Callala Bay, Sealark Road, Planning Proposal
Biodiversity Development Assessment Report

Hare Bay Development Consortium

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Template 2.8.1

Executive Summary

Eco Logical Australia Pty Ltd was engaged by Hare Bay Development Consortium to prepare a Biodiversity Development Assessment Report (BDAR) for a Planning Proposal at Lot 5 DP 1225356, Sealark Road, Callala Bay. The Planning Proposal seeks to amend the Shoalhaven Local Environmental Plan 2014 to rezone part of the land from C3 Environmental Management to R1 General Residential and R2 Low Density Residential, with the majority of the land to be rezoned to C2 Environmental Conservation.

This report has been prepared to meet the requirements of the Biodiversity Assessment Method 2020 established under Section 6.7 of the NSW *Biodiversity Conservation Act 2016* (BC Act).

The development site is approximately 1.87 ha in size. The proposed development has been located to take advantage of more disturbed parts of the property where slashing of vegetation and other disturbances have occurred for a number of years. However, the vast majority of the development site still contains native vegetation.

The development site supports two Plant Community Types (PCT), PCT 662 *Banksia - Red Bloodwood - Hard-leaved Scribbly Gum heathy open woodland on sandstone plateaux, southern Sydney Basin Bioregion* in a predominantly slashed condition, and PCT 1082 *Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion* in a disturbed condition.

PCT 662 and PCT 1082 do not conform to any Endangered Ecological Communities (EEC) listed under the NSW BC Act or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Surveys within the development site did not result in the detection of any of the candidate species credit species. One threatened species, *Pteropus poliocephalus* (Grey-headed Flying-fox), was recorded opportunistically in the development site. Three other threatened species were recorded opportunistically within the eastern half of the subject land: *Callocephalon fimbriatum* (Gang-gang Cockatoo), *Lophoictinia isura* (Square-tailed Kite) and *Haliaeetus leucogaster* (White-bellied Sea-eagle). The development site does not support any hollow-bearing trees, raptor nests, permanent water or rock habitats, nor any other habitat resources that are not widely available in surrounding areas.

This BDAR outlines the measures taken to avoid, minimise and mitigate impacts to the vegetation and habitats present within the development site during the design, construction and operation of the development. The residual unavoidable impacts of the proposed development were calculated in accordance with the BAM by utilising the Biodiversity Assessment Method Credit Calculator. A total of 28 ecosystem credits are required to offset the unavoidable impacts to the vegetation and habitats present within the development site. No species credits are required.

Serious and Irreversible Impact (SAII) values have been considered as part of this assessment. The proposal will not result in any SAII.

Following consideration of the administrative guidelines for determining significance under the EPBC Act, it is concluded that the proposal is unlikely to have a significant impact on matters of National Environmental Significance (MNES) or Commonwealth land, and a referral to the Commonwealth Environment Minister is therefore not recommended.

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Abbreviations

Abbreviation	Description
APZ	Asset Protection Zone
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Calculator
BC Act	NSW *Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offsets Scheme
CEEC	Critically Endangered Ecological Community
DA	Development Application
DAWE	Commonwealth Department of Agriculture, Water and the Environment (Now DCCEEW)
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DCP	Development Control Plan
DNG	Derived Native Grassland
DPE	NSW Department of Planning and Environment
DPIE	Former NSW Department of Planning, Industry and Environment (now DPE)
EEC	Endangered Ecological Community
ELA	Eco Logical Australia Pty Ltd
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FM Act	NSW *Fisheries Management Act 1994*
GIS	Geographic Information System
GPS	Global Positioning System
IBRA	Interim Biogeographic Regionalisation for Australia
LEP	Local Environmental Plan
LGA	Local Government Area
LLS	Local Land Service
PCT	Plant Community Type
SEPP	State Environmental Planning Policy
SSD	State Significant Development
TEC	Threatened Ecological Community
VI	Vegetation Integrity
WM Act	NSW *Water Management Act 2000*

1. Introduction

This Biodiversity Development Assessment Report (BDAR) has been prepared by David Coombes and Ryan Smithers. Ryan Smithers is an Accredited Person (BAAS17061) under the NSW *Biodiversity Conservation Act 2016* (BC Act). All credit calculations have been undertaken using the BAM Calculator (BAMC) version 61. Consistent with the BAM, the streamlined (small area) assessment module has been used for this assessment.

1.1 General description of the development site

The development site is located at Sealark Road, Callala Bay (part of Lot 5 DP 1225356) within the Shoalhaven Local Government Area (LGA). Lot 5 (the subject land) is currently zoned C3 Environmental Management under the Shoalhaven Local Environmental Plan (LEP) 2014. Most of the development site has been previously disturbed (cleared and/or slashed) but contains predominantly native vegetation.

This report includes two base maps, the Site Map (Figure 1) and the Location Map (Figure 2).

1.2 Brief description of the proposal

The planning proposal seeks to rezone the least constrained western parts of Lot 5 from C3 Environmental Management to R2 Low Density Residential and R1 General Residential, and to rezone the majority of the subject land to C2 Environmental Conservation (Figure 3). The preliminary subdivision layout for the proposal residential development is shown in Figure 4.

Most (approximately 4.29 ha or 71 %) of the subject land will not be directly affected by the proposed subdivision. It is noted that these lands will be retained for conservation purposes, including possible donation to the National Parks Estate.

1.3 Development site footprint

The development site occupies 1.87 ha. This is the total area that will be directly affected by the proposed residential development including APZs, roads, car parking, drainage and the provision of power and water.

The development site adjoins existing residential development on Sealark Road to the west and Monarch place to the south. Jervis Bay National Park adjoins the development footprint to the north. Predominantly intact native vegetation with proposed C2 zoning within the subject land occurs to the east of the development footprint, along with a small section of road reserve in the south-east.

1.4 Sources of information used

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

- BioNet Vegetation Classification
- BioNet Atlas (last accessed July 2024)
- Threatened Biodiversity Data Collection
- EPBC Protected Matters database (last accessed July 2024)
- Additional GIS datasets including cadastre, contours, imagery and drainage.

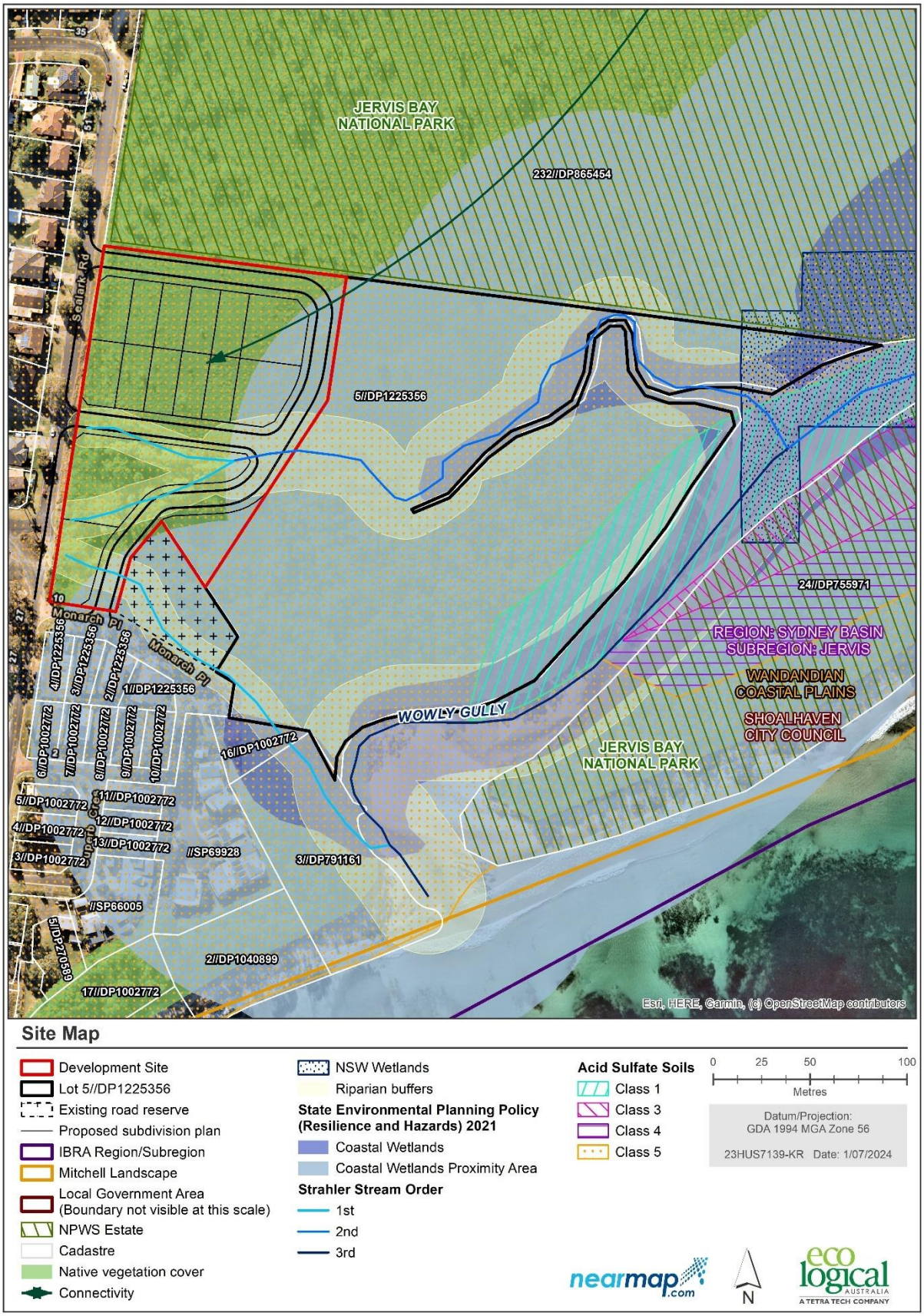

Figure 1: Site Map

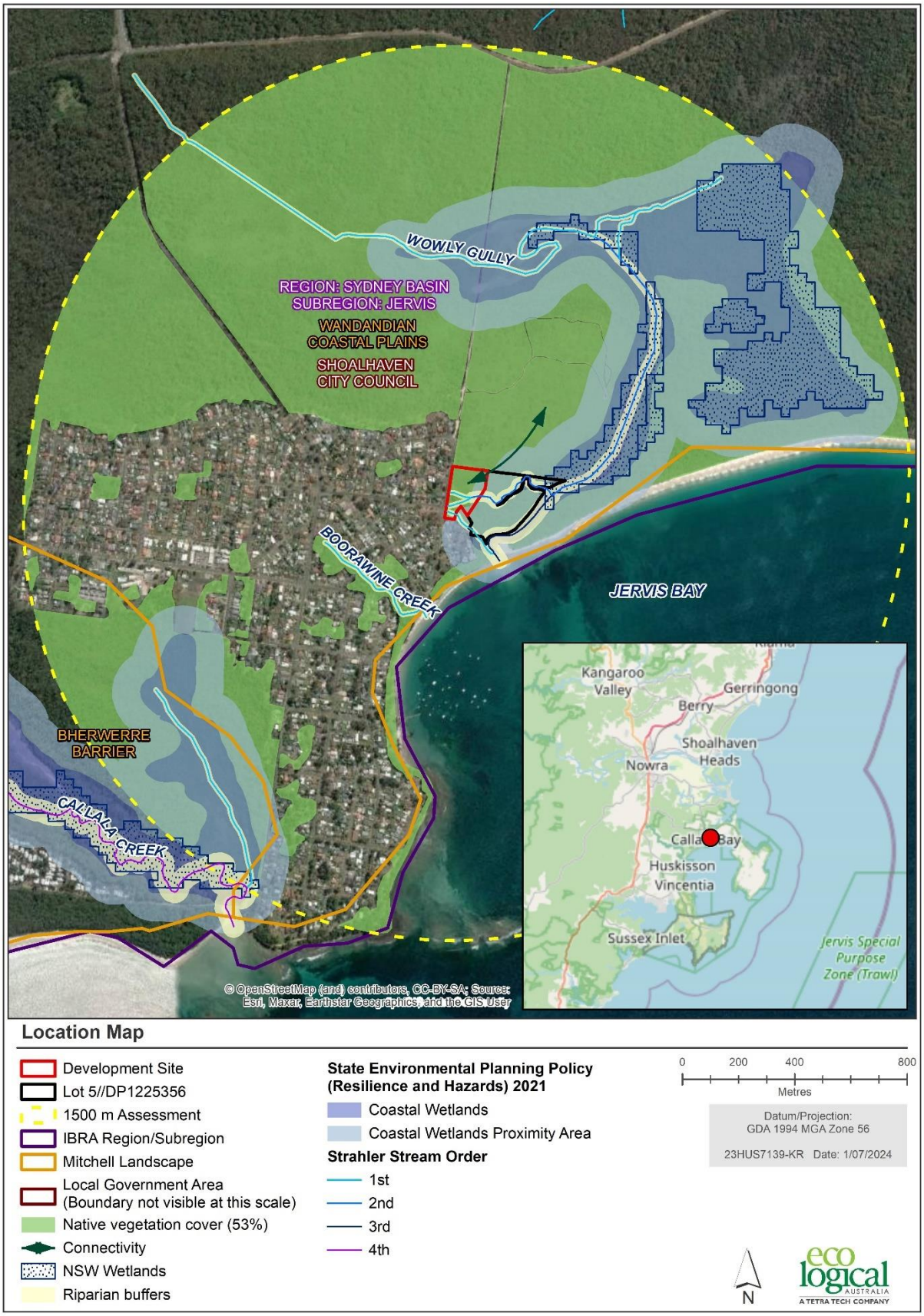

Figure 2: Location Map

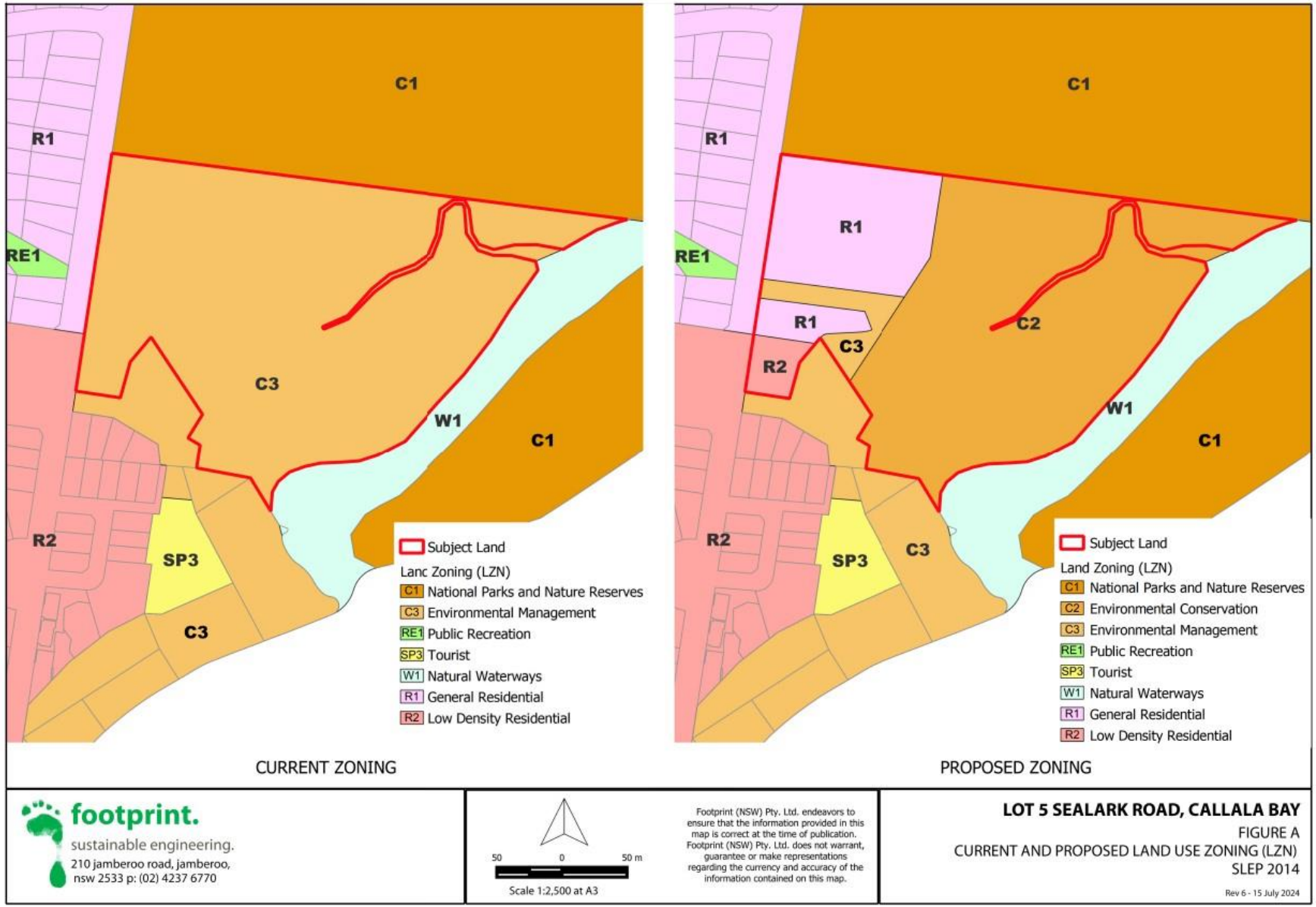

Figure 3: Proposed land use zoning

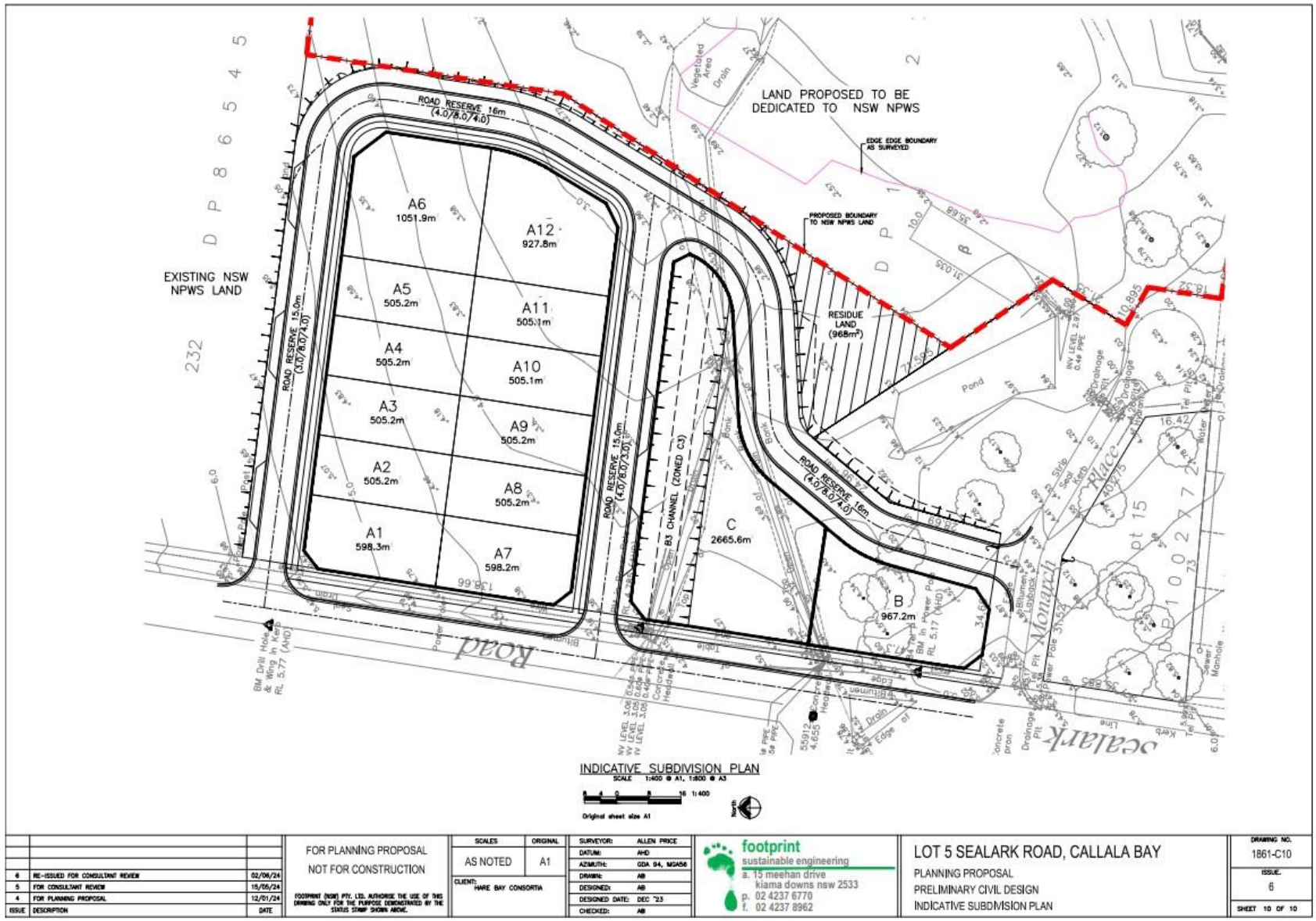

Figure 4: Preliminary subdivision layout

1.5 Legislative context

Table 1: Legislative context

Name	Relevance to the project	Report Section
Commonwealth		
Environmental Protection and Biodiversity Conservation Act 1999	Matters of national Environmental Significance have been identified on or near the development site. This report assesses impacts to MNES and concludes that the development is unlikely to have a significant impact on MNES.	Appendix C & Appendix D
State		
Environmental Planning and Assessment Act 1979	This planning proposal is to be submitted for Gateway Determination under s3.34 of the EP&A Act.	-
Biodiversity Conservation Act 2016	The proposed development exceeds the BAM area threshold and requires submission of a Biodiversity Development Assessment Report.	-
Fisheries Management Act 1994	The development does not involve impacts to Key Fish Habitat, does not involve harm to marine vegetation, dredging, reclamation or obstruction of fish passage. A permit or consultation under the FM Act is not required.	-
Water Management Act 2000	A first and second order stream are located within the development site. Therefore, the project involves works on waterfront land and may require a Controlled Activity Approval under s91 of the WM Act.	-
Planning Instruments		
SEPP (Resilience and Hazards) 2021	Chapter 2 - Coastal Management. A mapped Coastal Wetland occurs approximately 50 m to the east of the development site. Part of the development site is located within the Coastal Wetlands Proximity Area. Impacts on Coastal Wetland Proximity Areas requires additional assessment under s 2.8 of the SEPP.	8.2
SEPP (Biodiversity and Conservation) 2021	Chapter 4 – Koala habitat protection 2021 applies to the development. There are Koala use tree species within the development site, so Chapter 4 (Koala habitat protection) of the SEPP applies.	8.3
Shoalhaven Local Environment Plan 2014	Lot 5 is zoned C3 Environment Management under the Shoalhaven LEP 2014. No terrestrial biodiversity layers occur within the Lot 5, although the south-eastern portion of the property is land mapped as 'Excluded Land'. Riparian and watercourse mapping under the LEP is limited to the eastern edge of Lot 5.	-

2. Landscape features

2.1 IBRA regions and subregions

The development site falls within the Sydney Basin IBRA region and Jervis subregion as outlined in Table 2 and Table 3.

Table 2: IBRA regions

IBRA region	Area within development site (ha)
Sydney Basin	1.87

Table 3: IBRA subregions

IBRA subregion	Area within development site (ha)
Jervis	1.87

2.2 Native vegetation extent

The extent of native vegetation within the development site and buffer is outlined in Table 4.

Table 4: Native vegetation extent

Area within the development site (ha)	Area within the 1,500 m buffer area (ha)
1.87	422.76

There are no significant differences between the mapped vegetation extent and the aerial imagery.

2.3 Rivers and streams

The development site contains three mapped first order streams and one mapped second order stream. The southern-most mapped first order stream is not apparent on the site. The other first order streams are present but highly modified and originate from urban stormwater drains. None are mapped on the Shoalhaven LEP 2014 Riparian Land and Watercourse layer.

2.4 Wetlands

The development site does not contain any wetlands. However, a Coastal Wetland mapped under SEPP (Resilience and Hazards) 2021 is located more than 50 m to the east and south-east of the development site (Figure 1 and Figure 2). Parts of the development site occur within the 100 m Coastal Wetland Proximity Buffer.

2.5 Connectivity features

The development site does not provide any important habitat connectivity features, largely because it occurs on the edge of existing residential development and has been extensively modified. While there is direct connectivity to the adjacent national park to the north, connectivity values through the development site are minimal. The modified drainage lines in the development site originate from stormwater drains under Sealark Road and provide low connectivity values within the site.

2.6 Areas of geological significance and soil hazard features

The development site does not contain areas of geological significance and soil hazard features. All of the development site is mapped as Acid Sulfate Soils Class 5 (low probability).

2.7 Percent native vegetation cover in the landscape

The current percent native vegetation cover in the landscape was assessed in a Geographic Information System (GIS) using aerial imagery sourced from SIX Maps. The results of this analysis are shown in Figure 2 and Table 5.

Table 5: Percent native vegetation cover in the landscape

Area within the development site (ha)	Area within the 1,500m buffer (ha)	Cover within the 1,500 m buffer area (%)
1.87	794.48	53.21

2.8 Patch size

Patch size was calculated using available vegetation mapping for all patches of intact native vegetation on and adjoining the development site (Table 6).

Table 6: Patch size

Patch	Patch size area (ha)
1	>101

3. Native vegetation

3.1 Survey effort

Vegetation survey was undertaken within the development site by Ryan Smithers on 26 September 2019.

A total of three full-floristic vegetation plots were surveyed to identify Plant Community Types (PCT) and Threatened Ecological Communities (TEC) on the development site (Table 7 and Figure 5). A total of Three vegetation integrity plots were undertaken on the development site in accordance with the BAM (Table 8).

All field data collected at full-floristic and vegetation integrity plots is included in Appendix B.

Table 7: Full-floristic PCT identification plots

PCT ID	PCT Name	Number of plots surveyed
662	*Banksia - Red Bloodwood - Hard-leaved Scribbly Gum heathy open woodland on sandstone plateaux, southern Sydney Basin Bioregion*	2
1082	*Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion*	1

Table 8: Vegetation integrity plots

Veg Zone	PCT ID	PCT Name	Condition	Area (ha)	Plots required	Plots surveyed
1	662	*Banksia - Red Bloodwood - Hard-leaved Scribbly Gum heathy open woodland on sandstone plateaux, southern Sydney Basin Bioregion*	Slashed	1.33	1	1
2	662	*Banksia - Red Bloodwood - Hard-leaved Scribbly Gum heathy open woodland on sandstone plateaux, southern Sydney Basin Bioregion*	Intact	0.04	1	1
3	1082	*Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion*	Disturbed	0.50	1	1

3.2 Plant Community Types present

A total of two PCTs were identified on the development site (Table 9, Figure 5). The development site does not contain any listed TECs under the BC Act or EPBC Act (Table 10). Justification for the selection of PCTs occurring on the development site is based on a quantitative analysis of full-floristic plot data and is provided in Table 11.

Table 9: Plant Community Types

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Area	Percent cleared
662	Banksia - Red Bloodwood - Hard-leaved Scribbly Gum heathy open woodland on sandstone plateaux, southern Sydney Basin Bioregion	Sydney Montane Heaths	Heathlands	1.37	5%
1082	Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion	South East Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby sub-formation)	0.50	20 %

Table 10: Threatened Ecological Communities

PCT ID	BC Act			EPBC Act		
	Listing status	Name	Area (ha)	Listing status	Name	Area (ha)
662	Not listed	Not listed	-	Not listed	Not listed	-
1082	Not listed	Not listed	-	Not listed	Not listed	-

Table 11: PCT selection justification

PCT ID	PCT Name	Selection criteria	Species relied upon for identification of vegetation type and relative abundance
662	Banksia - Red Bloodwood - Hard-leaved Scribbly Gum heathy open woodland on sandstone plateaux, southern Sydney Basin Bioregion	IBRA region, landscape position and quantitative analysis	*Corymbia gummifera*, *Eucalyptus sclerophylla, Leptospermum trinervium, Hakea teretifolia subsp. hirsuta, Lambertia formosa Ptilothrix deusta*
1082	Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion	IBRA region, landscape position and quantitative analysis	*Corymbia gummifera, Eucalyptus sclerophylla, Banksia spinulosa, Lomatia ilicifolia, Comesperma ericinum, Entolasia stricta*

In determining the PCT for the development site, various attributes were considered in combination to assign vegetation to the best fit PCT. Attributes included dominant species in each stratum, community composition, soils and landscape position. Plot data was analysed in a quantitative analysis tool developed by ELA using the characteristic species present in each structural layer for all PCTs in the region (sourced from the BioNet Vegetation Information System (VIS)). This quantitative analysis was used to assist in determining PCTs that may be present. The tool uses positive characteristic species of PCTs and matches them to the flora species collected in plots. The tool then provides a total number of characteristic species present in the canopy, mid-storey and ground-layer and matches those communities that fit most strongly with the PCTs available. The higher the number of characteristic species the greater the fit for that community. It can be the case that a community matches strongly floristically with a PCT, however does not match well with other characteristics such as structure, landscape position or region. Therefore, this tool assists in the decision-making process, but is not the sole determining factor. Rather the tool assists expert judgement.

ELA considered the vegetation within the development site to comprise the PCT 662 Banksia - Red Bloodwood - Hard-leaved Scribbly Gum heathy open woodland on sandstone plateaux, southern Sydney Basin Bioregion in two condition states (slashed and intact) (Photo 1); and PCT 1082 Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion in one condition state (disturbed) (Photo 2). Within the development site, much of these communities have been floristically and structurally modified by historic clearing and/or slashing.

A quantitative analysis of the plot data obtained from the development site identified a good fit for PCT 662 and PCT 1082, with one or more characteristic species in each stratum. Other PCTs with at least one characteristic species in each stratum were ruled out given poor matches with respect to vegetation formation, geographic location and dominant species in each stratum.

The streamlined assessment method requires the dominant PCT within the development site. The dominant PCT within the development site is PCT 662.

3.3 Vegetation integrity assessment

A vegetation integrity assessment using the Credit Calculator (BAMC) was undertaken and the results are outlined in Table 12.

Table 12: Vegetation integrity

Veg Zone	PCT ID	Condition	Area (ha)	Composition Condition Score	Structure Condition Score	Function Condition Score	Current vegetation integrity score
1	662	Slashed	1.33	98.9	23.9	21.4	37
2	662	Intact	0.04	80.6	17.8	76.3	47.9
3	662	Disturbed	0.50	94.8	97.6	38.7	71

3.4 Use of local data

Use of local data instead of benchmark integrity scores is not proposed.

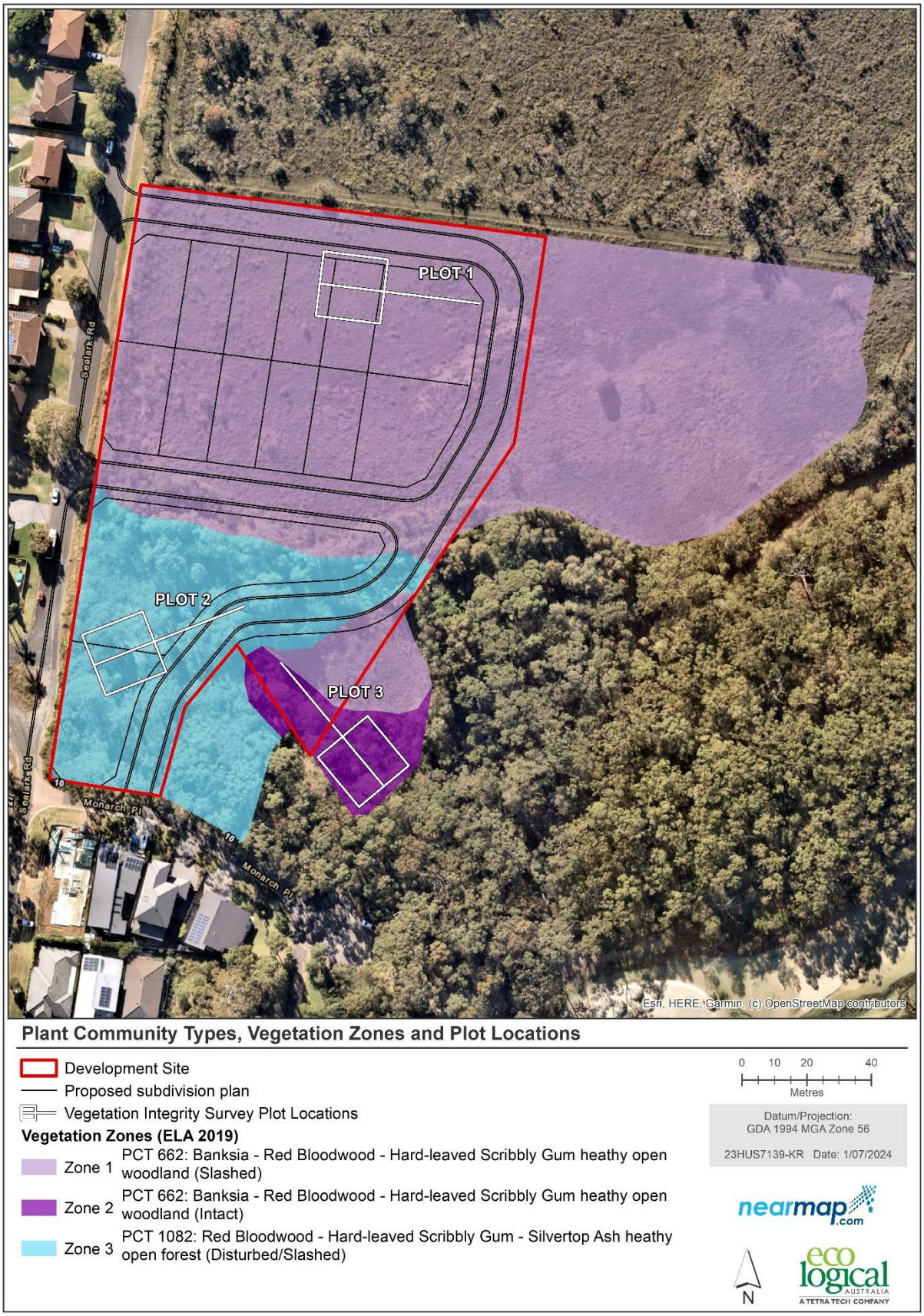

Figure 5: Plant Community Types and location of vegetation plots

Photo 1: Most of the development site and part of the vegetation to be retained (PCT 662) has been slashed for many years.

Photo 2: Disturbed forest (PCT 1082) in the south west of the development site contains relatively young trees, none of which contain hollows.

4. Threatened species

4.1 Ecosystem credit species

Ecosystem credit species predicted to occur at the development site, their associated habitat constraints, geographic limitations and sensitivity to gain class are included in Table 14.

Ecosystem credit species which have been excluded from the assessment and the relevant justifications for doing so are included in Table 13.

Table 13: Justification for exclusion of predicted ecosystem credit species

Species	Common Name	NSW listing status	EPBC Listing status	Justification for exclusion of species
Varanus rosenbergi	Rosenberg's Goanna	Vulnerable	-	There are no records of the species from the Jervis Bay region, and it would not occur within the development site.

4.2 Species credit species

Species credit species predicted to occur at the development site (i.e. candidate species), their associated habitat constraints, geographic limitations and sensitivity to gain class are included in Table 15.

Table 14: Predicted ecosystem credit species

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status
Anthochaera phrygia (Foraging)	Regent Honeyeater	-	-	High	Critically Endangered	Critically Endangered
Artamus cyanopterus cyanopterus	Dusky Woodswallow	-	-	Moderate	Vulnerable	Not Listed
Calamanthus fuliginosus	Striated Fieldwren	-	-	Moderate	Endangered	Not Listed
Daphoenositta chrysoptera	Varied Sittella	-	-	Moderate	Vulnerable	Not Listed
Dasyurus maculatus	Spotted-tailed Quoll	-	-	High	Vulnerable	Endangered
Glossopsitta pusilla	Little Lorikeet	-	-	High	Vulnerable	Not Listed
Hieraaetus morphnoides (Foraging)	Little Eagle	-	-	Moderate	Vulnerable	Not Listed
Lophoictinia isura (Foraging)	Square-tailed Kite	-	-	Moderate	Vulnerable	Not Listed
Miniopterus orianae oceanensis (Foraging)	Large Bent-wing Bat	-	-	High	Vulnerable	Not Listed
Micronomus norfolkensis	Eastern Coastal Freetail-bat	-	-	High	Vulnerable	Not Listed
Neophema pulchella	Turquoise Parrot	-	-	High	Vulnerable	Not Listed
Pteropus poliocephalus (Foraging)	Grey-headed Flying-fox	-	-	High	Vulnerable	Vulnerable
Varanus rosenbergi	Rosenberg's Goanna	-	-	High	Vulnerable	Not Listed

Table 15: Candidate species credit species

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status
Acacia bynoeana	Bynoe's Wattle	-	-	High	Endangered	Vulnerable
Anthochaera phrygia (Breeding)	Regent Honeyeater	Other As per mapped areas	-	High	Critically Endangered	Critically Endangered
Calochilus pulchellus	Pretty Beard Orchid	-	-	High	Endangered	Not listed
Cercartetus nanus	Eastern Pygmy-possum	-	-	High	Vulnerable	Not Listed
Chalinolobus dwyeri	Large-eared Pied Bat	Cliffs Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels	-	High	Vulnerable	Vulnerable
Cryptostylis hunteriana	Leafless Tongue orchid	-	-	Moderate	Vulnerable	Vulnerable
Eucalyptus langleyi	Albatross Mallee	Rocky areas Shallow soil over flat sandstone rock plate or within 100 m	North of Conjola and west of the Princes Highway	Moderate	Vulnerable	Vulnerable
Eucalyptus sturgissiana	Ettrema Mallee	-	West of the Princes Highway	High	Vulnerable	Not Listed
Genoplesium baueri	Bauer's Midge Orchid	-	-	High	Endangered	Endangered
Heleioporus australiacus	Giant Burrowing Frog	-	-	Moderate	Vulnerable	Vulnerable
Hieraaetus morphnoides (Breeding)	Little Eagle	Other Nest trees – live (occasionally dead) large old trees within vegetation	-	Moderate	Vulnerable	Not Listed
Litoria littlejohni	Littlejohn's Tree Frog	-	-	High	Vulnerable	Vulnerable
Lophoictinia isura (Breeding)	Square-tailed Kite	Other Nest trees	-	Moderate	Vulnerable	Not Listed

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status
Miniopterus orianae oceanensis (Breeding)	Large Bent-wing Bat	Caves Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat code "IC" -in cave Observation type code E nest-roost with numbers of individuals >500	-	High	Vulnerable	Not Listed
Petaurus norfolcensis	Squirrel Glider	-	-	High	Vulnerable	Not Listed
Pezoporus wallicus wallicus	Eastern Ground Parrot	-	-	High	Vulnerable	Not Listed
Potorous tridactylus	Long-nosed Potoroo	Other dense shrub layer or alternatively high canopy cover exceeding 70% (to capture pops inhabiting wet sclerophyll and rainforest)	-	High	Vulnerable	Vulnerable
Pteropus poliocephalus (Breeding)	Grey-headed Flying-fox	Other Breeding camps	-	High	Vulnerable	Vulnerable
Pterostylis vernalis	Pterostylis vernalis	Other Moss gardens	-	Moderate	Critically Endangered	Critically Endangered

4.3 Targeted surveys

Targeted surveys for species credit species were undertaken at the development site on the dates outlined in Table 16. The location of targeted flora survey transects are shown on Figure 6. The locations of targeted fauna surveys are shown on Figure 7.

Flora – Targeted surveys for threatened orchids *Pterostylis ventricosa, Calochilus pulchellus, Prasophyllum affine, Cryptostylis hunteriana* and *Genoplesium baueri* were undertaken via parallel transects approximately 10 m apart throughout the development site and immediately adjacent areas of suitable habitat during respective flowering periods. Surveys for other threatened flora including *Acacia bynoeana*, *Eucalyptus langleyi* and *E. sturgissiana* were also undertaken during these surveys.

Fauna – Breeding habitat surveys for Square-tailed Kite, Little Eagle and Grey-headed Flying-fox were conducted throughout the development site and adjoining areas on 26 September 2019. Transect searches for Eastern Ground Parrots were undertaken during all targeted orchid surveys, as were surveys listening for calls of the Eastern Bristlebird.

Surveys for threatened frogs were undertaken on four occasions during February 2020 following heavy rainfall. Nocturnal spotlight (visual encounter) searches and call playback for the Green and Golden Bell frog were focussed around the open drains and pond habitats in the development site. The same methods were used to target the Giant Burrowing Frog, but included additional parts of the development site and adjacent habitat. Surveys were repeated on each subsequent survey night.

Table 16: Targeted surveys

Date	Surveyors	Target species
22 May 2019	David Coombes & Katie Degnian	*Pterostylis ventricosa*
26 September 2019	David Coombes	Square-tailed Kite (Breeding), Little Eagle (Breeding), Grey-headed Flying-fox (Breeding)
13 November 2019	David Coombes	*Calochilus pulchellus, Prasophyllum affine, Acacia bynoeana, Eucalyptus langleyi, Eucalyptus sturgissiana,* Eastern Bristlebird, Eastern Ground Parrot
8 January 2020	David Coombes	*Cryptostylis hunteriana,* Eastern Bristlebird, Eastern Ground Parrot
10 February 2020	David Coombes	Giant Burrowing Frog / Green and Golden Bell Frog
12 February 2020	David Coombes	Giant Burrowing Frog / Green and Golden Bell Frog
14 February 2020	David Coombes	Giant Burrowing Frog / Green and Golden Bell Frog
18 February 2020	David Coombes	Giant Burrowing Frog / Green and Golden Bell Frog
3 March 2020	David Coombes	*Genoplesium baueri,* Eastern Bristlebird, Eastern Ground Parrot

Weather conditions during the targeted surveys are outlined in Table 17. Rainfall data were recorded from BOM weather station 68245 (Callala Treatment Plant) and temperature data were recorded from BOM weather station 68151 (Jervis Bay - Point Perpendicular).

Table 17: Weather conditions

Date	Rainfall (mm)	Minimum temperature ^{0}C	Maximum temperature ^{0}C
22 May 2019	0	16.1	19.4
26 September 2020	0	13.0	19.3
13 November 2019	0	12.2	20.1
8 January 2020	0	19.3	21.1
10 February 2020	119.8 (191.8 previous 7 days)	17.4	24.4
12 February 2020	8.0 (205 previous 7 days)	20.8	23.9
14 February 2020	0.2 (251.4 previous7 days)	20.9	24.1
18 February 2020	23.2 (93.3 previous 7 days)	19.5	28.5
3 March 2020	0	17.2	20.3

Survey effort undertaken at the development is outlined in Table 18.

Table 18: Survey effort

Method	Habitat (ha)	Stratification units	Total effort	Target species
Habitat search	3.9	Trees within the development site and immediate surrounds	1.5 person hour	Square-tailed Kite (Breeding), Grey-headed Flying-fox (Breeding), Little Eagle (Breeding)
Parallel transects	3.4	The development site and adjoining habitat	16 person hours	*Pterostylis ventricosa, Calochilus pulchellus, Prasophyllum affine, Cryptostylis hunteriana, Genoplesium baueri, Acacia bynoeana, Eucalyptus langleyi, Eucalyptus sturgissiana, Eastern Bristlebird, Eastern Ground Parrot*
Call playback	-	The development site and adjoining habitat	1 person hours	Giant Burrowing Frog / Green and Golden Bell Frog
Spotlighting on foot	2.4	The development site and adjoining habitat	4 person hours	Giant Burrowing Frog / Green and Golden Bell Frog

The targeted surveys did not result in the detection of any of the candidate species credit species.

Targeted frog surveys recorded four common species: *Crinia signifera* (Common eastern froglet), *Limnodynastes peronii* (Striped March Frog), *Litoria dentata* (Bleating Tree Frog), and *Litoria peronii* (Peron's Tree Frog).

The threatened *Pteropus poliocephalus* (Grey-headed Flying-fox) was recorded opportunistically during targeted frog surveys, foraging within the development site and throughout the surrounding area.

Three other threatened fauna species were recorded opportunistically within the eastern half of the subject land during other surveys: *Callocephalon fimbriatum* (Gang-gang Cockatoo), *Lophoictinia isura* (Square-tailed Kite) and *Haliaeetus leucogaster* (White-bellied Sea-eagle). No evidence of these species breeding within the subject land was recorded.

The primary habitat types within the development site are slashed heathland, areas of relatively young trees with disturbed understorey, small areas of intact heathy understorey, and two heavily modified drainage lines. No hollow-bearing trees are present within the development site. No Flying-fox roosts or raptor nests are present within the development site or subject land.

The development site is not mapped on the draft Swift Parrot important area map or the Regent Honeyeater or Migratory Shorebirds important area maps.

No species credit species have been included in the assessment. Justification for the exclusion of candidate species credit species is provided in Table 19.

4.4 Use of local data

Use of local data is not proposed for this assessment.

4.5 Expert reports

Expert reports have not been used for this assessment.

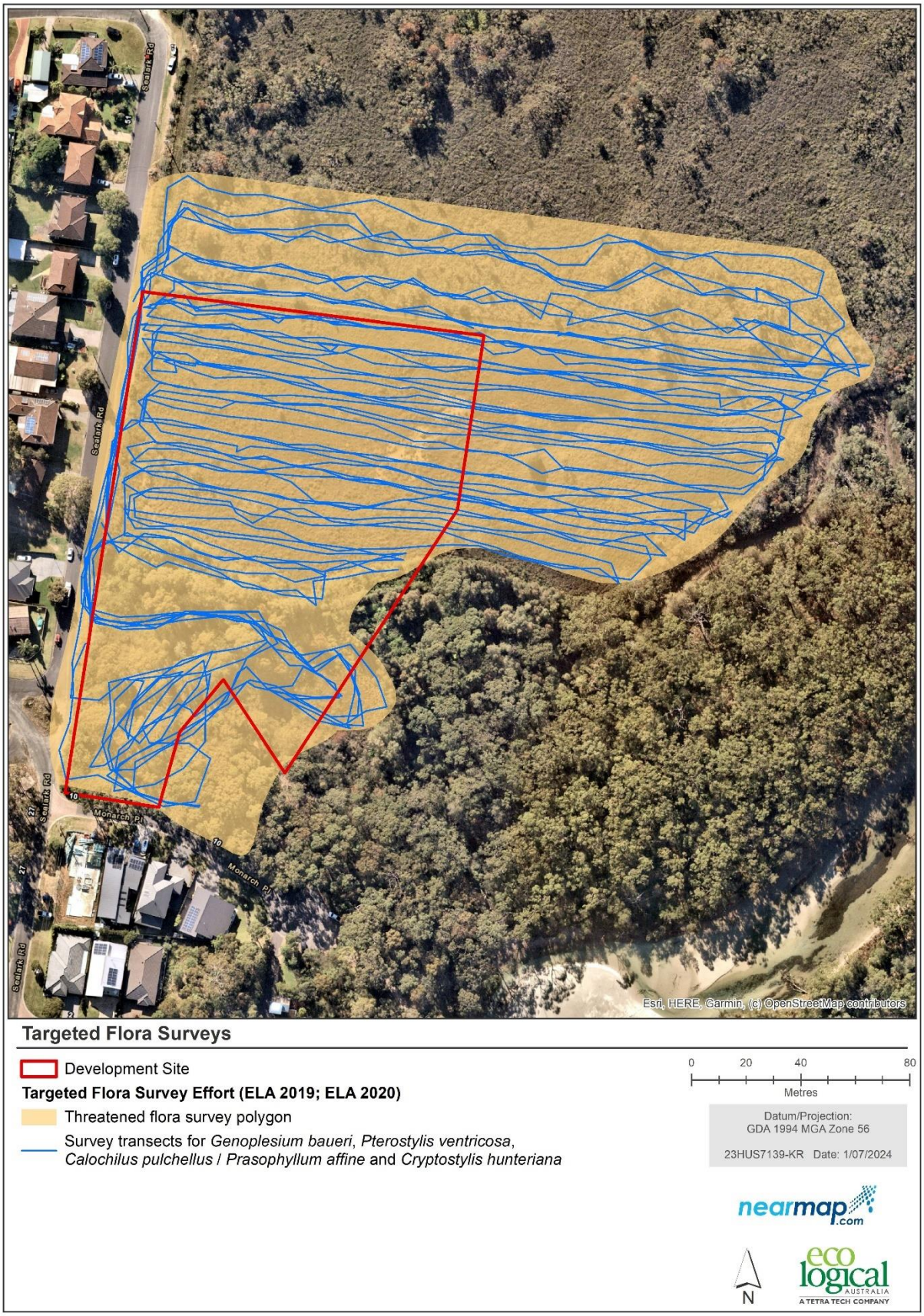

Figure 6: Targeted flora surveys

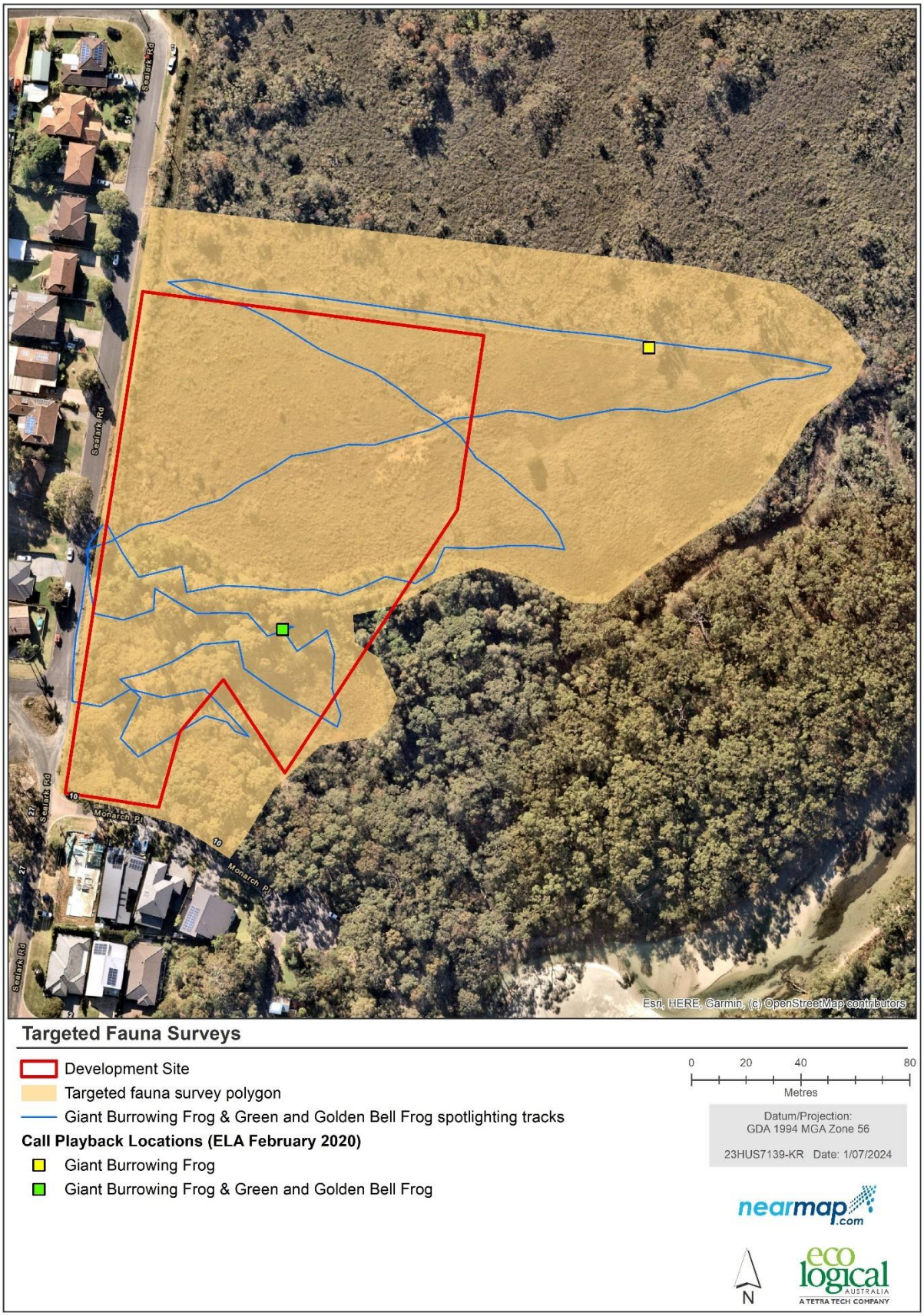

Figure 7: Targeted fauna surveys

Table 19: Justification for exclusion of candidate species credit species

Species	Common Name	NSW listing status	EPBC Listing status	Sensitivity to gain class	Justification for exclusion of species
Acacia bynoeana	Bynoe's Wattle	Endangered	Vulnerable	High	The species was not detected within the development site despite targeted survey and good survey coverage
Anthochaera phrygia (Breeding)	Regent Honeyeater	Critically Endangered	Critically Endangered	High	The streamlined assessment method only requires targeted surveys for species credit species with a very high sensitivity to gain. The species was not detected opportunistically within the development site.
Calochilus pulchellus	Pretty Beard Orchid	Endangered	Not listed	High	The species was not detected within the development site despite targeted survey and good survey coverage
Cercartetus nanus	Eastern Pygmy-possum	Vulnerable	Not Listed	High	The streamlined assessment method only requires targeted surveys for species credit species with a very high sensitivity to gain. The species was not detected opportunistically within the development site.
Chalinolobus dwyeri	Large-eared Pied Bat	Vulnerable	Vulnerable	High	The development site does not meet the habitat requirements for the species. There are no suitable roosting areas within 2 km of the development site.
Cryptostylis hunteriana	Leafless Tongue orchid	Vulnerable	Vulnerable	Moderate	The species was not detected within the development site despite targeted survey and good survey coverage
Eucalyptus langleyi	Albatross Mallee	Vulnerable	Vulnerable	Moderate	The species was not detected within the development site despite targeted survey and good survey coverage
Eucalyptus sturgissiana	Ettrema Mallee	Vulnerable	Not Listed	High	The species was not detected within the development site despite targeted survey and good survey coverage
Genoplesium baueri	Bauer's Midge Orchid	Endangered	Endangered	High	The species was not detected within the development site despite targeted survey and good survey coverage
Heleioporus australiacus	Giant Burrowing Frog	Vulnerable	Vulnerable	Moderate	The species was not detected within the development site despite targeted survey and good survey coverage
Hieraaetus morphnoides (Breeding)	Little Eagle	Vulnerable	Not Listed	Moderate	The streamlined assessment method only requires targeted surveys for species credit species with a very high sensitivity to gain. The species was not detected opportunistically within the development site.

Species	Common Name	NSW listing status	EPBC Listing status	Sensitivity to gain class	Justification for exclusion of species
Lophoictinia isura (Breeding)	Square-tailed Kite	Vulnerable	Not Listed	Moderate	The streamlined assessment method only requires targeted surveys for species credit species with a very high sensitivity to gain. There are no nesting trees within the development site.
Miniopterus orianae oceanensis (Breeding)	Large Bent-wing Bat	Vulnerable	Not Listed	High	The development site does not meet the habitat requirements for the species. here are no suitable caves, culverts or tunnels for breeding within the development site.
Petaurus norfolcensis	Squirrel Glider	Vulnerable	Not Listed	High	The streamlined assessment method only requires targeted surveys for species credit species with a very high sensitivity to gain. The species was not detected opportunistically within the development site.
Potorous tridactylus	Long-nosed Potoroo	Vulnerable	Vulnerable	High	The streamlined assessment method only requires targeted surveys for species credit species with a very high sensitivity to gain. The species was not detected opportunistically within the development site.
Pteropus poliocephalus (Breeding)	Grey-headed Flying-fox	Vulnerable	Vulnerable	High	The development site does not meet the habitat requirements for the species. There are no suitable roosting areas within the development site.
Pterostylis vernalis	Pterostylis vernalis	Critically Endangered	Critically Endangered	Moderate	The development site does not meet the geological or hydrological requirements for the species. There are no sandstone sheets with shallow soils or suitable hydrological conditions.

5. Avoiding and minimising impacts on biodiversity values

5.1 Locating a project to avoid and minimise impacts on vegetation and habitat

The development has been located in a way which avoids and minimises impacts as outlined in Table 20.

Table 20: Locating a project to avoid and minimise impacts on vegetation and habitat

Approach	How addressed	Justification
locating the project in areas where there are no biodiversity values	Not possible.	It is not possible to locate the proposal in areas with no biodiversity values.
locating the project in areas where the native vegetation or threatened species habitat is in the poorest condition	The proposal has been located in the most heavily disturbed parts of the property.	The location of the proposal appropriately avoids areas of intact vegetation and associated habitats.
locating the project in areas that avoid habitat for species and vegetation in high threat categories (e.g. an EEC or CEEC), indicated by the biodiversity risk weighting for a species	The proposal has been located to avoid impacts to EECs and threatened species habitat.	The proposal has been appropriately located to avoid the Bangalay Sand Forest EEC and areas of mature forest.
locating the project such that connectivity enabling movement of species and genetic material between areas of adjacent or nearby habitat is maintained	The proposal has been located in areas which minimise loss of habitat connectivity.	The proposal has been located in the most disturbed parts of the property that are adjacent to existing urban development to the west and south, so will have limited impacts to habitat connectivity. Habitat in the eastern half of the property will maintain connectivity with adjacent areas of habitat.

5.2 Designing a project to avoid and minimise impacts on vegetation and habitat

The development has been designed in a way which avoids and minimises impacts as outlined in Table 21.

Table 21: Designing a project to avoid and minimise impacts on vegetation and habitat

Approach	How addressed	Justification
reducing the clearing footprint of the project	The development footprint has been reduced.	The initial development footprint has been reduced through a more refined proposal design which minimises impacts on native vegetation.
locating ancillary facilities in areas where there are no biodiversity values	The proposed development and any ancillary facilities will be contained within the proposed APZ.	The proposal has been designed to avoid and minimise impacts on biodiversity values.
locating ancillary facilities in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower vegetation integrity score)	The proposed development and any ancillary facilities will be contained within the proposed APZ.	The proposal has been located in the most disturbed parts of the property to minimise impacts.
locating ancillary facilities in areas that avoid habitat for species and vegetation in high threat status categories (e.g. an EEC or CEEC)	The proposal will avoid areas of EEC and important threatened species habitat.	The habitats to be affected are of relatively low quality compared to habitats retained on the property and in the adjacent national park.
providing structures to enable species and genetic material to move across barriers or hostile gaps	Structures to enable species and genetic material to move across barriers or hostile gaps have not been included in the design.	The development will not result in any significant hostile gaps or barriers. The majority of connectivity through the property will be maintained and provision of structures to facilitate movement is not considered necessary.
making provision for the demarcation, ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on the development site.	No vegetation is proposed to be retained within the development site.	All areas beyond the development footprint will retain environmental protection zoning and will potentially be donated to the National Parks Estate.
Efforts to avoid and minimise impacts through design must be documented and justified	See above	See above

5.3 Prescribed biodiversity impacts

The development site does not have any prescribed biodiversity impacts.

6. Assessment of Impacts

6.1 Direct impacts

The direct impacts of the development on:

- native vegetation are outlined in Table 22
- threatened ecological communities are outlined in Table 23
- prescribed biodiversity impacts are outlined in Section 2.2.4.

Table 22: Direct impacts to native vegetation

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Direct impact (ha)
662	Banksia - Red Bloodwood - Hard-leaved Scribbly Gum heathy open woodland on sandstone plateaux, southern Sydney Basin Bioregion	Sydney Montane Heaths	Heathlands	1.37
1082	Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion	South East Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby sub-formation)	0.50

Table 23: Direct impacts on threatened ecological communities

PCT ID	BC Act			EPBC Act		
	Listing status	Name	Direct impact (ha)	Listing status	Name	Direct impact (ha)
662	Not listed	Not listed	-	Not listed	Not listed	-
1082	Not listed	Not listed	-	Not listed	Not listed	-

6.2 Change in vegetation integrity

The change in vegetation integrity as a result of the development is outlined in Table 24.

Table 24: Change in vegetation integrity

Veg Zone	PCT ID	Condition	Area (ha)	Current vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity
1	662	Slashed	1.33	37	0	-37
2	662	Intact	0.04	47.9	0	-47.9
3	662	Disturbed	0.50	71	0	-71

6.3 Indirect impacts

The indirect impacts of the development are outlined in Table 25. Indirect impact zones are shown on Figure 9.

6.4 Prescribed biodiversity impacts

The development does not have any prescribed biodiversity impacts.

6.5 Mitigating and managing impacts

Measures proposed to mitigate and manage impacts at the development site before, during and after construction are outlined in Table 26.

Figure 8: Indirect impact zone

Table 25: Indirect impacts

Indirect impact	Project phase	Nature	Extent	Frequency	Duration	Timing
Sedimentation and contaminated and/or nutrient rich run-off	Construction and post construction	Minor	Minor	During and after any heavy rainfall	Ongoing	Occasional
Noise, dust or light spill	Construction and post construction	Minor	Minor	Intermittently	Ongoing	Intermittently
Inadvertent impacts on adjacent habitat or vegetation	Construction and post construction	Minor	Minor	Not expected but possible	Ongoing	
Transport of weeds and pathogens from the site to adjacent vegetation	Construction and post construction	Minor	Minor	Not expected but possible	Ongoing	Not expected
Vehicle strike	Construction and post construction	Minor	Minor	Occasionally	Ongoing	Occasional
Trampling of threatened flora species	Construction and post construction	Not expected	Not expected	Not expected	Not expected	Not expected
Rubbish dumping	Construction and post construction	Not expected	Minor	Not expected but possible	Ongoing	Ongoing
Wood collection	Construction and post construction	Not expected	Not expected	Not expected	Not expected	Not expected
Bush rock removal and disturbance	Construction and post construction	Not expected	Not expected	Not expected	Not expected	Not expected
Increase in predatory species populations	Construction and post construction	Not expected	Not expected	Not expected	Not expected	Not expected
Increase in pest animal populations	Construction and post construction	Not expected	Not expected	Not expected	Not expected	Not expected
Increased risk of fire	Construction and post construction	Not expected	Not expected	Not expected	Not expected	Not expected
Disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds.	Construction and post construction	Not expected	Not expected	Not expected	Not expected	Not expected

Table 26: Measures proposed to mitigate and manage impacts

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
Displacement of resident fauna	Low	Low	None proposed	N/A	N/A	N/A
timing works to avoid critical life cycle events such as breeding or nursing	Low	Low	None proposed	N/A	N/A	N/A
instigating clearing protocols including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or licensed wildlife handler during clearing events	Low	Low	None proposed	N/A	N/A	N/A
installing artificial habitats for fauna in adjacent retained vegetation and habitat or human made structures to replace the habitat resources lost and encourage animals to move from the impacted site, e.g. nest boxes	Low	Low	None proposed	N/A	N/A	N/A
clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chain-saw, rather than heavy machinery, is preferable in situations where partial clearing is proposed	High	Low	Boundaries of the development site to be clearly delineated with fencing, retained areas marked with “No Go” signage.	Protection of vegetation outside development footprint	During construction	Project Manager, Contractor
sediment barriers or sedimentation ponds to control the quality of water released from the site into the receiving environment	High	Low	Install sediment barriers and erosion control during and post construction to prevent runoff into adjacent creek. Maintain controls throughout construction and undertake weekly inspections. Appropriate stormwater infrastructure should be installed to manage long term impacts on adjacent creek.	Control of erosion, sedimentation and runoff of contaminated substances into adjacent waterways	During and post-construction	Project Manager

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
			Implementation guided by preparation of drainage and stormwater control plan, erosion and sediment control plan.			
noise barriers or daily/seasonal timing of construction and operational activities to reduce impacts of noise	Low	Low	Restrict work to daylight hours	Noise impacts mitigated	During construction	Project Manager
light shields or daily/seasonal timing of construction and operational activities to reduce impacts of light spill	Low	Low	Conduct works during daylight hours. Minimise light spill from street lighting into adjoining vegetation by installing light shields	Mitigate light disturbance to native fauna during and after construction	During construction	Project Manager, Contractor
adaptive dust monitoring programs to control air quality	Low	Low	Dust management controls to be implemented during construction.	Control dust and maintain air quality during construction.	During construction.	Project Manager, Contractor.
temporary fencing to protect significant environmental features such as riparian zones	Medium	Low	Temporary fencing is to be installed around development site	Avoid impacts to retained vegetation and habitats	During construction.	Project Manager, Contractor.
hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	Medium	Low	Construction vehicles entering the site should be free of plant material and soil. Known weed or invasive species should not be planted for landscaping purposes.	Risk of weed spread reduced	During and post construction	Project Manager, Contractor.
staff training and site briefing to communicate environmental features to be protected and measures to be implemented	Medium	Low	The vegetation to be removed should be clearly marked such that those undertaking the proposed clearing do not	Clearing is limited to development footprint.	During construction	Project Manager, Contractor

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
			remove vegetation that should be retained.			
development control measures to regulate activity in vegetation and habitat adjacent to residential development including controls on pet ownership, rubbish disposal, wood collection, fire management and disturbance to nests and other niche habitats	Medium	Low	Land adjacent to development will be subject to high levels of environmental protection through zoning. On site methods will include signage and fencing to deter access and inappropriate activities in adjacent habitats.	Maintain or improve current level of biodiversity value.	Post construction	Landowner
making provision for the ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on or adjacent to the development site	Medium	Low	No vegetation to be retained on site. Measures in place to avoid disturbances to adjacent vegetation. Weed maintenance along interface of development and retained vegetation.	Maintain or improve vegetation integrity adjacent to development	Post construction	Landowner

6.6 Serious and Irreversible Impacts (SAII)

The development does not have any Serious and Irreversible Impacts (SAII).

6.7 Risk assessment

A risk assessment has been undertaken for any residual impacts likely to remain after the mitigation measures (Section 2.2.5) have been applied. Likelihood criteria, consequence criteria and the risk matrix are provided in Table 27, Table 28 and Table 29 respectively.

Table 27: Likelihood criteria

Likelihood criteria	Description
Almost certain (Common)	Will occur, or is of a continuous nature, or the likelihood is unknown. There is likely to be an event at least once a year or greater (up to ten times per year). It often occurs in similar environments. The event is expected to occur in most circumstances.
Likely (Has occurred in recent history)	There is likely to be an event on average every one to five years. Likely to have been a similar incident occurring in similar environments. The event will probably occur in most circumstances.
Possible (Could happen, has occurred in the past, but not common)	The event could occur. There is likely to be an event on average every five to twenty years.
Unlikely (Not likely or uncommon)	The event could occur but is not expected. A rare occurrence (once per one hundred years).
Remote (Rare or practically impossible)	The event may occur only in exceptional circumstances. Very rare occurrence (once per one thousand years). Unlikely that it has occurred elsewhere; and, if it has occurred, it is regarded as unique.

Table 28: Consequence criteria

Consequence category	Description
Critical (Severe, widespread long-term effect)	Destruction of sensitive environmental features. Severe impact on ecosystem. Impacts are irreversible and/or widespread. Regulatory and high-level government intervention/action. Community outrage expected. Prosecution likely.
Major (Wider spread, moderate to long term effect)	Long-term impact of regional significance on sensitive environmental features (e.g. wetlands). Likely to result in regulatory intervention/action. Environmental harm either temporary or permanent, requiring immediate attention. Community outrage possible. Prosecution possible.
Moderate (Localised, short-term to moderate effect)	Short term impact on sensitive environmental features. Triggers regulatory investigation. Significant changes that may be rehabilitated with difficulty. Repeated public concern.
Minor (Localised short-term effect)	Impact on fauna, flora and/or habitat but no negative effects on ecosystem. Easily rehabilitated. Requires immediate regulator notification.
Negligible (Minimal impact or no lasting effect)	Negligible impact on fauna/flora, habitat, aquatic ecosystem or water resources. Impacts are local, temporary and reversible. Incident reporting according to routine protocols.

Table 29: Risk matrix

Consequence	Likelihood				
	Almost certain	Likely	Possible	Unlikely	Remote
Critical	Very High	Very High	High	High	Medium
Major	Very High	High	High	Medium	Medium
Moderate	High	Medium	Medium	Medium	Low
Minor	Medium	Medium	Low	Low	Very Low
Negligible	Medium	Low	Low	Very Low	Very Low

Table 30: Risk assessment

Potential impact	Project phase	Risk (pre-mitigation)	Risk (post mitigation)
Vegetation clearing	Construction / operation	Medium	Low
sedimentation and contaminated and/or nutrient rich run-off	Construction / operation	Medium	Low
noise, dust or light spill	Construction / operation	Medium	Low
inadvertent impacts on adjacent habitat or vegetation	Construction / operation	Medium	Low
transport of weeds and pathogens from the site to adjacent vegetation	Construction / operation	Medium	Low
vehicle strike	Construction / operation	Very Low	Very Low
trampling of threatened flora species	Construction / operation	Very Low	Very Low
rubbish dumping	Construction / operation	Very Low	Very Low
wood collection	Construction / operation	Very Low	Very Low
bush rock removal and disturbance	Construction / operation	Very Low	Very Low
increase in predatory species populations	Construction / operation	Low	Very Low
increase in pest animal populations	Construction / operation	Low	Very Low
increased risk of fire	Construction / operation	Very Low	Very Low
disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds.	Construction / operation	Very Low	Very Low

6.8 Adaptive management strategy

This section is required for those impacts that are infrequent, cumulative or difficult to predict. Impacts associated with the proposed development have been considered extensively and addressed in Section 2.2.5 and further consideration of infrequent, cumulative or difficult to predict impacts is not considered to be necessary.

7. Impact summary

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

7.1 Serious and Irreversible Impacts (SAII)

The development does not have any Serious and Irreversible Impacts (SAII).

7.2 Impacts requiring offsets

The impacts of the development requiring offset for native vegetation are outlined in Table 31 and shown on Figure 9. The development does not require any offsets for threatened species and threatened species habitat as no species credits are required for threatened species with a very high sensitivity to gain.

Table 31: Impacts to native vegetation that require offsets

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Direct impact (ha)
662	Banksia - Red Bloodwood - Hard-leaved Scribbly Gum heathy open woodland on sandstone plateaux, southern Sydney Basin Bioregion	Sydney Montane Heaths	Heathlands	1.87

7.3 Impacts not requiring offsets

The impacts of the development on native vegetation require offsets. The impacts of the development on species credit species habitats do not require offsets.

7.4 Areas not requiring assessment

There are no areas of the development footprint that do not require assessment.

7.5 Credit summary

The number of ecosystem credits required for the development are outlined in Table 32. A biodiversity credit report is included in Appendix E.

Table 32: Ecosystem credits required

PCT ID	PCT Name	Vegetation Formation	Direct impact (ha)	Credits required
662	Banksia - Red Bloodwood - Hard-leaved Scribbly Gum heathy open woodland on sandstone plateaux, southern Sydney Basin Bioregion	Heathlands	1.87	28

Figure 9: Impacts requiring offset

8. Consistency with legislation and policy

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

An assessment of likelihood of occurrence (Appendix C) was made for threatened and migratory species listed under the EPBC Act identified from the database search.

A significance assessment under the EPBC Act was then undertaken on MNES known to occur within the development site or immediate surrounds or with potential to occur there. These MNES were:

- Grey-headed Flying-fox (Vulnerable)
- New Holland Mouse (Vulnerable)
- Black-faced Monarch (Migratory)
- Spectacled Monarch (Migratory)
- Rufous Fantail (Migratory)
- Satin Flycatcher (Migratory)
- Oriental Cuckoo (Migratory)

The outcome of this assessment was that it is highly unlikely that the development would significantly impact on those MNES assessed (Appendix D).

A referral to the Commonwealth under the EPBC Act is not recommended.

8.2 State Environmental Planning Policy (Resilience and Hazards) 2021

The development site does not directly impact on any mapped Coastal Wetland under the SEPP, but parts of the development site occur within the outer portion of the 100 m wide Proximity Area for Coastal Wetlands (Figure 1 and Figure 2). Section 2.8 of the SEPP states that:

Development consent must not be granted to development on land identified as “proximity area for coastal wetlands” or “proximity area for littoral rainforest” on the *Coastal Wetlands and Littoral Rainforests Area Map* unless the consent authority is satisfied that the proposed development will not significantly impact on—

(a) the biophysical, hydrological or ecological integrity of the adjacent coastal wetland or littoral rainforest, or

(b) the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest.

Unfiltered urban stormwater currently drains through the development site and into the Coastal Wetland. While the development may slightly increase the amount of stormwater draining through the site during high rainfall events, it will also include treatment measures to filter the stormwater and control flow velocities, with the aim of improving the current water quality draining from the site. The development will include a range of development controls such as a drainage and stormwater control plan, erosion and sediment control plan, and isa expected to be appropriately designed to maintain or improve drainage impacts on downstream habitats. The development site will maintain a vegetated buffer of more than 50 m to the Coastal Wetland. The vegetated buffer area will be managed to protect

the area's conservation values. Management actions in this area are expected to include native vegetation regeneration, weed control works and sediment control works.

Under these circumstances the development is not likely to significantly impact on the integrity of the nearby Coastal Wetland.

8.3 State Environmental Planning Policy (Biodiversity and conservation) 2021

Chapter 4 (Koala habitat protection) 2021 applies to the development site as Koala use tree species, listed on Schedule 3 of the SEPP, are present, as are a few Bionet Koala records in the locality within the last decade. Koala records are still rare in the locality, with no evidence of a resident or breeding population. Much of the development site is unsuitable or marginal for Koalas due to the lack of trees or limited connectivity to better areas of habitat (forest or woodland) as the development site abuts existing urban development to the west and to the south. Koalas are very unlikely to occur in the development site, which is not considered to be highly suitable or core Koala habitat. Therefore the proposal is not likely to adversely affect Koalas or Koala habitat.

9. Recommendations

To further ameliorate the potential impacts of the proposed development and to improve environmental outcomes, the following recommendations for impact mitigation and amelioration are suggested as modifications to the proposal and/or as conditions of consent.

- The mitigation measures identified in Table 26 should be incorporated into the proposal.

10. Conclusion

Eco Logical Australia Pty Ltd was engaged by the Hare Bay Development Consortium to prepare a BDAR for a Planning Proposed involving rezoning to permit residential development on part of Lot 5 DP 1225356, Sealark Road, Callala Bay.

This report has been prepared to meet the requirements of the BAM 2020 established under Section 6.7 of the BC Act.

This BDAR outlines the measures taken to avoid, minimise and mitigate impacts to the vegetation and habitats present within the development site during the design, construction and operation of the development. The residual unavoidable impacts of the proposed development were calculated in accordance with the BAM by utilising the BAMC. The BAMC calculated that a total of 28 ecosystem credits are required to offset the unavoidable impacts to the vegetation and habitat present within the development site.

SAII values have been considered as part of this assessment. The proposal will not result in any SAII.

Following consideration of the administrative guidelines for determining significance under the EPBC Act, it is concluded that the proposal is unlikely to have a significant impact on MNES or Commonwealth land, and a referral to the Commonwealth Environment Minister is therefore not recommended.

Appendix A Definitions

Terminology	Definition
Biodiversity credit report	The report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site.
BioNet Atlas	The BioNet Atlas (formerly known as the NSW Wildlife Atlas) is the OEH database of flora and fauna records. The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails) and some fish
Broad condition state:	Areas of the same PCT that are in relatively homogenous condition. Broad condition is used for stratifying areas of the same PCT into a vegetation zone for the purpose of determining the vegetation integrity score.
Connectivity	The measure of the degree to which an area(s) of native vegetation is linked with other areas of vegetation.
Credit Calculator	The computer program that provides decision support to assessors and proponents by applying the BAM, and which calculates the number and class of biodiversity credits required to offset the impacts of a development or created at a biodiversity stewardship site.
Development	Has the same meaning as development at section 4 of the EP&A Act, or an activity in Part 5 of the EP&A Act. It also includes development as defined in section 115T of the EP&A Act.
Development footprint	The area of land that is directly impacted on by a proposed development, including access roads, and areas used to store construction materials.
Development site	An area of land that is subject to a proposed development that is under the EP&A Act.
Ecosystem credits	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development site and the gain in biodiversity values at a biodiversity stewardship site.
High threat exotic plant cover	Plant cover composed of vascular plants not native to Australia that if not controlled will invade and outcompete native plant species.
Hollow bearing tree	A living or dead tree that has at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the minimum entrance width is at least 5 cm; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1 m above the ground. Trees must be examined from all angles.
Important wetland	A wetland that is listed in the Directory of Important Wetlands of Australia (DIWA) and SEPP 14 Coastal Wetlands
Linear shaped development	Development that is generally narrow in width and extends across the landscape for a distance greater than 3.5 kilometres in length
Local population	The population that occurs in the study area. In cases where multiple populations occur in the study area or a population occupies part of the study area, impacts on each subpopulation must be assessed separately.
Local wetland	Any wetland that is not identified as an important wetland (refer to definition of Important wetland).
Mitchell landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.

Terminology	Definition
Multiple fragmentation impact development	Developments such as wind farms and coal seam gas extraction that require multiple extraction points (wells) or turbines and a network of associated development including roads, tracks, gathering systems/flow lines, transmission lines
Operational Manual	The Operational Manual published from time to time by OEH, which is a guide to assist assessors when using the BAM
Patch size	An area of intact native vegetation that: a) occurs on the development site or biodiversity stewardship site, and b) includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or ≤30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site or stewardship site.
Proponent	A person who intends to apply for consent to carry out development or for approval for an activity.
Reference sites	The relatively unmodified sites that are assessed to obtain local benchmark information when benchmarks in the Vegetation Benchmarks Database are too broad or otherwise incorrect for the PCT and/or local situation. Benchmarks can also be obtained from published sources.
Regeneration	The proportion of over-storey species characteristic of the PCT that are naturally regenerating and have a diameter at breast height <5 cm within a vegetation zone.
Remaining impact	An impact on biodiversity values after all reasonable measures have been taken to avoid and minimise the impacts of development. Under the BAM, an offset requirement is calculated for the remaining impacts on biodiversity values.
Retirement of credits	The purchase and retirement of biodiversity credits from an already-established biobank site or a biodiversity stewardship site secured by a biodiversity stewardship agreement.
Riparian buffer	Riparian buffers applied to water bodies in accordance with the BAM
Sensitive biodiversity values land map	Development within an area identified on the map requires assessment using the BAM.
Site attributes	The matters assessed to determine vegetation integrity. They include: native plant species richness, native over-storey cover, native mid-storey cover, native ground cover (grasses), native ground cover (shrubs), native ground cover (other), exotic plant cover (as a percentage of total ground and mid-storey cover), number of trees with hollows, proportion of over-storey species occurring as regeneration, and total length of fallen logs.
Site-based development	a development other than a linear shaped development, or a multiple fragmentation impact development
Species credits	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.
Subject land	Is land to which the BAM is applied in Stage 1 to assess the biodiversity values of the land. It includes land that may be a development site, clearing site, proposed for biodiversity certification or land that is proposed for a biodiversity stewardship agreement.
Threatened Biodiversity Data Collection	Part of the BioNet database, published by OEH and accessible from the BioNet website.
Threatened species	Critically Endangered, Endangered or Vulnerable threatened species as defined by Schedule 1 of the BC Act, or any additional threatened species listed under Part 13 of the EPBC Act as Critically Endangered, Endangered or Vulnerable.

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

Appendix B Vegetation plot data

Table 33: Species recorded in the plots and incidentally elsewhere within the subject land

Family	Species	Common Name	Exotic	High Threat Weed	Growth Form Group	Plot 1			Plot 2			Plot 3		
						Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance
Fabaceae (Mimosoideae)	*Acacia longifolia* subsp. *longifolia*	Sydney Golden Wattle			Shrub (SG)				m	1	10	m	1	5
Fabaceae (Mimosoideae)	*Acacia myrtifolia*	Red-stemmed Wattle			Shrub (SG)	g	0.1	10	g	0.1	5	m	0.1	3
Fabaceae (Mimosoideae)	*Acacia suaveolens*	Sweet Wattle			Shrub (SG)	g	0.1	1	m	0.1	1	m	0.2	5
Apiaceae	*Actinotus minor*	Lesser Flannel Flower			Forb (FG)	g	0.2	50						
Casuarinaceae	*Allocasuarina littoralis*	Black She-Oak			Tree (TG)	g	0.1	1	m	2	2	m	0.7	1
Casuarinaceae	*Allocasuarina paludosa*				Shrub (SG)	g	1	50				m	0.3	2
Poaceae	*Andropogon virginicus*	Whisky Grass	*	1		g	0.1	50						
Poaceae	*Anisopogon avenaceus*	Oat Speargrass			Grass & grasslike (GG)	g	1	50						

Family	Species	Common Name	Exotic	High Threat Weed	Growth Form Group	Plot 1			Plot 2			Plot 3		
						Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance
Poaceae	*Aristida vagans*	Threeawn Speargrass			Grass & grasslike (GG)				g	5	500			
Poaceae	*Aristida warburgii*				Grass & grasslike (GG)	g	2	100						
Asparagaceae	*Asparagus aethiopicus*	Asparagus Fern	*	1					g	0.1	3			
Poaceae	*Austrostipa pubescens*				Grass & grasslike (GG)	g	10	500						
Poaceae	*Austrostipa rudis* subsp. *rudis*				Grass & grasslike (GG)				g	1	100			
Poaceae	*Axonopus fissifolius*	Narrow-leafed Carpet Grass	*	1		g	0.1	10	g	5	100			
Proteaceae	*Banksia integrifolia* subsp. *integrifolia*	Coastal Banksia			Tree (TG)							m	2	2
Proteaceae	*Banksia paludosa* subsp. *paludosa*				Shrub (SG)	g	0.1	1						

Family	Species	Common Name	Exotic	High Threat Weed	Growth Form Group	Plot 1			Plot 2			Plot 3		
						Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance
Proteaceae	*Banksia spinulosa*	Hairpin Banksia			Shrub (SG)				g	0.1	3	m	0.3	2
Pittosporaceae	*Billardiera scandens*	Hairy Apple Berry			Other (OG)				m	0.1	1	g	0.1	5
Colchicaceae	*Burchardia umbellata*	Milkmaids			Forb (FG)	g	0.1	20	g	0.1	2	g	0.1	1
Anthericaceae	*Caesia parviflora* var. *parviflora*				Forb (FG)	g	0.1	10						
Myrtaceae	*Callistemon citrinus*	Crimson Bottlebrush			Shrub (SG)	g	0.1	2						
Myrtaceae	*Callistemon linearis*	Narrow-leaved Bottlebrush			Shrub (SG)	g	0.2	2	m	0.1	1	m	30	20
Lauraceae	*Cassytha glabella f. glabella*				Other (OG)	g	1	100				g	0.1	5
Poaceae	*Cenchrus clandestinus*	Kikuyu Grass			Grass & grasslike (GG)				g	1	10			
Apiaceae	*Centella asiatica*	Indian Pennywort			Forb (FG)	g	0.1	5	g	0.1	2			
Polygalaceae	*Comesperma ericinum*	Pyramid Flower			Shrub (SG)	g	0.1	20				g	0.1	5

Family	Species	Common Name	Exotic	High Threat Weed	Growth Form Group	Plot 1			Plot 2			Plot 3		
						Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance
Myrtaceae	*Corymbia gummifera*	Red Bloodwood			Tree (TG)	g	1	20				u	1	1
Orchidaceae	*Cryptostylis subulata*	Large Tongue Orchid			Forb (FG)	g	0.1	3	g	0.1	1	g	0.1	1
Cyperaceae	*Cyathochaeta diandra*				Grass & grasslike (GG)	g	1	50	g	0.2	20			
Poaceae	*Cymbopogon refractus*	Barbed Wire Grass			Grass & grasslike (GG)				g	0.1	1			
Poaceae	*Cynodon dactylon*	Common Couch			Grass & grasslike (GG)				g	1	50			
Goodeniaceae	*Dampiera stricta*				Forb (FG)	g	0.4	100						
Myrtaceae	*Darwinia leptantha*				Shrub (SG)	g	0.5	100				g	0.2	10
Fabaceae (Faboideae)	*Daviesia ulicifolia* subsp. *ulicifolia*				Shrub (SG)				g	0.1	2			
Phormiaceae	*Dianella caerulea* var. *caerulea*				Forb (FG)	g	0.2	20	g	0.2	20			

Family	Species	Common Name	Exotic	High Threat Weed	Growth Form Group	Plot 1			Plot 2			Plot 3		
						Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance
Convolvulaceae	*Dichondra repens*	Kidney Weed			Forb (FG)				g	0.1	1			
Orchidaceae	*Diuris spp.*				Forb (FG)	g	0.1	1						
Droseraceae	*Drosera spatulata*				Forb (FG)	g	0.2	100						
Poaceae	*Echinopogon caespitosus* var. *caespitosus*	Tufted Hedgehog Grass			Grass & grasslike (GG)				g	0.1	10			
Poaceae	*Entolasia marginata*	Bordered Panic			Grass & grasslike (GG)				g	1	100	g	1	100
Poaceae	*Entolasia stricta*	Wiry Panic			Grass & grasslike (GG)	g	15	1000	g	2	100	g	5	500
Ericaceae	*Epacris microphylla*	Coral Heath			Shrub (SG)	g	0.2	20				g	1	20
Poaceae	*Eragrostis brownii*	Brown's Lovegrass			Grass & grasslike (GG)	g	0.3	100	g	0.1	1			
Myrtaceae	*Eucalyptus botryoides*	Bangalay			Tree (TG)							u	10	4
Myrtaceae	*Eucalyptus sclerophylla*	Hard-leaved Scribbly Gum			Tree (TG)				u	50	4	u	2	2

Family	Species	Common Name	Exotic	High Threat Weed	Growth Form Group	Plot 1			Plot 2			Plot 3		
						Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance
Orobanchaceae	*Euphrasia* sp.				Forb (FG)	g	0.3	100						
Cyperaceae	*Gahnia clarkei*	Tall Saw-sedge			Grass & grasslike (GG)							g	0.3	1
Fabaceae (Faboideae)	*Glycine clandestina*	Twining glycine			Other (OG)				g	0.1	5			
Fabaceae (Faboideae)	*Gompholobium glabratum*	Dainty Wedge Pea			Shrub (SG)	g	0.2	100				g	0.1	10
Fabaceae (Faboideae)	*Gompholobium grandiflorum*	Large Wedge Pea			Shrub (SG)	g	0.1	5						
Haloragaceae	*Gonocarpus tetragynus*	Poverty Raspwort			Forb (FG)	g	0.1	2				g	0.1	10
Goodeniaceae	*Goodenia bellidifolia* subsp. *bellidifolia*				Forb (FG)	g	0.3	100						
Haemodoraceae	*Haemodorum corymbosum*				Forb (FG)	g	0.2	50				g	0.1	1
Proteaceae	*Hakea dactyloides*	Finger Hakea			Shrub (SG)	g	1	20						
Proteaceae	*Hakea teretifolia* subsp. *hirsuta*				Shrub (SG)	m	2	20	m	0.1	1	m	5	20

Family	Species	Common Name	Exotic	High Threat Weed	Growth Form Group	Plot 1			Plot 2			Plot 3		
						Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance
Fabaceae (Faboideae)	*Hardenbergia violacea*	False Sarsaparilla			Other (OG)				g	0.1	1			
Dilleniaceae	*Hibbertia riparia*				Shrub (SG)	g	0.1	20				g	0.1	10
Violaceae	*Hybanthus vernonii* subsp. *vernonii*				Forb (FG)	g	0.1	5						
Clusiaceae	*Hypericum gramineum*	Small St John's Wort			Forb (FG)	g	0.1	5	g	0.1	5			
Asteraceae	*Hypochaeris radicata*	Catsear	*			g	0.1	10	g	0.1	10			
Poaceae	*Imperata cylindrica*	Blady Grass			Grass & grasslike (GG)							g	0.3	100
Proteaceae	*Isopogon anemonifolius*	Broad-leaf Drumsticks			Shrub (SG)	g	0.1	5						
Myrtaceae	*Kunzea ambigua*	Tick Bush			Shrub (SG)	g	1	20	m	10	20	m	50	50
Asteraceae	*Lagenophora stipitata*	Common Lagenophora			Forb (FG)				g	0.1	1			
Proteaceae	*Lambertia formosa*	Mountain Devil			Shrub (SG)	g	0.1	1						

Family	Species	Common Name	Exotic	High Threat Weed	Growth Form Group	Plot 1			Plot 2			Plot 3		
						Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance
Cyperaceae	*Lepidosperma laterale*	Variable Sword-sedge			Grass & grasslike (GG)				g	0.1	5	g	0.1	5
Cyperaceae	*Lepidosperma neesii*				Grass & grasslike (GG)	g	10	1000						
Myrtaceae	*Leptospermum continentale*	Prickly Teatree			Shrub (SG)	g	1	100	m	0.1	5	m	0.3	10
Myrtaceae	*Leptospermum polygalifolium* subsp. *polygalifolium*				Shrub (SG)				m	0.1	1	m	1	10
Myrtaceae	*Leptospermum trinervium*	Slender Tea-tree			Shrub (SG)	g	1	20				m	1	10
Restionaceae	*Lepyrodia anarthria*				Grass & grasslike (GG)							g	10	500
Lindsaeaceae	*Lindsaea linearis*	Screw Fern			Fern (EG)	g	1	500	g	0.1	5			
Ericaceae	*Lissanthe strigosa* subsp. *subulata*	Peach Heath			Shrub (SG)	g	0.1	1						

Family	Species	Common Name	Exotic	High Threat Weed	Growth Form Group	Plot 1			Plot 2			Plot 3		
						Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance
Arecaceae	*Livistona australis*	Cabbage Palm			Other (OG)				g	0.1	1			
Lobeliaceae	*Lobelia purpurascens*	Whiteroot			Forb (FG)				g	0.1	5			
Lomandraceae	*Lomandra cylindrica*				Grass & grasslike (GG)	g	5	500						
Lomandraceae	*Lomandra glauca*	Pale Mat-rush			Grass & grasslike (GG)	g	0.1	50						
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush			Grass & grasslike (GG)							g	0.1	1
Lomandraceae	*Lomandra obliqua*				Grass & grasslike (GG)	g	1	100						
Proteaceae	*Lomatia ilicifolia*	Holly Lomatia			Shrub (SG)							g	0.1	1
Myrtaceae	*Melaleuca thymifolia*	Thyme Honey-myrtle			Shrub (SG)	g	0.3	10	g	1	20	m	10	100
Euphorbiaceae	*Micrantheum ericoides*				Shrub (SG)	g	1	100	g	2	100	g	5	500
Poaceae	*Microlaena stipoides* var. *stipoides*	Weeping Grass			Grass & grasslike (GG)	g	0.3	100	g	3	1000			

Family	Species	Common Name	Exotic	High Threat Weed	Growth Form Group	Plot 1			Plot 2			Plot 3		
						Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance
Fabaceae (Faboideae)	*Mirbelia rubiifolia*	Heathy Mirbelia			Shrub (SG)	g	0.2	20						
Loganiaceae	*Mitrasacme polymorpha*				Forb (FG)	g	0.1	10						
Rubiaceae	*Opercularia diphylla*	Stinkweed			Forb (FG)				g	0.1	1			
Oxalidaceae	*Oxalis chnoodes*				Forb (FG)				g	0.1	5			
Poaceae	*Paspalidium distans*				Grass & grasslike (GG)				g	0.5	100	g	0.5	100
Poaceae	*Paspalum dilatatum*	Paspalum	*	1					g	0.1	10			
Iridaceae	*Patersonia sericea*	Silky Purple-Flag			Forb (FG)	g	1	100						
Thymelaeaceae	*Pimelea linifolia* subsp. *linifolia*				Shrub (SG)	g	0.1	20				m	0.1	10
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum			Shrub (SG)				m	0.2	10	g	0.3	100
Plantaginaceae	*Plantago lanceolata*	Lamb's Tongues	*						g	0.1	1			
Dennstaedtiaceae	*Pteridium esculentum*	Bracken			Fern (EG)				g	6	100	g	0.1	5

Family	Species	Common Name	Exotic	High Threat Weed	Growth Form Group	Plot 1			Plot 2			Plot 3		
						Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance
Cyperaceae	*Ptilothrix deusta*				Grass & grasslike (GG)	g	40	2000				g	30	2000
Fabaceae (Faboideae)	*Pultenaea rosmarinifolia*				Shrub (SG)	g	1	100				g	0.5	50
Fabaceae (Faboideae)	*Pultenaea tuberculata*				Shrub (SG)	g	0.3	50						
Poaceae	*Rytidosperma tenuius*	A Wallaby Grass			Grass & grasslike (GG)				g	0.1	5			
Schizaeaceae	*Schizaea dichotoma*	Branched Comb Fern			Fern (EG)	g	0.1	5						
Cyperaceae	*Schoenus brevifolius*				Grass & grasslike (GG)	g	5	1000	g	0.1	10	g	5	100
Selaginellaceae	*Selaginella uliginosa*	Swamp Selaginella			Fern (EG)				g	0.1	1	g	0.1	20
Fabaceae (Caesalpinioideae)	*Senna pendula* var. *glabrata*		*	1					m	0.1	1			
Malvaceae	*Sida rhombifolia*	Paddy's Lucerne	*						g	0.1	1			
Fabaceae (Faboideae)	*Sphaerolobium vimineum*				Shrub (SG)	g	0.1	10						

Family	Species	Common Name	Exotic	High Threat Weed	Growth Form Group	Plot 1			Plot 2			Plot 3		
						Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance	Stratum & Layer	Cover	Abundance
Fabaceae (Faboideae)	*Tephrosia grandiflora*		*						m	0.1	1			
Phormiaceae	*Thelionema umbellatum*				Forb (FG)	g	0.1	20						
Anthericaceae	*Tricoryne elatior*	Yellow Autumn-lily			Forb (FG)	g	0.1	5						
Xanthorrhoeaceae	*Xanthorrhoea* sp.				Other (OG)	g	0.2	10						
Apiaceae	*Xanthosia tridentata*	Rock Xanthosia			Forb (FG)	g	0.2	100						

Table 34: Plot location data

Plot no.	PCT	Condition	Easting	Northing	Bearing
1	662	Slashed	292570	6125391	90
2	1082	Disturbed	292562	6125332	60
3	662	Intact	292586	6125291	270

Table 35: Vegetation integrity data (composition)

Composition (number of species)						
Plot	Tree	Shrub	Grass	Forb	Fern	Other
1	2	27	13	20	2	2
2	2	13	15	10	3	4
3	5	22	10	4	2	2

Table 36: Vegetation integrity data (Structure)

Structure (Total cover)						
Plot	Tree	Shrub	Grass	Forb	Fern	Other
1	1.1	12.1	90.7	4.1	1.1	1.2
2	52	15	15.3	1.1	6.2	0.4
3	15.7	106.7	52.3	0.4	0.2	0.2

Table 37: Vegetation integrity data (Function)

Function																				
Plot	Large Trees	Hollow trees	Litter Cover	Length Fallen Logs	Tree 5-9	Stem	Tree 10-1 9	Stem	Tree 20-29	Stem	Tree 30-49	Stem	Tree 50-79	Stem	Tree Regen	High Threat Weed Cover
1	0	0	29	0	0		0		0		0		0		1	0.2
2	1	0	69	5	1		1		1		1		1		1	5.3
3	0	0	64	0	1		1		0		0		0		1	0

Appendix C Likelihood Assessment

An assessment of likelihood of occurrence was made for threatened and migratory species listed under the EPBC Act identified from the database search. Fish, shorebirds, marine and wetland species have generally been omitted from the results due to lack of suitable habitat. Five terms for the likelihood of occurrence of species are used in this report. This assessment was based on database or other records, presence or absence of suitable habitat, features of the proposal site, results of the site inspection and professional judgement. The terms for likelihood of occurrence are defined below:

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

A significance assessment was conducted for threatened or migratory species that were recorded, or have potential to occur, within the development site.

- "CE" = Critically Endangered
- "E" = Endangered
- "V" = Vulnerable
- "M" = Migratory
- "Ma" = Marine

Flora Species	BC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Astrotricha crassifolia Thick-leaf Star-hair	V	V	Occurs near Patonga (Gosford LGA), and in Royal NP and on the Woronora Plateau (Sutherland and Campbelltown LGAs). There is also a record from near Glen Davis (Lithgow LGA). Occurs in dry sclerophyll woodland on sandstone. Flowers in spring. Resprouts from root suckers or basal stem buds after fire. Seed storage and dispersal ecology and germination requirements are unknown. There is not enough data to rank sensitivity to either frequent or infrequent fires.	Unlikely: No local records or typical habitat, not recorded during surveys.
Banksia vincentia	CE	CE	Currently only one population is known, consisting of 14 individuals from a site Vincentia, NSW. This population occurs on coastal sands over clay on sandstone in low sedgeland and grassy heath, sometimes amongst emergent mallee Eucalyptus gummifera and other tall shrubs of Banksia and Hakea.	Unlikely: No local records, not recorded during surveys.
Caladenia tessellata Thick-lipped Spider Orchid	E	V	Grassy sclerophyll woodland on clay loam or sandy soils, or low woodland with stony soil. Currently known from two disjunct areas; one population near Braidwood on the Southern Tablelands and three populations in the Wyong area on the Central Coast.	Unlikely: No local records or typical habitat, not recorded during surveys.
Cryptostylis hunteriana Leafless Tongue Orchid	V	V	This terrestrial orchid is known from swamp-heath and open forest on sandy soils in coastal districts. The larger populations typically occur in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black She-oak (*Allocasuarina littoralis*); where it appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (*C. subulata*) and the Tartan Tongue Orchid (*C. erecta*).	Unlikely: Not recorded during targeted surveys.
Cynanchum elegans White-flowered Wax Plant	E	E	Found on the edges of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; Coastal Tea-tree *Leptospermum laevigatum* – Coastal Banksia *Banksia integrifolia* subsp. *integrifolia* coastal scrub; Forest Red Gum *Eucalyptus tereticornis* aligned open forest and woodland; Spotted Gum Corymbia *maculata* aligned open forest and woodland; and Bracelet Honeymyrtle *Melaleuca armillaris* scrub to open scrub. Distribution is to eastern NSW, from Brunswick Heads on the north coast to Gerroa in the Illawarra region.	Unlikely: No local records or typical habitat, not recorded during surveys.

Flora Species	BC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Genoplesium baueri Bauer's Midge Orchid	E	E	Dry sclerophyll forest and moss gardens over sandstone. Has been recorded from locations between the Shoalhaven area and Pittwater and may occur as far north as Port Stephens. In the Shoalhaven most commonly found in Red Bloodwood, Hard-leaved Stringybark and Silvertop Ash dominated vegetation.	Unlikely: Not recorded during targeted surveys.
Genoplesium vernale East Lynne Midge-orchid	V	V	Found in dry sclerophyll woodland and forest in areas with good drainage and shallow, low fertility soils, often occurring near crests of ridges and on low rises where ground cover is more open and sedge dominated rather than shrubby. Known from only a narrow belt, approximately 12 km wide, on the south coast of NSW between Moruya and 24 km north of Ulladulla.	Unlikely: No local records or typical habitat.
Haloragis exalata subsp. exalata Wingless Raspwort	V	V	Occurs in protected and shaded damp situations in riparian habitats. Disjunct distribution in the Central Coast, South Coast and North Western Slopes botanical subdivisions of NSW.	Unlikely: No local records or typical habitat, not recorded during surveys.
Melaleuca biconvexa Biconvex Paperbark	V	V	This species may occur in dense stands forming a narrow strip adjacent to watercourses, in association with other *Melaleuca* species or as an understorey species in wet forest. Biconvex Paperbark is only found in NSW, with scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north.	Unlikely: No local records, not recorded during targeted surveys.
Persicaria elatior Tall Knotweed	V	V	Recorded in south-eastern NSW at Mt Dromedary (an old record), Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. The species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	Unlikely: No local records or typical habitat, not recorded during surveys.
Pimelea spicata Spiked Rice-flower	E	E	Occurs in well-structured clay soils. *Eucalyptus moluccana* (Grey Box) communities and in areas of ironbark on the Cumberland Plain. Coast Banksia open woodland or coastal grassland in the Illawarra. Known from two disjunct areas; the Cumberland Plain (Marayong and Prospect Reservoir south to Narellan and Douglas Park) and the Illawarra (Landsdowne to Shellharbour to northern Kiama).	Unlikely: No local records or typical habitat, not recorded during surveys.

Flora Species	BC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Prasophyllum affine Jervis Bay Leek Orchid	E	E	Occurs on poorly drained grey clay soils that support low heathland and sedgeland communities. Currently only found in three areas: Kinghorne Point, Wowly Gully near the town of Callala Bay, and near the township of Vincentia in Jervis Bay.	Unlikely: Not recorded during targeted surveys.
Prostanthera densa Villous Mintbush	V	V	Found in sclerophyll forest and shrubland on coastal headlands and near coastal ranges, primarily on sandstone, and rocky slopes near the sea. Recorded in three distinct areas: the Currarong area in Jervis Bay, Royal National Park (Marley), Cronulla, Helensburgh and Port Stephens (Nelson Bay).	Unlikely: No typical habitat, not recorded during surveys.
Pterostylis gibbosa Illawarra Greenhood	E	E	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).	Unlikely: No local records or typical habitat, beyond known range.
Pterostylis vernalis Halbury Greenhood	CE	CE	Known from five populations located to the west and south-west of Nowra. *Pterostylis vernalis* grows in open sites around moss gardens in shallow soil over sandstone sheets or moss gardens on heavy laterite associated soils, in heath and dry heathy forest/woodland. Patchy distribution as the species is often restricted to sections of rock shelf where there is only a thin layer of soil over the rock shelf and where these sites are subject to particular hydrological conditions. Habitat generally contains moss gardens on various substrates.	No: No local records or suitable habitat, beyond known range.
Rhizanthella slateri Eastern Underground Orchid	V	E	Species has poorly understood habitat requirements but is known to occur in sclerophyll forest. It is a highly cryptic species, growing predominantly underground, with only the flowers visible above ground. Potentially occurs from south-east Queensland to south-east NSW. In NSW it is currently only known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra.	Unlikely: No local records or typical habitat.

Flora Species	BC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Syzygium paniculatum Magenta Lilly Pilly	E	V	Found in subtropical and littoral rainforest on gravels, sands, silts and clays. Occurs only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest.	Unlikely: No local records or typical habitat, not recorded during surveys.
Thesium australe Austral Toadflax	V	V	*Thesium australe* is widespread throughout the eastern third of NSW but most common on the North Western Slopes, Northern Tablelands and North Coast. Occurs in grassland or grassy woodland. Often found in damp sites in association with Kangaroo Grass (*Themeda triandra*) (DECC 2007). The preferred soil type is a fertile loam derived from basalt or argillaceous sediment (e.g. shale) although it occasionally occurs on metasediments and granite.	Unlikely: No local records or typical habitat, not recorded during surveys.
Xerochrysum palustre Swamp Everlasting	-	V	Within NSW the species is restricted to Kosciuszko National Park and the eastern escarpment south of Badja where it is found growing in in swamps and bogs which are often dominated by heaths. It also occurs at the edges of bog margins on peaty soils with a cover of shrubs or grasses.	No: No local records or typical habitat.

Fauna Species	BC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
AMPHIBIA				
Heleioporus australiacus Giant Burrowing Frog	V	V	Heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Breeding habitat of this species is generally soaks or pools within first or second order streams. They are also commonly recorded from 'hanging swamp' seepage lines and where small pools form from the collected water. Spends more than 95% of its time in non-breeding habitat in areas up to 300 m from breeding sites. Whilst in non-breeding habitat it burrows below the soil surface or in the leaf litter. South eastern NSW and Victoria, in two distinct populations: a northern population in the sandstone geology of the Sydney Basin as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria.	Unlikely: No local records or typical habitat, not recorded during surveys.

Fauna Species	BC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Litoria aurea Green and Golden Bell Frog	E	V	This species has been observed utilising a variety of natural and man-made waterbodies (Pyke & White 1996) such as coastal swamps, marshes, dune swales, lagoons, lakes, other estuary wetlands, riverine floodplain wetlands and billabongs, stormwater detention basins, farm dams, bunded areas, drains, ditches and any other structure capable of storing water (DEC 2007). Preferable habitat for this species includes attributes such as shallow, still or slow flowing, permanent and/or widely fluctuating water bodies that are unpolluted and without heavy shading (DEC 2007). Large permanent swamps and ponds exhibiting well-established fringing vegetation (especially bulrushes–Typha sp. and spikerushes–Eleocharis sp.) adjacent to open grassland areas for foraging are preferable (Ehmann 1997; Robinson 1994).	Unlikely: Limited habitat, not recorded during surveys.
AVES				
Anthochaera phrygia Regent Honeyeater	E	CE	The Regent Honeyeater is associated with temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts, and riparian forests of River Oak (*Casuarina cunninghamiana*) containing mistletoe infestations. Areas containing Swamp Mahogany (*Eucalyptus robusta*) in coastal areas have been observed to be utilised, as well as Spotted Gum in the Hunter Valley. The Regent Honeyeater primarily feeds on nectar from box and ironbark eucalypts and occasionally from banksias and mistletoes. As such it is reliant on locally abundant nectar sources with different flowering times to provide reliable supply of nectar.	Unlikely: Only small amount of marginal foraging habitat present.
Botaurus poiciloptilus Australasian Bittern	E	E	Occurs in terrestrial wetlands with tall dense vegetation, such as reedbeds, swamps, streams, and estuaries. Favours permanent shallow waters, edges of pools and waterways, with tall, dense vegetation such as sedges, rushes and reeds on muddy or peaty substrate.	Unlikely: No suitable habitat in development site.
Callocephalon fimbriatum Gang-gang Cockatoo	V	E	This species is generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In cooler months of the year, the species may move to lower altitudes in drier more open Eucalypt forests and woodlands, and often found in urban areas. The species forages mainly on range of seeds from trees and shrubs and requires medium to tree large hollows for breeding.	Potential: Generic foraging habitat present but no suitable tree hollows for breeding in development site.

Fauna Species	BC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo	V	V	The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. An isolated population exists on Kangaroo Island, South Australia. Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of She-oak occur, particularly Black She-oak (*Allocasuarina littoralis*) in the Shoalhaven area. Requires large tree hollows for breeding.	Potential: Small amount of foraging habitat present but no evidence of feeding. No suitable tree hollows for breeding in development site.
Dasyornis brachypterus Eastern Bristlebird	E	E	This species habitat is characterised by dense, low vegetation including heath and open woodland with a heathy understorey. Age of habitat since fires (fire-age) is of paramount importance to this species; Illawarra and southern populations reach maximum densities in habitat that has not been burnt for at least 15 years.	Unlikely: Most habitat in development area unsuitable. Not recorded during surveys.
Falco hypoleucos Grey Falcon	E	V	The Grey Falcon occurs sparsely in NSW, throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. The species is generally restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions but can occur in open woodlands near the coast and in wetlands. It preys predominantly on birds, especially parrots and pigeons, using high-speed chases and stoops.	Unlikely: No local records and beyond typical distribution.
Grantiella picta Painted Honeyeater	V	V	Found in Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus *Amyema.* Nest from spring to autumn in a small, delicate nest hanging within the outer canopy of drooping eucalypts, she-oak, paperbark or mistletoe branches. Widely distributed in NSW, predominantly on the inland side of the Great Dividing Range but avoiding arid areas.	Unlikely: No local records and beyond typical distribution.
Haliaeetus leucogaster White-bellied Sea Eagle	V	Ma	Freshwater swamps, rivers, lakes, reservoirs, billabongs, saltmarsh and sewage ponds and coastal waters. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, forest and urban areas. Distributed along the coastline of mainland Australia and Tasmania, extending inland along some of the larger waterways, especially in eastern Australia.	Unlikely: Known from adjacent coastal areas but no suitable foraging, nesting or sheltering habitat in development site.

Fauna Species	BC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Hirundapus caudacutus White-throated Needletail	-	V/M	Forages aerially over a variety of habitats usually over coastal and mountain areas. Has been observed roosting in dense foliage of canopy trees, and may seek refuge in tree hollows in inclement weather.	Possible: May overfly development site, but no suitable habitat present.
Lathamus discolor Swift Parrot	E	CE	Box-ironbark forests and woodlands. Favoured feed trees include winter flowering species such as Eucalyptus robusta (Swamp Mahogany), Corymbia maculata (Spotted Gum), C. gummifera (Red Bloodwood), E. sideroxylon (Mugga Ironbark), and E. albens (White Box). Commonly used lerp infested trees include E. microcarpa (Inland Grey Box), E. moluccana (Grey Box) and E. pilularis (Blackbutt). Migrates from Tasmania to mainland in Autumn-Winter. In NSW, the species mostly occurs on the coast and south west slopes.	Unlikely: Only small amount of marginal foraging habitat present.
Neophema chrysogaster Orange-bellied Parrot	E	CE	Winter habitat is mostly within 3 km of the coast in sheltered bays, lagoons, estuaries, coastal dunes and saltmarshes. Also small islands and peninsulas, saltworks, golf courses, low samphire herbland and taller coastal shrubland. Feeds in sedgelands, coastal saltmarshes and dunes, or beach-front vegetation. Breeds in Tasmania and migrates in autumn to spend the winter on the mainland coast.	Unlikely: No local records or typical habitat.
Pandion cristatus Eastern Osprey	V	Ma	Common around the northern NSW coast, and uncommon to rare from coast further south. Some records from inland areas. Feed on fish over clear, open water. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	Unlikely: No suitable habitat present.
Rostratula australis Australian Painted Snipe	E	E	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. Roosts during the day in dense vegetation and forages at night on mud-flats and in shallow water.	Unlikely: No suitable habitat present.
MAMMALIA				
Chalinolobus dwyeri	V	V	Wet and dry sclerophyll forests, Cyprus Pine dominated forest, woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country. Roosts in caves, rock overhangings and disused mine shafts, and is associated with rock outcrops and cliff faces. Recorded from Rockhampton in Qld south to Ulladulla in NSW. Largest concentrations of	Unlikely: No local records or nearby roosting habitat.

Fauna Species	BC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Large-eared Pied Bat			populations occur in the sandstone escarpments of the Sydney basin and the NSW north-west slopes.	
Dasyurus maculatus Spotted-tailed Quoll	V	E	The Spotted-tailed Quoll inhabits a range of forest communities including wet and dry sclerophyll forests, coastal heathlands and rainforests, more frequently recorded near the ecotones of closed and open forest. This species requires habitat features such as maternal den sites, an abundance of food (birds and small mammals) and large areas of relatively intact vegetation to forage in. Maternal den sites are logs with cryptic entrances; rock outcrops; windrows; and burrows. Home ranges measured in hundreds to thousands of hectares.	Unlikely: No local records, no preferred resources in development site.
Isoodon obesulus obesulus Southern Brown Bandicoot	E	E	Heath or open forest with a heathy understorey on sandy or friable soils. Found in south-eastern NSW, east of the Great Dividing Range south from the Hawkesbury River, but limited to a small number of sites.	Unlikely: No recent local records.
Petauroides volans Greater Glider	E	E	The Greater Glider is an arboreal nocturnal marsupial, largely restricted to eucalypt forests and woodlands. It is primarily folivorous, with a diet mostly comprising eucalypt leaves and occasionally flowers. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. May favour forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species.	Unlikely: No typical habitat present in development site.
Phascolarctos cinereus Koala	E	E	Eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range and sparse populations on the south coast and southern tablelands. In the Shoalhaven, species is now generally associated with western escarpment areas, not the coastal plain, where the species is not regularly recorded. There is no evidence of a breeding population in the locality.	Unlikely: No regular local records or evidence of a resident or breeding population, marginal habitat in development site and restricted connectivity.
Potorous tridactylus Long-nosed Potoroo	V	V	Occurs in coastal heaths and dry and wet sclerophyll forests. Potoroos are nocturnal and crepuscular and rarely seen. They spend the day in "squats" in dense vegetation and their regular movement through the vegetation creates characteristic runways. In NSW it is generally restricted to coastal heaths and forests east of the Great Dividing Range, with an annual rainfall exceeding 760 mm.	Unlikely: No local records, marginal habitat in development site.

Fauna Species	BC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Pseudomys novaehollandiae New Holland Mouse	-	V	A small burrowing native rodent with a fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Inhabits open heathlands, open woodlands with a heathland understorey and vegetated sand dunes. A social animal, living predominantly in burrows shared with other individuals. The home range of the New Holland Mouse ranges from 0.44 ha to 1.4 ha and the species peaks in abundance during early to mid-stages of vegetation succession typically induced by fire.	Possible: No local records but potentially suitable habitat present.
Pteropus poliocephalus Grey-headed Flying-fox	V	V	The Grey-headed Flying-fox inhabits a wide range of habitats including rainforest, mangroves, and paperbark forests. Camps are often located in gullies, typically close to water, in vegetation with a dense canopy.	Likely: Small amount of generic foraging habitat present, no roosting habitat.
REPTILIA				
Hoplocephalus bungaroides Broad-headed Snake	E	V	Dry and wet sclerophyll forests, riverine forests, coastal heath swamps, rocky outcrops, heaths, grassy woodlands. Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Largely confined to Triassic and Permian sandstones within the coast and ranges in an area within approximately 250 km of Sydney.	No: No suitable habitat.
Migratory terrestrial species				
Cuculus optatus Oriental Cuckoo	-	M	Summer migrant to Australia. Non-breeding habitat: monsoonal rainforest, vine thickets, wet sclerophyll forest or open Casuarina, Acacia or Eucalyptus woodland. Northern and eastern Australia, records mainly coastal in NSW south to Bega area but rare south of Sydney.	Possible: Small amount of generic foraging habitat present, no breeding habitat.
Hirundapus caudacutus White-throated Needletail	-	V/M	Forages aerially over a variety of habitats usually over coastal and mountain areas, most likely with a preference for wooded areas (Marchant & Higgins 1993; Simpson & Day 2010). Has been observed roosting in dense foliage of canopy trees, and may seek refuge in tree hollows in inclement weather (Marchant & Higgins 1993).	Possible: May overfly site, but no suitable resources present.

Fauna Species	BC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Monarcha melanopsis Black-faced Monarch	-	M	Australian resident, moving south when non-breeding. Rainforest and eucalypt forests, coastal scrubs, and moist forest in drainage lines; may be in woodland when migrating. Insectivorous, often feeding in tangled understory.	Possible: Small amount of marginal foraging habitat present, unlikely breeding habitat.
Monarcha trivirgatus Spectacled Monarch	-	M	Occurs in dense vegetation, mainly in rainforest but also in moist or wet sclerophyll forest and occasionally in other densely vegetated habitats such as mangroves, drier forest, woodlands, parks and gardens. In NSW occurs on the coast and eastern slopes of Great Dividing Range, less frequent south of Sydney.	Possible: Small amount of marginal foraging habitat present, unlikely breeding habitat.
Myiagra cyanoleuca Satin Flycatcher	-	M	Occurs in Eucalypt-dominated forests, especially near wetlands, watercourses, and heavily-vegetated gullies. Prefers tall, wetter, denser forest but not rainforest; often at high elevations (Simpson & Day 2010). Spring breeding migrant in southern Australia. During migration, may use coastal forests, woodlands, mangroves and open forests. In NSW, widespread on and east of the Great Divide and sparsely scattered on the western slopes, with very occasional records on the western plains.	Possible: Small amount of marginal foraging habitat present, unlikely breeding habitat.
Rhipidura rufifrons Rufous Fantail	-	M	The Rufous Fantail is a summer breeding migrant to southeastern Australia (Morcombe 2004). The Rufous Fantail is found in rainforest, dense wet eucalypt and monsoon forests, paperbark and mangrove swamps and riverside vegetation (Morcombe 2004). Open country and drier open forest may be used by the Rufous Fantail during migration (Morcombe 2004). Wet sclerophyll forests, subtropical and temperate rainforests. Sometimes drier sclerophyll forests and woodlands. Coastal and near coastal districts of northern and eastern Australia, including on and east of the Great Divide in NSW.	Possible: Small amount of marginal foraging habitat present, unlikely breeding habitat.

Appendix D EPBC Act Significant Impact Criteria

The EPBC Act Administrative Guidelines on Significance set out 'Significant Impact Criteria' that are to be used to assist in determining whether a proposed action is likely to have a significant impact on matters of national environmental significance. Matters listed under the EPBC Act as being of national environmental significance include:

- Listed threatened species and ecological communities;
- Listed migratory species;
- Wetlands of International Importance;
- The Commonwealth marine environment;
- World Heritage properties;
- National Heritage places;
- Nuclear actions; and
- Great Barrier Reef.

Specific 'Significant Impact Criteria' are provided for each matter of national environmental significance except for threatened species and ecological communities in which case separate criteria are provided for species listed as endangered and vulnerable under the EPBC Act.

The following Commonwealth listed species have potential to occur within the development site:

- Gang-gang Cockatoo (Endangered)
- Glossy Black-cockatoo (Vulnerable)
- Grey-headed Flying-fox (Vulnerable)
- New Holland Mouse (Vulnerable)
- Black-faced Monarch (Migratory)
- Spectacled Monarch (Migratory)
- Rufous Fantail (Migratory)
- Satin Flycatcher (Migratory)
- Oriental Cuckoo (Migratory)

The relevant Significant Impact Criteria have been applied to determine the significance of impacts associated with the proposal.

Matters to be considered	Impact
Any environmental impact on a World Heritage Property or National Heritage Places	No. The proposed action does not impact on a World Heritage Property or a National Heritage Place.
any environmental impact on Wetlands of International Importance	No. The proposal will not affect any part of Ramsar wetland.

Matters to be considered	Impact
any impact on Commonwealth Listed Critically Endangered or Endangered Species;	Yes. The development site provides marginal foraging habitat for the endangered Gang-gang Cockatoo. The significant impact criteria for endangered species are discussed below. ***a. lead to a long-term decrease in the size of a population*** The proposal would remove approximately 0.62 ha of generic foraging habitat for the Gang-gang Cockatoo. No potential breeding habitat occurs in the subject land. Around 3 ha of habitat would be retained within Lot 5, and extensive areas of suitable habitat occur in the vicinity. The proposal will not lead to a long-term decrease in the size of a population of Gang-gang Cockatoo. ***b. reduce the area of occupancy of the species*** The proposal will not reduce the area of occupancy of the species as only a relatively small (0.62 ha) area of marginal foraging habitat would be removed. ***c. fragment an existing population into two or more populations*** The proposal will not fragment an existing population of the Gang-gang Cockatoo as only a relatively small area of marginal habitat will be removed from the edge of an established residential area. No barriers to the movement of the species will be created by the proposal. ***d. adversely affect habitat critical to the survival of a species*** No habitat critical to the survival of the species will be adversely affected by the proposal. No potential breeding habitat or important foraging habitat will be affected. High quality habitat for the species will be retained the surrounding areas. ***e. disrupt the breeding cycle of a population*** The proposal will not affect the breeding cycle as no potential nesting trees occur in or adjacent to the development site, and no other important areas of habitat will be removed. ***f. modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*** The relatively small amount marginal foraging habitat on the urban fringe to be removed would not adversely impact the Gang-gang Cockatoo such that this species is likely to decline. Areas of higher quality habitat on Lot 5 would be retained and extensive areas of habitat for the species occur in the locality. ***g. result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat*** The development is not likely to result in the establishment of harmful invasive species. Methods to effectively control weeds and domestic cats and dogs in retained habitats are expected to be implemented as part of the development. ***h. introduce disease that may cause the species to decline*** The proposal is not expected to introduce any diseases. ***j. interfere with the recovery of the species.*** The relatively small proportion of marginal habitat to be affected will not interfere with the recovery of the species. Extensive areas of suitable habitat are available throughout the locality and up to 3 ha will be retained on Lot 5.

Matters to be considered	Impact
Any impact on Commonwealth Listed vulnerable Species;	Yes. The development site provides suitable or potential habitat for the vulnerable species: • Glossy Black-cockatoo • Grey-headed Flying-Fox • New Holland Mouse The significant impact criteria for vulnerable species are discussed below: ***a. lead to a long-term decrease in the size of an important population of a species*** The development site does not contain any nesting habitat (hollow-bearing trees) for the Glossy Black-cockatoo. Small and scattered patches of suitable foraging habitat (cone-bearing *Allocasuarina littoralis* trees) are present within the development site, but no evidence of foraging was found during the survey period. The majority of suitable habitat on Lot 5 would be retained. The proposal will not lead to a long-term decrease in the size of an important population of the Glossy Black-cockatoo. The development site contains suitable foraging habitat for the Grey-headed Flying-Fox in the form of flowering trees. No roosts occur in the area, so sheltering and breeding habitat are not affected. The proposal is highly unlikely to impact adversely on the Grey-headed Flying-Fox as it will affect only a relatively small amount of seasonally available foraging habitat. Extensive areas of foraging habitat occur in the locality, including around 3 ha of intact forest retained on Lot 5. Under these circumstances, it is considered highly unlikely that the proposal will lead to a long-term decrease in the size of an important population of the Grey-headed Flying-Fox. The development site provides marginal habitat for the New Holland Mouse, which occurs in open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes. Spatial and temporal distribution is patchy within this habitat, with peaks in abundance during early to mid stages of vegetation succession typically induced by fire. The disturbed habitats of the development site are not considered optimal for the species, and are likely to contain introduced predators given the close proximity to residential areas. The species is not known to occur in the vicinity of the Lot 5, but has been recorded from a few sites in the Jervis Bay area. The removal of disturbed habitat for the development is not likely to affect an important population of the species, particularly considering the extent of suitable habitat in adjacent Jervis Bay National Park. Under these circumstances, it is considered highly unlikely that the proposal will lead to a long-term decrease in the size of an important population of the New Holland Mouse. ***b. reduce the area of occupancy of an important population*** The development site contains small patches of suitable foraging habitat for the Glossy Black-cockatoo which would be removed. Around 3 ha of suitable habitat would be retained within the subject land, and extensive areas of habitat occur in the surrounding landscape. The proposal will not substantially reduce the area of occupancy of an important population. The proposal is highly unlikely to impact adversely on the Grey-headed Flying-Fox at as it will affect only a relatively small amount (around 0.62 ha) of disturbed foraging habitat in the context of that available within the locality. While the development site may be utilised on occasion by this species, it does not contain an important population. As such it will not reduce the area of occupancy of an important population. Up to 1.8 ha of marginal habitat for the New Holland Mouse would be removed, with extensive areas of more suitable habitat occurring the in Jervis Bay region. The habitats affected are not likely to be significant for an important population of the species. Therefore the development is not likely to reduce the area of occupancy of an important population.

Matters to be considered	Impact
	c. fragment an existing important population into two or more populations The proposal will only remove a relatively small area of habitat on the edge of an existing urban area and will not fragment existing populations of the Glossy Black-cockatoo, Grey-headed Flying-Fox or New Holland Mouse. ***d. adversely affect habitat critical to the survival of a species*** No habitat within the development site is considered to be critical to the survival of the Glossy Black-cockatoo, Grey-headed Flying-Fox or New Holland Mouse. Only small areas of foraging habitat will be removed for the Glossy Black-cockatoo and Grey-headed Flying-Fox. The relatively small area of disturbed potential habitat for the New Holland Mouse is not critical to the survival of the species considering the extent of better-quality habitat available in the vicinity. ***e. disrupt the breeding cycle of an important population*** The proposal will not affect any breeding habitat for the Glossy Black-cockatoo or Grey-headed Flying-Fox, and is highly unlikely to disrupt the breeding cycle of an important population of New Holland Mouse. ***f. modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*** The relatively small amount disturbed habitat on the urban fringe to be removed would not adversely impact the Glossy Black-cockatoo, Grey-headed Flying-Fox or New Holland Mouse such that these species are likely to decline. ***g. result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat*** The development is not likely to result in the establishment of harmful invasive species. Methods to effectively control weeds and domestic cats and dogs in retained habitats are expected to be implemented as part of the development. ***h. introduce disease that may cause the species to decline*** The proposal is not expected to introduce any diseases. ***j. interferes substantially with the recovery of the species.*** The relatively small proportion of habitat to be affected will not interfere substantially with the recovery of these species.
Any environmental impact on Commonwealth Listed Migratory Species;	The development site contains marginal habitat for five Commonwealth Listed Migratory Terrestrial Species: the Black-faced Monarch, Spectacled Monarch, Rufous Fantail, Satin Flycatcher and Oriental Cuckoo. It is possible that these species may occasionally forage in more densely vegetated parts of the development site. However, habitat in the development site is mostly unsuitable or marginal for these species. No breeding habitat is likely to be present for these species in the development site. Retained forest to the east of the development site provides more suitable habitat for these species. This forest habitat will not be directly impacted or substantially disturbed by the proposal. The development site does not support an ecologically significant portion of a population of any migratory species, and the proposal is too small to have any substantially effect on these species or their habitat.
Does any part of the Proposal involve a Nuclear Action;	No. The project does not include a Nuclear Action.
Any environmental impact on a Commonwealth Marine Area;	No. There are no Commonwealth Marine Areas within the study area.

Matters to be considered	Impact
In addition, any direct or indirect impact on Commonwealth lands	No. The project does not directly or indirectly affect Commonwealth land.

Appendix E Biodiversity credit report

NSW GOVERNMENT

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id 00019026/BAAS17061/20/00021678	Proposal Name Sealark Development	BAM data last updated * 14/03/2024
Assessor Name	Assessor Number	BAM Data version * 67
Proponent Names	Report Created 05/07/2024	BAM Case Status Finalised
Assessment Revision 2	Assessment Type Part 4 Developments (Small Area)	Date Finalised 05/07/2024
BOS entry trigger BOS Threshold: Area clearing threshold	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.	

Potential Serious and Irreversible Impacts

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

Species
Nil

Additional Information for Approval

BAM Biodiversity Credit Report (Like for like)

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
662-Banksia - Red Bloodwood - Hard-leaved Scribbly Gum heathy open woodland on sandstone plateaux, southern Sydney Basin Bioregion	Not a TEC	1.9	0	28	28

NSW GOVERNMENT

BAM Biodiversity Credit Report (Like for like)

662-Banksia - Red Bloodwood - Hard-leaved Scribbly Gum heathy open woodland on sandstone plateaux, southern Sydney Basin Bioregion

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Sydney Montane Heaths This includes PCT's: 636, 662, 708, 709, 814, 816, 844, 1665, 3690, 3857, 3858, 3859, 3860, 3861, 3862, 3863, 3865, 3866	Sydney Montane Heaths <50%	662_Slashed	No	18	Jervis, Bateman, Ettrema, Illawarra and Jervis. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Sydney Montane Heaths This includes PCT's: 636, 662, 708, 709, 814, 816, 844, 1665, 3690, 3857, 3858, 3859, 3860, 3861, 3862, 3863, 3865, 3866	Sydney Montane Heaths <50%	662_Disturbed	No	9	Jervis, Bateman, Ettrema, Illawarra and Jervis. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Sydney Montane Heaths This includes PCT's: 636, 662, 708, 709, 814, 816, 844, 1665, 3690, 3857, 3858, 3859, 3860, 3861, 3862, 3863, 3865, 3866	Sydney Montane Heaths <50%	662_Intact	No	1	Jervis, Bateman, Ettrema, Illawarra and Jervis. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

662-Banksia - Red Bloodwood - Hard-leaved Scribbly Gum heathy open woodland on sandstone plateaux, southern Sydney Basin Bioregion

Species Credit Summary

No Species Credit Data

Credit Retirement Options

Like-for-like credit retirement options

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