsp. multiflora*	Many-flowered Mat-rush											0.1	3		
Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling Lily									0.1	5				
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne	1	100	1	500	0.1	5	0.1	10	0.2	50			0.1	10
Myrtaceae	*Acmena smithii*	Lilly Pilly	1	1												
Myrtaceae	*Angophora floribunda*	Rough-barked Apple									5		25			
Myrtaceae	*Eucalyptus botryoides*	Bangalay									4	2				
Myrtaceae	*Eucalyptus botryoides <--> saligna*		15	6												
Myrtaceae	*Eucalyptus globoidea*	White Stringybark											4	1		
Myrtaceae	*Eucalyptus longifolia*	Woollybutt									1	1				
Myrtaceae	*Eucalyptus paniculata*	Grey Ironbark	25	10							2	1	1	1		
Myrtaceae	*Eucalyptus pilularis*	Blackbutt			40	9										
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum			1	1							50			
Myrtaceae	*Melaleuca linariifolia*	Flax-leaved Paperbark									1	3				

Family	Species	Common Name	Plot 1 Cover	Plot 1 Abundance	Plot 2 Cover	Plot 2 Abundance	Plot 3 Cover	Plot 3 Abundance	Plot 4 Cover	Plot 4 Abundance	Plot 5 Cover	Plot 5 Abundance	Plot 6 Cover	Plot 6 Abundance	Plot 7 Cover	Plot 7 Abundance
Oleaceae	*Notelaea spp.*												0.1	1		
Passifloraceae	*Passiflora spp.**		0.1	1												
Phormiaceae	*Dianella revoluta*	Blueberry Lily											0.1	1		
Phyllanthaceae	*Breynia oblongifolia*	Coffee Bush											0.1	2		
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum									0.1	1	0.2	3		
Plantaginaceae	*Plantago lanceolata**	Lamb's Tongues			0.1	20									0.1	1
Poaceae	*Bromus cartharticus**	Prairie Grass			0.1	20	0.1	100							0.1	50
Poaceae	*Cenchrus clandestinum**	Kikuyu Grass	1	20	50	1000	98	2000	80	1500	5	500	2	100	90	
Poaceae	*Echinopogon ovatus*	Forest Hedgehog Grass	0.1	1	0.1	10					0.1	5				
Poaceae	*Ehrharta erecta**	Panic Veldtgrass	10								3	300	1	100		
Poaceae	*Entolasia marginata*	Bordered Panic			0.1	5					0.1	10				
Poaceae	*Entolasia stricta*	Wiry Panic											0.5	100		
Poaceae	*Holcus lanatus**	Yorkshire Fog	0.1	10	0.1	20	0.1	10				0.1	5			
Poaceae	*Imperata cylindrica*	Blady Grass											0.2	100		
Poaceae	*Lolium perenne**	Perennial Ryegrass	0.1	5	0.1	50	0.5	1000							1	300
Poaceae	*Microlaena stipoides*	Weeping Grass	1	100												
Poaceae	*Oplismenus imbecillis*		0.1	10	0.1	10			0.1	3	0.1	5				
Poaceae	*Paspalum dilatatum**	Paspalum													0.2	150
Poaceae	*Rytidosperma spp.*												0.1	5		
Poaceae	*Setaria spp.**										0.1	10				
Poaceae	*Sporobolus fertilis**	Giant Parramatta Grass	0.1	10											0.1	10
Ranunculaceae	*Clematis aristata*	Old Man's Beard											0.1	1		
Rosaceae	*Rubus fruticosus sp. agg.**	Blackberry complex									1	50				
Rosaceae	*Rubus parvifolius*	Native Raspberry											0.1	5		
Rosaceae	*Rubus spp.**												0.1	10		
Solanaceae	*Solanum nigrum**	Black-berry Nightshade									0.1	1				
Solanaceae	*Solanum pseudocapsicum**	Madeira Winter Cherry	0.2	10							0.1	3				
Verbenaceae	*Lantana camara**	Lantana											0.1	1		

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
5595sb1	694	Blackbutt – Bangalay forest	3	0	4	4	0	2	41	0	1.3	0.4	0	0.2	11.4
5595sb2	694	Blackbutt – Bangalay forest	2	0	6	4	0	0	41	0	15.5	0.4	0	0	50.2
5595sb3	-	Exotic grassland	0	0	0	0	0	0	0	0	0	0	0	0	0
5595sb4	1232	Swamp Oak forest	1	1	1	0	0	1	35	0.1	0.1	0	0	0.1	80.1
5595sb5	1232	Swamp Oak forest	5	2	6	4	0	3	92	1.1	10.5	0.8	0	50.2	9.2
5595sb6	838	Red Gum forest	6	5	5	4	0	3	80.6	1.5	30.9	0.4	0	3.3	3.4
5595sb7	-	Exotic grassland	0	0	0	1	0	0	0	0	0	0	0	0	90.3

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
5595sb1	Absent	3	1	45	36	Absent	Present	Present	Present	Present
5595sb2	Absent	5	2	55	1	Absent	Present	Present	Present	Present
5595sb3	Absent	0	0	0	0	0	0	0	0	0
5595sb4	Absent	0	0	25	6	Absent	Present	Present	Present	Absent
5595sb5	Absent	4	1	25	0	Present	Present	Present	Present	Absent
5595sb6	Absent	6	0	30	0	Present	Present	Present	Present	Present
5595sb7	Absent	0	0	0	0	0	0	0	0	0

Appendix 4 - Threatened species status, likelihood of occurrence and credit type

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Credit type
Amphibians						
Heleioporus australiacus	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
Litoria aurea	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.	Low. Potential to traverse site during 'explosive' years when long-term adequate rain and breeding occurs.	Species
Litoria littlejohni	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
Reptiles						
Hoplocephalus bungaroides	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						
Anthochaera phrygia	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	Low	Species/Ecosystem

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Credit type
				coastal woodlands and forests in some years. There are only three known key 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.		
Apus pacificus	Fork-tailed Swift	-	M	The Fork-tailed Swift is almost exclusively aerial, flying from less then one metre to at least 300 metres above ground and probably much higher.	Low	-
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-	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. 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.	Low	Ecosystem
Botaurus poiciloptilus	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 bulrushes and spikerushes.	None	Ecosystem
Callocephalon fimbriatum	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
Calyptorhynchus lathami	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
Cuculus optatus	Oriental Cuckoo		MA	Mainly inhabits coniferous, deciduous and mixed forests. Breeds in northern hemisphere. Brood parasite, laying eggs in nests of other birds.	Low	-
Daphoenositta chrysoptera	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

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Credit type
Dasyornis brachypterus	Eastern Bristlebird	E	E	Found in coastal woodlands, dense scrub and heathlands, particularly where it borders taller woodlands.	None	Species
Ephippiorhynchus asiaticus	Black-necked Stork	E	-	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. They also forage within or around estuaries and along intertidal shorelines, such as saltmarshes, mudflats and sandflats, and mangrove vegetation.	None	Ecosystem
Glossopsitta pusilla	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 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.	Low	Ecosystem
Haematopus longirostris	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
Haliaeetus leucogaster	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
Hieraeetus morphnoides	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
Hirundapus caudacutus	White-throated Needletail	-	M, MA	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges.	Low	-
Ixobrychus flavicollis	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
Lathamus discolor	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
Lophoictinia isura	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 by Woollybutt, Spotted Gum, River Peppermint or Gully Gum. Individuals appear to occupy large hunting ranges of more than 100km². They require large living trees for breeding, particularly near water with surrounding	Low	Species/Ecosystem

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Credit type
				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.		
Monarcha melanopsis	Black-faced Monarch	-	M	Found along the coast of eastern Australia, becoming less common further south. Inhabits rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating.	Low	-
Monarcha trivirgatus	Spectacled Monarch	-	M	Coastal north-eastern and eastern Australia, including coastal islands, from Cape York, Queensland to Port Stephens, New South Wales. Prefers thick understorey in rainforests, wet gullies and waterside vegetation, as well as mangroves.	None	-
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. Found in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests.	Low	-
Neophema chrysogaster	Orange-bellied Parrot	CE	CE, M	The Orange-bellied Parrot breeds in the south-west of Tasmania and migrates in autumn to spend the winter on the mainland coast of south-eastern South Australia and southern Victoria. There are occasional reports from NSW, with the most recent records from Shellharbour and Maroubra in May 2003. It is expected that NSW habitats may be more frequently utilised than observations suggest. Typical winter habitat is saltmarsh and strandline-foredune vegetation communities either on coastlines or coastal lagoons. Spits and islands are favoured but they will turn up anywhere within these coastal regions. The species can be found foraging in weedy areas associated with these coastal habitats or even in totally modified landscapes such as pastures, seed crops and golf courses.	None	Species
Ninox strenua	Powerful Owl	V	-	Occupies wet and dry eucalypt forests and rainforests. Can occupy both un-logged 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
Pachycephala olivacea	Olive Whistler	V	-	Mostly inhabit wet forests above about 500m. During the winter months they may move to lower altitudes. Forage in trees and shrubs and on the ground, feeding on berries and insects.	Low	Ecosystem
Pandion cristatus	Eastern Osprey	V	M, MA	Ospreys are found right around the Australian coastline, 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	Low	Species/Ecosystem

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Credit type
				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.		
Pezoporus wallicus	Eastern Ground Parrot	V	-	Large populations occur on the NSW south coast, particularly Barren Grounds NR, Budderoo NP, the Jervis Bay area and Nadgee NR. Small numbers are recorded at Morton and Ben Boyd NP and other areas on the south coast. The Ground Parrot occurs in high rainfall coastal and near coastal low heathlands and sedgelands, generally below one metre in height and very dense (up to 90% projected foliage cover). These habitats provide a high abundance and diversity of food, adequate cover and suitable roosting and nesting opportunities for the Ground Parrot, which spends most of its time on or near the ground.	None	Species
Rhipidura rufifrons	Rufous Fantail	-	M	Found along the east coast of Australia from far northern Queensland to Tasmania, including south-eastern South Australia. Inhabits tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests.	Low	-
Stagonopleura guttata	Diamond Firetail	V	-	Feeds exclusively on the ground, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season). Found in grassy eucalypt woodlands, including box-gum woodlands and snow gum woodlands. Also occurs in open forest, mallee, natural temperate grassland, and in secondary grassland derived from other communities.	Low	Ecosystem
Tyto novaehollandiae	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
Mammals						
Chalinolobus dwyeri	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
Dasyurus maculatus	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

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Credit type
Falsistrellus tasmaniensis	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.	High	Ecosystem
Micronomus norfolkensis	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.	High	Ecosystem
Miniopterus schreibersii oceanensis	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
Myotis macropus	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 groups of 10 – 15 close to water in caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage.	High	Species
Petauroides volans	Greater Glider	EP in the Seven Mile Beach National Park area	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
Petaurus australis	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
Phascolarctos cinereus	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.	Low	Species/Ecosystem

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Credit type
Potorous tridactylus	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
Pseudomys novaehollandiae	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
Pteropus poliocephalus	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.	High	Species/Ecosystem
Saccolaimus flaviventris	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.	High	Ecosystem
Scoteanax rueppellii	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.	High	Ecosystem
Flora						
Caladenia tessellata	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
Chamaesyce psammogeton		E	-	Found sparsely along the coast from south of Jervis Bay (at Currarong, Culburra and Seven Mile Beach National Park) to Queensland (and Lord Howe Island). Populations have been recorded in Wamberal Lagoon Nature Reserve, Myall Lakes National Park and Bundjalung National Park. Grows on fore-dunes and exposed headlands, often with Spinifex sericeus.	Low	Species
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	Low	Species

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Credit type
				Ash, Red Bloodwood and Black She-oak and appears to prefer open areas in the understorey of this community.		
Cynanchum elegans	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
Daphnandra johnsonii	Illawarra Socketwood	E	E	Restricted to the Illawarra region where it has been recorded from the local government areas of Shoalhaven, Kiama, Shellharbour and Wollongong. Occupies the rocky hillsides and gullies of the Illawarra lowlands, occasionally extending onto the upper escarpment slopes. Associated vegetation includes rainforest and moist eucalypt forest.	Low	Species
Genoplesium baueri	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
Melaleuca biconvexa	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.	Low	Species
Pimelea spicata	Spiked Rice-flower	E	E	Once widespread on the Cumberland Plain, the Spiked Rice-flower occurs in two disjunct areas; the Cumberland Plain (Narellan, Marayong, Prospect Reservoir areas) and the Illawarra (Landsdowne to Shellharbour to northern Kiama). In both the Cumberland Plain and Illawarra environments this species is found on well-structured clay soils. On the inland Cumberland Plain sites it is associated with grey box and Ironbark. In the coastal Illawarra it occurs commonly in Coast Banksia open woodland with a better developed shrub and grass understorey.	Low	Species
Pomaderris brunnea	Brown Pomaderris	V	V	The species is expected to live for 10 - 20 years, while the minimum time to produce seed is estimated to be 4 - 6 years. Found in a very limited area around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area. It also occurs at Walcha on the New England Tableland and in far eastern Gippsland in Victoria.	Low	Species
Pterostylis gibbosa		E	E	Grows in open forest or woodland, on flat or gently sloping land with poor drainage. Known from a small number of populations in the Hunter region (Milbrodale), the Illawarra region (Albion Park and Yallah) and the Shoalhaven region (near Nowra).	Low	Species

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of Occurrence	Credit type
Rhodamnia rubescens		CE	-	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	Low	Species
Syzygium paniculatum	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.	Low	Species
Thesium australe	Austral Toadflax	V	V	Grows in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Occurs in grassland or grassy woodland. Grows on kangaroo grass tussocks but has also been recorded within the exotic coolatai grass.	Low	Species
Xerochrysum palustre	Swamp Everlasting	-	V	Found in Kosciuszko National Park and the eastern escarpment south of Badja. Also found in eastern Victoria. Grows in swamps and bogs which are often dominated by heaths. Also grows at the edges of bog margins on peaty soils with a cover of shrubs or grasses.	Low	Species
Zieria granulata		E	E	Restricted to the Illawarra region where it is recorded from a number of sites. The species primarily occupies the coastal lowlands between Oak Flats and Toolijooa, in the local government areas of Shellharbour and Kiama. This is a range of approximately 22 kilometres.	Low	Species

Appendix 5 – Fauna species list

Species recorded from site or adjacent areas during the Site investigation

Species in **bold** are listed as vulnerable under the NSW BC Act

* - denotes introduced species

Common Name	Scientific Name	Observation Type
BIRDS		
Australian King Parrot	*Alisterus scapularis*	Heard call
Australian Magpie	*Gymnorhina tibicen*	Observed
Australian Raven	*Corvus coronoides*	Observed
Australian Wood Duck	*Chenonetta jubata*	Observed
Black Swan	*Cygnus atratus*	Observed
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	Observed
Common Myna *	*Acridotheres tristis*	Observed
Common Starling *	*Sturnus vulgaris*	Observed
Crested Pigeon	*Ocyphaps lophotes*	Heard call
Crimson Rosella	*Platycercus elegans*	Heard call
Dollarbird	*Eurystomas orientalis*	Heard call
Eastern Rosella	*Platycercus eximius*	Observed
Galah	*Eolophus roseicapilla*	Observed
Grey Butcherbird	*Cracticus torquatus*	Heard call
Laughing Kookaburra	*Dacelo novaeguineae*	Heard call
Lewins Honeyeater	*Meliphaga lewinii*	Heard call
Magpie Lark	*Grallina cyanoleuca*	Heard call
Masked Lapwing	*Vanellus miles*	Heard call
Noisy Miner	*Manorina melanocephala*	Observed
Pied Currawong	*Strepera graculina*	Observed
Rainbow Lorikeet	*Trichoglossus moluccanus*	Heard call
Straw-necked Ibis	*Threskiornis spinicollis*	Observed
Willy Wagtail	*Rhipidura leucophrys*	Observed
Yellow-tailed Black Cockatoo	*Calyptorhynchus funereus*	Heard call
MAMMALS		
Grey-headed Flying Fox	***Pteropus poliocephalus***	Observed
Fox *	*Vulpes*	Scat
Rabbit *	*Oryctolagus cuniculus*	Observed
White-striped Freetail-bat	*Austronomus australis*	Heard call
AMPHIBIANS		
Eastern Dwarf Tree Frog	*Litoia fallax*	Observed
Peron's Tree Frog	*Litoria peronii*	Observed
Green Tree Frog	*Litoria caerulea*	Observed
Bleating Tree Frog	*Litoria dentata*	Observed

Appendix 6 – Ecosystem and species credit requirements for the Project

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00018945/BAAS18054/20/00018946	Beach Road BDAR	26/11/2019
Assessor Name	Report Created	BAM Data version *
	04/03/2020	22
Assessor Number	BAM Case Status	Date Finalised
	Open	To be finalised
Assessment Revision	Assessment Type	
0	Part 4 Developments (General)	

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

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

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Blackbutt - Turpentine - Bangalay moist open forest on sheltered slopes and gullies, southern Sydney Basin Bioregion								
1	694_Low	39.8	1.1	0.25	High Sensitivity to Potential Gain	1.75		20
							Subtotal	**20**

Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion							
3	838_Low	58.4	0.1	0.25	High Sensitivity to Potential Gain	2.00	1
						Subtotal	**1**
Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion							
2	1232_Low	32.4	0.3	0.25	High Sensitivity to Potential Gain	2.00	5
						Subtotal	**5**
						Total	**26**

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Potential SAII	Species credits

niche Environment and Heritage

niche-eh.com

Excellence in your environment

Contact Us

Niche Environment and Heritage
02 9630 5658
info@niche-eh.com

NSW Head Office – Sydney
PO Box 2443 North Parramatta
NSW 1750 Australia

QLD Head Office – Brisbane
PO Box 540 Sandgate
QLD 4017 Australia

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)