# BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

RE-ZONING PROPOSAL

LOT 522 DP 1077907, LOT 3 DP 101694 CENTRAL COAST HIGHWAY & LOTS 1-4 DP 1000694 BAKALI ROAD, FORRESTERS BEACH

Prepared by:

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| | |
|---|---|
| **Site Details:** | Lot 522 DP 1077907, Lot 3 DP 101694 Central Coast Highway & Lots 1-4 DP 1000694 Bakali Road, Forresters Beach. |
| **Prepared by:** | ***Alex Fraser B.Sc. (Hons)***<br>***BAAS18156 Accredited Assessor***<br>***Fraser Ecological Pty Ltd***<br>**A**BN – 797 637 40114<br>M: 0423238193 Email: alohafraser@gmail.com |
| **Prepared for:** | John Klumper (owner) c/o Progressive Property Solutions (applicant) |
| **Reference No.** | BDAR Bakali Rd Forresters Beach_Rev B |
| **Document Status & Date:** | 14th March 2022 |

# Abbreviations

| Abbreviation | Meaning |
|---|---|
| AOBV | Areas of Outstanding Biodiversity Value |
| AWTS | Aerated Wastewater Treatment System |
| APZ | Asset Protection Zone (bushfire protetction) |
| BAM | Biodiversity Assessment Methodology |
| BAM - C | Biodiversity Assessment Method Calculator |
| BC Act | *Biodiversity Conservation Act 2016* |
| BDAR | Biodiversity Development Assessment Report |
| BOS | Biodiversity Offsets Scheme |
| DA | Development Application |
| DCP | Development Control Plan |
| DEC | Department of Environment and Conservation |
| DECC | Department of Environment and Climate Change |
| DPIE | NSW Department of Planning, Industry and Environment (formerly OEH) |
| DEE | Department of Environment and Energy |
| EEC | Endangered Ecological Community |
| EP&A Act | *Environmental Planning and Assessment Act 1979* |
| EPBC Act | *Environment Protection and Biodiversity Conservation Act 1999* |
| Ha | Hectare |
| HTE | High Threat Exotic |
| LEP | Local Environmental Plan |
| LGA | Local Government Area |
| MU | Map Unit |
| NPWS | NSW National Parks and Wildlife Service |
| OEH | Office of Environment and Heritage |
| PCT | Native vegetation classification system approved by NSW Plant Community Type Control Panel |
| PFC | Projected Foliage Cover |
| SAII | Serious and Irreversible Impacts |
| SEPP | State Environmental Planning Policy |
| TBDC | Threatened Biodiversity Data Collection |
| TEC | Threatened Ecological Community |

# GLOSSARY

| Acronym/ Term | Definition |
|---|---|
| Accredited Biodiversity Assessor | Individuals accredited by the Department of Planning, Industry and Environment (DPIE) to apply the Biodiversity Assessment Method. |
| 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. |
| Biodiversity Offsets | Management actions that are undertaken to achieve a gain in biodiversity values on areas of land in order to compensate for losses to biodiversity from the impacts of subdivision. |
| Biodiversity values | The composition, structure and function of ecosystems, including threatened species, populations and ecological communities, and their habitats. |
| Ecosystem credit | The class of biodiversity credit that relates to a vegetation type and the threatened species that are reliably predicted by that vegetation type (as a habitat surrogate). |
| Locality | A 1500m buffer area surrounding the Subject Land |
| Native Vegetation | Means any of the following types of plants native to New South Wales: (a) trees (including any sapling or shrub), (b) understorey plants, (c) groundcover (being any type of herbaceous vegetation), (d) plants occurring in a wetland. |
| Proposal | The development, subdivision, activity or action proposed. |
| SAII entity | Species and ecological communities that are likely to be the subject of serious and irreversible impacts (SAIIs) |
| Species credit | The class of biodiversity credit that relate to 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 | The footprint of the proposed development |
| Subject Properties | Lot 522 DP 1077907, Lot 3 DP 101694 Central Coast Highway & Lots 1-4 DP 1000694 Bakali Road, Forresters Beach. |

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# CERTIFICATION

I, Alex Fraser of Fraser Ecological, hereby state that this Biodiversity Assessment Report (BDAR) for a residential development at Bakali Road Forresters Beach, has been prepared in accordance with the Biodiversity Assessment Method (BAM) 2020 established under the NSW *Biodiversity Conservation Act 2016* as part of the development assessment process.

Fieldwork (BAM plot vegetation surveys for BAM-C) for this project was undertaken by Alex Fraser. The BDAR report writing was undertaken by Alex Fraser.

We have relied upon the previous fauna surveys and other field data undertaken within the Ecological Assessment Report prepared by Conachers Environmental consulting company dated January 2022. We have subcontracted Corey Mead (Treehouse Ecology) to undertake recent targeted amphibian surveys and Wizard Tech GIS services to undertake PCT area calculation mapping and shapefile production (CVs attached in Appendix C).

**My qualifications are:**
Alex Fraser, Principal Ecologist (Fraser Ecological)
B.A Applied Science (Hons)
Certificate 3 Natural Area Restoration
Certificate 3 Vertebrate Animal Pest Control
BAM Accredited Assessor (BAAS 18156)
Member of the Ecological Consultants Association of NSW

**Conflicts of Interest**
The Accredited Assessors have signed an agreement to abide by the Accredited BAM Assessor Code of Conduct. The authors declare in accordance with the Assessors Code of Conduct that no actual, perceived, or potential conflicts of interest exist.

**Disclaimer**
This document may only be used for the purposes for which it was commissioned. Fraser Ecological accepts no liability or responsibility in respect of any use or reliance upon this report by any third party. Unauthorised use of this report in any form is prohibited.

Alex Fraser
B.A Applied Science (Hons), Cert 3 Natural Area Restoration
BAAS18156 Accredited Assessor
Principal Ecologist, Fraser Ecological

# EXECUTIVE SUMMARY

Fraser Ecological has been contracted to prepare a Biodiversity Development Assessment Report (BDAR) for the proposed rezoning ('the Proposal' or 'the Project') at Lot 522 DP 1077907, Lot 3 DP 101694 Central Coast Highway & Lots 1-4 DP 1000694 Bakali Road, Forresters Beach, in the Central Coast Council local government area.

This BDAR has been prepared in accordance with the Office of Environment and Heritage (OEH) (2020) Biodiversity Assessment Method (BAM). The Biodiversity Offset Scheme (BOS) applies to the Proposal, as it would require clearing of native vegetation that is mapped on the Biodiversity Values Map (BVM). We have relied upon the previous targeted fauna surveys undertaken within the Ecological Assessment Report prepared by Conachers Consulting dated January 2022. Targeted amphibian surveys (Feb/ March) were undertaken as part of Council's request for further information.

The planning proposal assessed in this report is the rezoning of the subject site to enable future residential development. The planning proposal will result in the retention and management of an area of native vegetation within the north-west and southern section of the site under an environmental conservation zoning.

The future land-uses within the site will incorporate both development areas (residential lots) and conservation areas of maintained, managed and improved vegetation.

This BDAR has been prepared by Fraser Ecological to identify the potential impacts of the proposal on biodiversity values within the Subject Land. This assessment has been completed in accordance with the Biodiversity Assessment Method and includes:

- Detailed literature review and desktop assessment to describe the environment and landscape features of the Subject Land and to identify the suite of threatened biota potentially affected by the proposal;
- Site assessment to describe the biodiversity values of the Subject Land and to determine the likelihood of threatened biota and their habitats occurring within the proposed activity footprint;
- Targeted field surveys for candidate Species Credit species identified by the Biodiversity Assessment Method Calculator as likely to occur within the native vegetation of the Subject Land in accordance with the relevant NSW threatened species survey guidelines;
- Discussion and recommendation of measures to avoid and minimise impacts to biodiversity values;
- Discussion on impacts to biodiversity values including Serious and Irreversible Impacts; and
- Biodiversity Assessment Method calculations using the Biodiversity Assessment Method Calculator to quantify the level of biodiversity impacts of the proposal following the implementation of measures to avoid and minimise impacts, and to determine the biodiversity credits that will need to be purchased and retired to offset the residual impacts of the proposal.

Two (2) Plant Community Types (PCTs) were identified as being potentially impacted in the Subject Site, being:

- PCT 1728 Swamp Oak – Prickly Paperbark- Tall Sedge Swamp Forest on Coastal Lowlands of the Central Coast and Lower North Coast (0.6ha) – poor condition (Vegetation integrity Score = 38.5)

- PCT 1722 Swamp Mahogany- Paperbarks- Harsh Ground Fern swamp forest of the Central Coast (0.6ha) – poor condition (Vegetation integrity Score = 38)

Therefore, it has been assumed a total 1.2 ha of tree canopy is proposed for removal or modification as an overly precautionary measure for the BAM-C credit calculation.

Areas mapped as Swift Parrot Important Habitat Areas are present within the northwest areas of the site. These areas will be included in either an E2-Environmental Protection or RE1-Public Recreation zone. No development or native vegetation clearing is proposed in the land mapped as Swift Parrot Important Habitat Areas.

The extent of the proposed open space (RE1) land covers approximately 4,000 square metres and was determined by Council and the proponent during ongoing discussions. This area will be classified as Community Land and subject to a VPA and the preparation of a Plan of Management as required for public reserves under the provisions of the Local Government Act.

The following Ecosystem Credits are required to be retired to offset the residual biodiversity impacts of the proposal:

- 11 credits of PCT 1728 Swamp Oak – Prickly Paperbark- Tall Sedge Swamp Forest on Coastal Lowlands of the Central Coast and Lower North Coast

- 12 credits of PCT 1722 Swamp Mahogany- Paperbarks- Harsh Ground Fern swamp forest of the Central Coast

The following Species Credits are required to be retired to offset the residual biodiversity impacts of the proposal:

- 23 credits for Southern Myotis (*Myotis macropus*) a microchiropteran bat was recorded foraging by Conachers Environmental

The exclusion of development and ongoing management of the areas included in the Swift Parrot Important Habitat Area are part of the direct impact avoidance measures proposed for the rezoning outcomes.

Fauna habitat of significant value was not recorded within the proposed development impact area. No threatened amphibians were recorded after the recent targeted surveys. No hollow-bearing trees are proposed for removal (they will be retained and protected within the proposed E2 and RE1 zoned land.

Ecological features that can be further protected by way of s.88b instrument as part of a future subdivision development application includes patches of mapped Swift Parrot Important Habitat trees along the western boundary and the man-made dam within in Lot 3 DP 10000694 (Stage 4). This has been shown in an updated map (Figure 23).

# 1 INTRODUCTION

Fraser Ecological has been engaged by John Klumper (owner) c/o Progressive Property Solutions, to provide a Biodiversity Assessment Report (BDAR) for the proposed development at Lot 522 DP 1077907, Lot 3 DP 101694 Central Coast Highway & Lots 1-4 DP 1000694 Bakali Road, Forresters Beach located in the Central Coast Council LGA as part of the rezoning development assessment process.

See Figures 1 - 4 for the location & aerial maps showing property boundaries.

The subject site itself is on the Office of Environment and Heritage (OEH)'s Sensitive Biodiversity Values Map (https://www.environment.nsw.gov.au/biodiversity/biodiversity-values-map.htm) and is trigger this requirement for this assessment (Figure 7).

## 1.1 Description of the site and proposal

The total property size subject to the re-zoning proposal is approximately 9.8ha. The existing land uses are rural residential and vacant land (Figure 5).

The area of proposed rezoning also includes the 30 small lots (most with dwellings) located along the western side of the Central Coast Highway. These lots are currently zoned as 'Deferred Matter' and Council have requested that they be included in the planning components of the rezoning proposal (Figure 6).

The planning proposal assessed in this report is the rezoning of the subject site to enable future residential development. The planning proposal will result in the retention and management of an area of native vegetation within the north-west and southern section of the site under an environmental conservation zoning.

The future land-uses within the site will incorporate both development areas (residential lots) and conservation areas of maintained, managed and improved vegetation. These outcomes are summarised below.

**Development Outcomes**

- Residential lots, residential dwellings, roads, drainage infrastructure and urban services.
- Residential developments are planned to be undertaken in separate stages (Stages 1-6).
- Staged development will be dependent on the timing by each land holder and future approvals by Council.
- Stages 1, 2, 3 will cover Lot 522, Lot 3 DP 101649 and Lot 4.
- Stage 4 will cover Lot 3 DP 1000694.
- Stage 5 will cover Lot 2.
- Stage 6 will cover Lot 1.
- The timing of development stages will be subject to future planning considerations by Council (eg Development Control Plans, Voluntary Planning Agreements etc).

Ongoing consideration of the avoid and minimise direct impacts on biodiversity has been undertaken during the initial planning and ecological assessment by both Council and the proponent.

The current areas considered for avoidance of direct impacts through vegetation clearing include:

- All areas of mapped Swift Parrot Important Habitat Map.
- Areas of Swamp Sclerophyll Forest Endangered Ecological Community in the north-west and southern parts of the site.
- Areas of Swamp Oak Floodplain Forest Endangered Community in the north-west part of the site.
- The constructed dam and adjoining fringe areas in the northern part of Lot 3 DP 1000694.

**Draft DCP controls that have been considered for the proposal include:**

a) The Endangered Ecological Community on the western part of Lot 522 DP 1077907 is the subject of a Vegetation Management Plan under a Planning Agreement relating to the land. This area, zoned C2 Environmental Conservation, is to be placed under an 88B restriction as to its use and enforced under Section 88E of the Conveyancing Act, 1919.

b) The Endangered Ecological Community on the northern part of Lot 3 DP 1000694 is to be placed under an 88B restriction as to its use and managed under a Vegetation Management Plan that would be enforced under Section 88E of the Conveyancing Act 1919.

c) A Vegetation Management Plan is to be prepared for the wetland at the northern part of Lot 3 DP 1000694 and has been submitted with the development application for subdivision of that property.

d) The Vegetation Management Plan for Lot 3 DP 1000694 addresses:

- ownership of the land;
- regeneration of native vegetation;
- threats and ameliorative measures for the protection of threatened species;
- how the area will be managed from the impact of weeds and other edge effects;
- native plantings including compensatory planting;
- schedule of works and responsibilities.

e) The implementation of the Vegetation Management Plan on Lot 3 DP 1000694 will be undertaken by a qualified person.

f) The Vegetation Management Plan on Lot 3 DP 1000694 will be in force from the date of the registration of the subdivision.

g) Weeds are to be continually managed on the C2 Environmental Conservation zoned land of Lot 522 DP 1077907 and Lot 3 DP 1000694 such that the ecological integrity

of the Endangered Ecological Community is maintained. No solid fencing will be erected along the boundary between these two properties.

h) All Asset Protection Zones are to be located outside the area which will be subject to the Vegetation Management Plan and the 88B restriction as to its use.

i) Removal of any asbestos containing material by an accredited hygienist is required prior to registration of any future subdivision and the affected area must be validated following the removal.

j) No services are to be constructed through the land zoned C2 Environmental Conservation.

k) Any drainage works required as part of the subdivision will be constructed on land to be zoned C2 Environmental Conservation and are to have no adverse impact on the wetland vegetation.

The extent of the six (6) stages of the proposed re-zoning have been provided within Appendix A of this report.

## 1.2 Aim and Approach

This report has been prepared in accordance with the BAM (DPIE 2020a) and aims to:

- Describe the biodiversity values present within the Subject Land, including the extent of native vegetation, vegetation integrity and the presence of Threatened Ecological Communities (TECs);
- Determine the habitat suitability within the Subject Land for candidate threatened species;
- Prepare an impact assessment in regard to potential impacts of the proposed development on biodiversity values, including potential prescribed impacts and SAIIs within the Subject Land;
- Discuss and recommend efforts to avoid and minimise impacts on biodiversity values; and
- Calculate the biodiversity credits (i.e., ecosystem credits and species credits) that measure potential impacts of the subdivision on biodiversity values. This calculation will inform the decision maker as to the number and class of offset credits required to be purchased and retired as a result of the proposed subdivision.

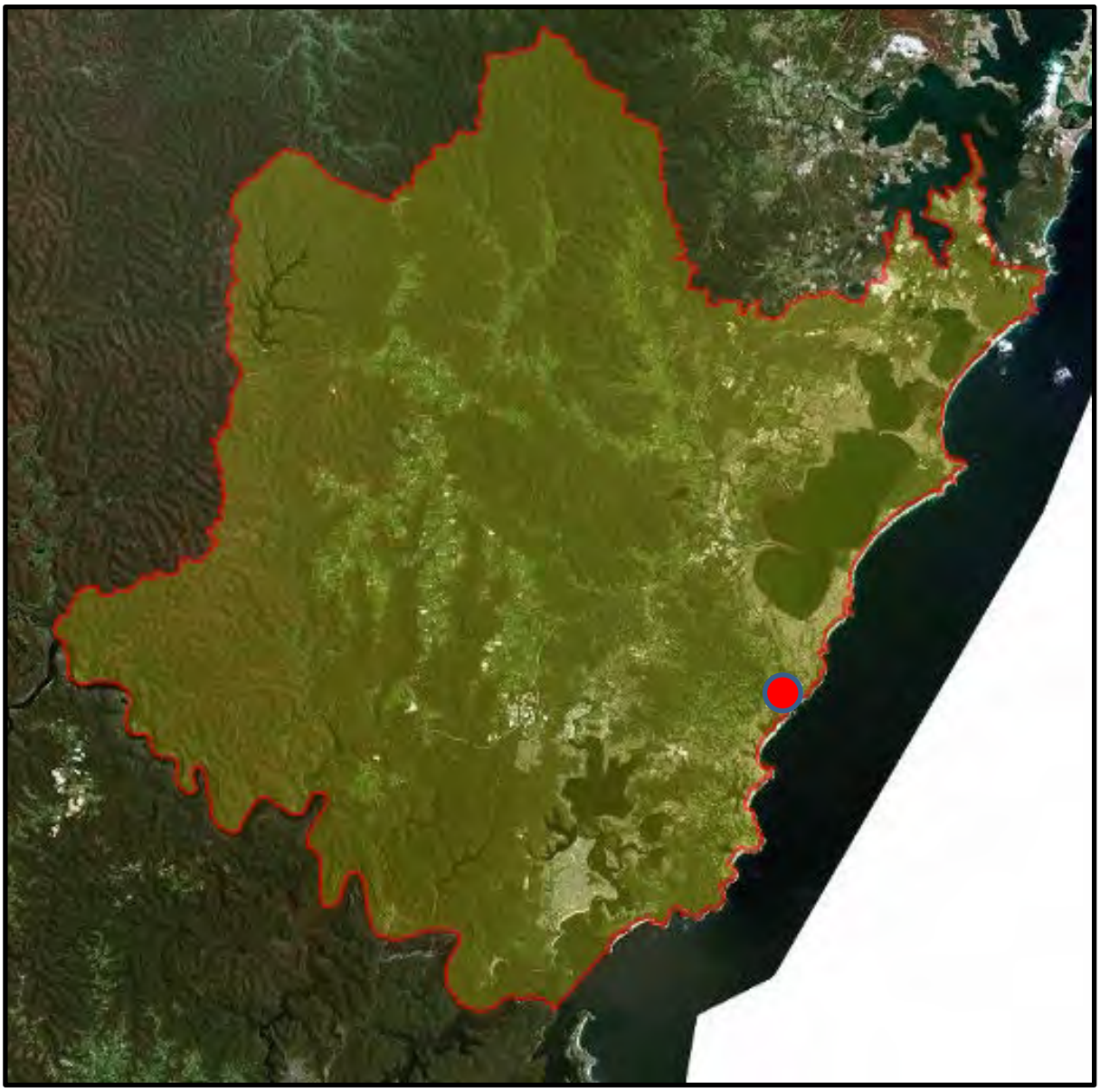


**Figure 1: location of the proposed development (red circle) in relation to the extent of the Central Coast Council LGA (Source: SIX Maps.com)**

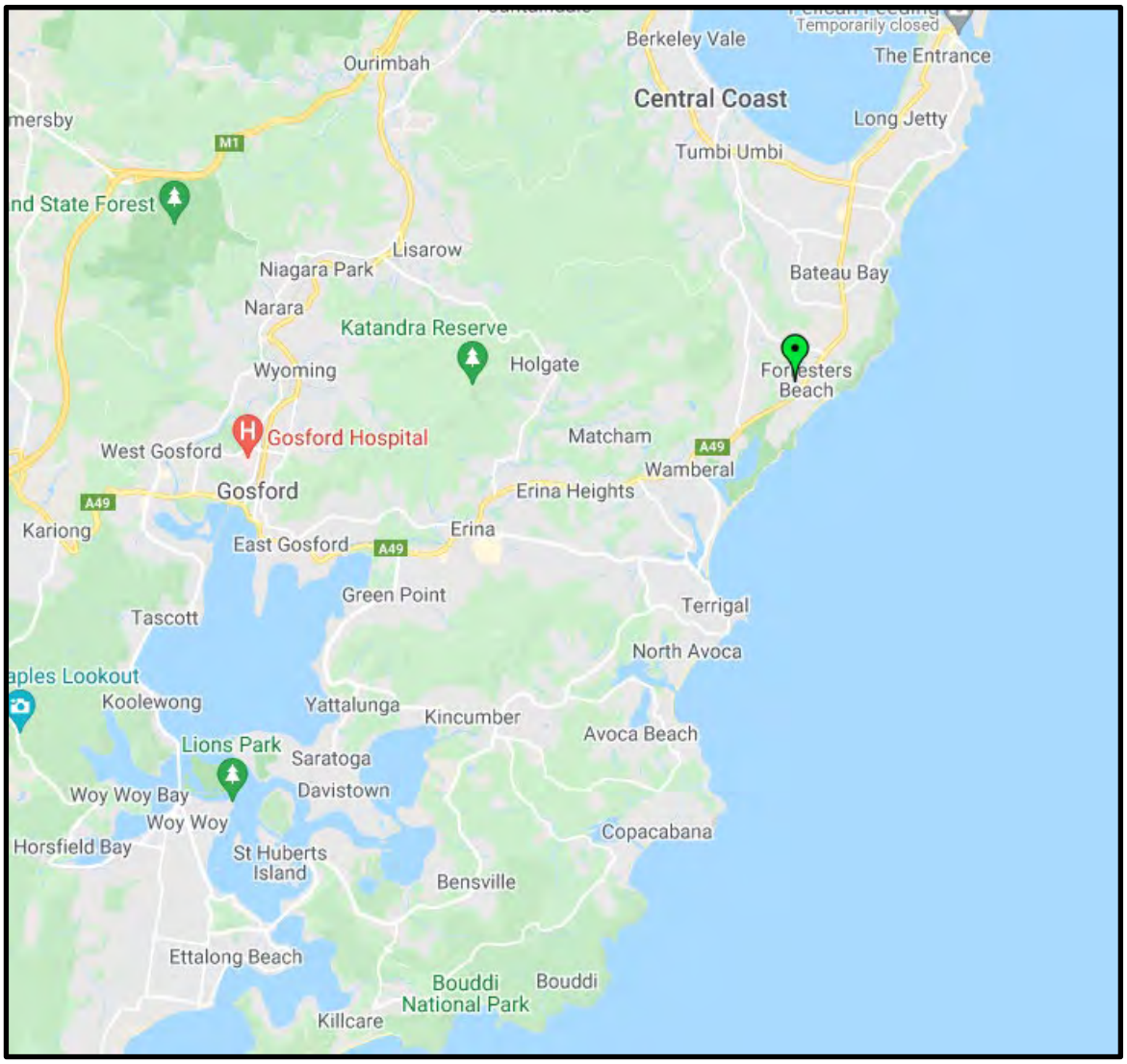



**Figure 2: Location of the site in relation to surrounding suburbs (Source: Google Maps.com)**

**Figure 3: Aerial map showing the local catchment (Source: Nearmap.com)**

**Figure 4: Nearmap aerial imagery showing cadastral boundaries (Source: Nearmap.com accessed January 2022)**


**Figure 5: Cadastral numbered lot boundaries and aerial mapping of the subject site bounded by the red polygon (Source: Central Coast Council interactive mapping online tool accessed 2nd February 2022)**


**Figure 6: Cadastral boundaries of area subject to the proposed certification**

**Figure 7: Sensitive biodiversity land values map (Source: NSW DPIE accessed 29/01/22)**


**Figure 8: Site location within the Woodbury Ridge Soil Landscape (Source: E-Spade Version 2.0 accessed 7th Feb 2022)**

### 1.2.1 Database Searches

The following database searches were undertaken, in order to compile a list of threatened flora and fauna species predicted to occur in the area:

- Review of threatened fauna and flora records within a 10 km radius of the site, contained in the OEH Atlas of NSW Wildlife (NSW BioNet).
- Review of the MNES records within a 10 km radius of the site, using the Commonwealth Department of Environment and Energy (DEE), EPBC Act Protected Matters Search Tool.

### 1.2.2 Literature Review

Information sources reviewed included, but were not necessarily limited to:

- Aerial Photograph Interpretation (API);
- Relevant guidelines, including:
    - OEH *Biodiversity Assessment Method*, 2017 No 469
    - *NSW Guide to Surveying Threatened Plants* (OEH, 2016)
    - *'Species credit' threatened bats and their habitats: NSW survey guide for the Biodiversity Assessment Method* (OEH, 2018)
    - *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (Department of Environment and Conservation (DEC), 2004)
- OEH Threatened Species, Populations and Ecological Communities website
- Commonwealth DEE Species, Profile and Threats Database;
- OEH Threatened Species, Populations and Ecological Communities website
- Commonwealth DEE Species, Profile and Threats Database;
- Threatened species survey and assessment guidelines: field survey methods for fauna: Amphibians (DEC 2009);
- NSW Guideline to Surveying Threatened Plants (OEH 2016b);
- Operational Manual for BioMetric 3.1. (DECCW 2011);
- Survey guidelines for Australia's threatened birds. Guidelines for detecting birds listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth of Australia 2010a);
- Survey guidelines for Australia's threatened bats. Guidelines for detecting bats listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999(Commonwealth of Australia 2010b);

- Survey guidelines for Australia's threatened frogs. Guidelines for detecting frogs listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth of Australia 2010c);
- Survey guidelines for Australia's threatened mammals. Guidelines for detecting
- mammals listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth of Australia 2011);
- Survey guidelines for Australia's threatened orchids.
- Guidelines for detecting bats listed as 'threatened' under the Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth of Australia 2013).

It was not possible to determine with certainty all the fauna that utilise habitats in the subject site. This is because of the likely seasonal occurrences of some fauna species, the occasional occurrence of vagrant species, and because some species are difficult to detect because of their timid or cryptic behaviour. Therefore, in addition to targeted fauna surveys, investigations comprised an assessment of fauna habitats present on site and an indication of their potential to support native wildlife populations and, in particular, threatened species.

This assessment relies upon the relatively recent fauna surveys undertaken by Travers Environmental Consulting dated January 2022.

### 1.2.3 Field surveys

Field surveys were undertaken by Conachers Environmental as part of the flora and fauna assessment dated January 2022 and by Fraser Ecological (Feb 2022) as part of this biodiversity development assessment report (BDAR).

Meander searches, survey transects and survey quadrats were undertaken across the subject site to identify the presence of threatened flora species and to identify the main flora species present.

Flora surveys were undertaken by Conachers Environmental on the following dates:

- 30 January 2008
- 15 March 2014
- 12 February 2015
- 27 March 2021

Alexander Fraser (Fraser Ecological Consulting) undertook the vegetation BAM plots and additional targeted flora surveys for this BDAR in February 2022. The field datasheets are provided in Appendix B.

This biodiversity assessment relied upon the fauna surveys undertaken by Conachers Environmental. The following methods were utilised for fauna surveys:

- Targeted nocturnal and diurnal reptile and amphibian searches;
- Diurnal and nocturnal bird surveys;
- Diurnal and nocturnal mammal surveys;
- Arboreal and terrestrial mammal trapping;
- Recorded call playback for threatened nocturnal bird, amphibian and mammal species;
- Spotlighting;
- Microchiropteran bat echolocation call detection;
- Koala habitat assessment;
- Habitat searches and opportunistic observations during the completion of method specific fauna surveys; and
- Hollow bearing tree observation survey.

Subject to further information requests and Council, additional targeted surveys were undertaken for amphibians in February and March after flooding rains in accordance with DPIE survey guidelines (refer to Table 2 survey effort and Figure 9a for location of spotlighting and call playback). The amphibian surveys were undertaken by fauna ecologist Corey Mead (Treehouse Ecology).

Frog surveys were undertaken throughout the study area targeting presence of threatened frog species Green and Golden Bell Frog, Green-thighed Frog, Wallum Froglet and Mahony's Toadlet. These surveys were undertaken over four consecutive nights both during and following a late February to early March rainfall period. The week leading up to these surveys recorded over 200m of rainfall.

Each night of survey, aural and visual transects were undertaken. Spotlighting was used along roads and where calling frogs were heard. Although no habitats within the study area were considered ideal for the four target species, call-playback techniques were deployed in locations consistent with species breeding requirements. Green and Golden Bell Frog calls were emitted at the edges of waterbodies open to sunlight for basking and providing fringing aquatic vegetation. Wallum Froglet calls were emitted within paperbark swamp areas. Green-thighed Frog calls were emitted in both vegetated and non-vegetated fringes inundated from flooding rains. No Mahony's Toadlet calls were undertaken as no habitat consistent with this species was considered present.

Amphibian call-playback involved broadcasting recorded calls through a 15 watt Toa 'Faunatech' amplifier.

Alex Fraser undertook hollow bearing tree mapping on 5 March 2022 (refer to section 3.34 updated hollow bearing tree map.

All fauna survey locations are shown in Figure 9 and Figure 9a details of fauna survey effort are provided in Table 1.

The fauna survey effort and timing is consistent with the optimal detection period for threatened species as per *Central Coast Council Flora and Fauna guidelines* dated July 2019 (refer to Figure 10) and NSW Survey Guide for Threatened Frogs: A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method (DPIE 2020).

**Table 1:Fauna survey effort details (Source: Conachers Environmental)**

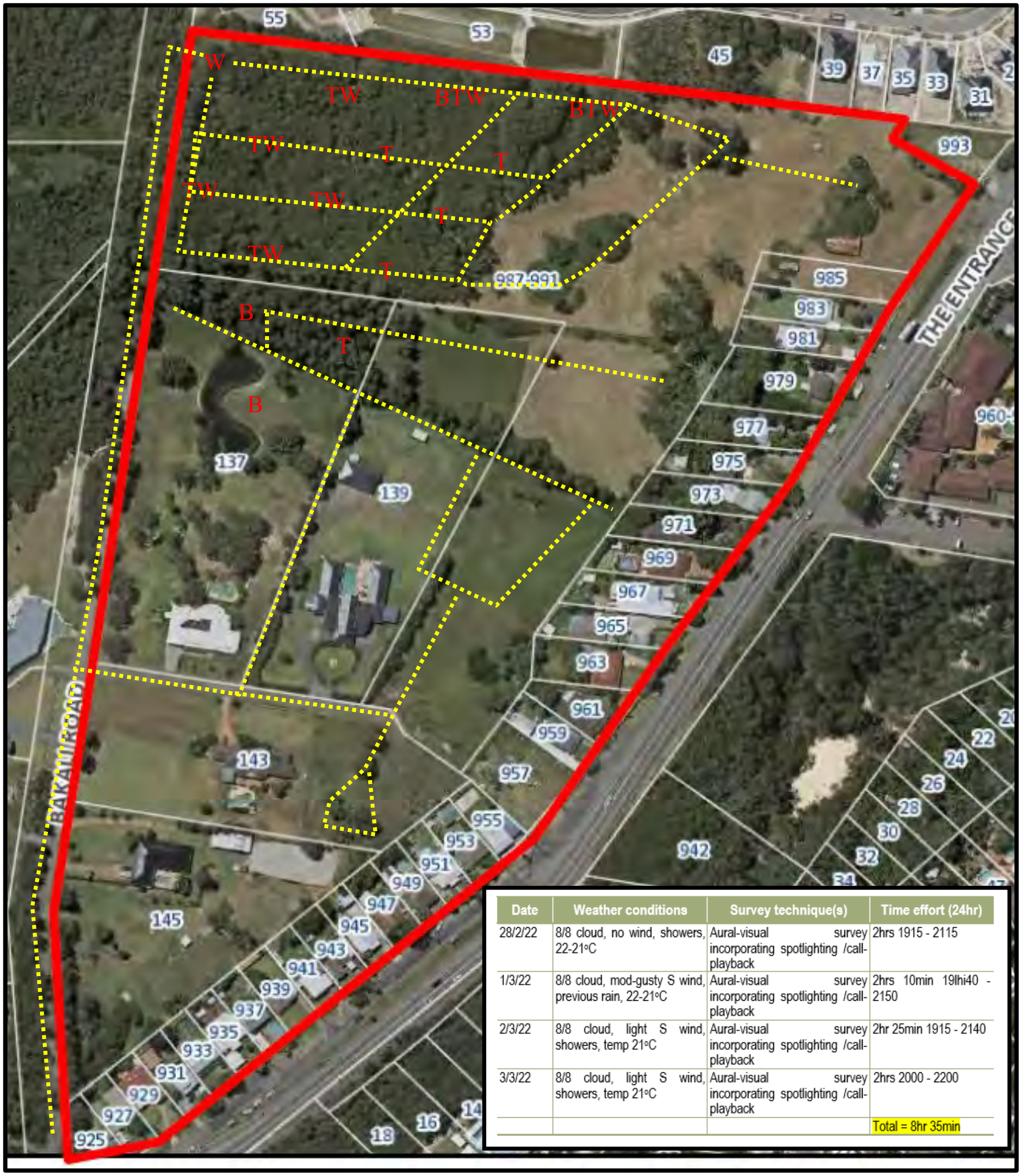
| Survey Type | Date | Survey Method | Weather Conditions | Survey Effort / Time |
|---|---|---|---|---|
| **Diurnal Surveys** | 23 January 2008 | Amphibian habitat search<br>Reptile habitat search<br>Mammal census<br>Bird census | 0/8 cloud<br>No wind<br>No rain<br>17$^0$C | 1hr 15min<br>7pm-8.15pm |
| | 24 January 2008 | Amphibian habitat search<br>Reptile habitat search<br>Mammal census<br>Bird census | 0/8 cloud<br>No wind<br>No rain<br>19$^0$C | 1hr 30mins<br>7.30am-9.00am |
| | 24 January 2008 | Amphibian habitat search<br>Reptile habitat search<br>Mammal census<br>Bird census | 1/8 cloud<br>Light NE<br>wind No rain<br>16$^0$C | 1hr<br>7.00pm-8.00pm |
| | 25 January 2008 | Amphibian habitat search<br>Reptile habitat search<br>Mammal census<br>Bird census | 5/8 cloud<br>No wind<br>No rain<br>16$^0$C | 50mins<br>6.50am-7.40am |
| | 26 January 2008 | Amphibian habitat search<br>Reptile habitat search<br>Mammal census<br>Bird census | 1/8 cloud<br>No wind<br>No rain<br>20$^0$C | 50mins<br>7.30am-8.20am |
| | 14 March 2014 | Amphibian habitat search<br>Reptile habitat search<br>Mammal census<br>Bird census | Not Recorded | 2 hrs<br>8.30am-10.30am |
| **Diurnal Surveys** | 12 February 2015 | Amphibian habitat search<br>Reptile habitat search<br>Mammal census<br>Bird census | 0/8 cloud<br>SSE wind<br>No rain<br>25$^0$C | 1 hr<br>8.30am-9.30am |
| | 25 March 2021 | Amphibian habitat search<br>Bird census | No rain<br>22°C | 1 hr<br>3.00pm-4.00pm |
| | 29 March 2021 | Amphibian habitat search<br>Bird census | No rain<br>19° | 1hr<br>7.00am-8.00am |
| | 19 August 2021 | Bird census | No rain<br>18°C | 2 hrs<br>9.00am-11.00am |
| | 26 August 2021 | Amphibian habitat search<br>Bird census | After rain<br>16°C | 1hr 30mins<br>8.00am-9.30am |
| | 9 November | Amphibian habitat search | Light rain | 1 hr |

| Survey Type | Date | Survey Method | Weather Conditions | Survey Effort/Time |
|---|---|---|---|---|
| | 2021 | Bird census | 22°C | 5.00pm-6.00pm |
| | 17 November 2021 | Amphibian habitat search<br>Bird census | No rain<br>20°C | 1hr<br>4.00pm-5.00pm |
| | 3 December 2021 | Bird census<br>Amphibian habitat search | No rain<br>20°C | 1 hr 30 mins<br>10.00am-11.30am |
| | 7 December 2021 | Amphibian habitat searchBird census<br>Giant Dragonfly | No rain<br>17°C | 1 hr4.00pm-5.00pm |
| **Nocturnal Surveys** | 23 January 2008 | Spotlighting /habitat searchAmphibian call detection Threatened fauna playback Microchiropteran bat ultrasonic callrecording x2 units | 0/8 cloud<br>No wind<br>No rain<br>4/4 moon<br>17$^0$C | 1hr 30mins<br>8.00pm-9.30pm |
| | 24 January 2008 | Spotlighting /habitat searchAmphibian call detection Threatened fauna playback Microchiropteran bat ultrasonic callrecording x2 units | 0/8 cloud<br>Light NE wind No rain<br>4/4 moon<br>16$^0$C | 1hr 30mins<br>8.00pm-9.30pm |
| | 19 August 2021 | Spotlighting /habitat searchAmphibian habitat search Bird census<br>Mammal census | 2/8 Cloud<br>Light E breeze<br>15$^0$C | 1 hr 30 mins<br>6.00pm-7.30pm |
| | 9 November 2021 | Amphibian habitat searchBird census | 8/8 Cloud<br>Light rain<br>20$^0$C | 1hr 30mins<br>8.30pm-10.00pm |
| | 22 November - 6 December 2021 | 3 Anabat/ call detectors | Variable | Call activated recording |
| **Trapping Surveys** | 23-25 January 2008 | 15 arboreal Elliot trap nights 15 terrestrial Elliot trap nights | Variable | 30 trap nights |
| | 22 November- | 3 Remote detection camera traps | Variable | 42 trap nights |

**Table 2: Feb/ March 2022 amphibian surveys (Treehouse Ecology)**

| Date | Weather conditions | Survey technique(s) | Time effort (24hr) |
|---|---|---|---|
| 28/2/22 | 8/8 cloud, no wind, showers, 22-21oC | Aural-visual survey incorporating spotlighting /call-playback | 2hrs 1915 - 2115 |
| 1/3/22 | 8/8 cloud, mod-gusty S wind, previous rain, 22-21oC | Aural-visual survey incorporating spotlighting /call-playback | 2hrs 10min 19lhi40 - 2150 |
| 2/3/22 | 8/8 cloud, light S wind, showers, temp 21oC | Aural-visual survey incorporating spotlighting /call-playback | 2hr 25min 1915 - 2140 |
| 3/3/22 | 8/8 cloud, light S wind, showers, temp 21oC | Aural-visual survey incorporating spotlighting /call-playback | 2hrs 2000 - 2200 |
| | | | **Total** = 8hr 35min |


**Figure 9: Location of fauna surveys across the subject site (Source: Conachers Environmental dated Jan 2022)**

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| 1/3/22 | 8/8 cloud, mod-gusty S wind, previous rain, 22-21°C | Aural-visual survey incorporating spotlighting /call-playback | 2hrs 10min 19lhi40 - 2150 |
| 2/3/22 | 8/8 cloud, light S wind, showers, temp 21°C | Aural-visual survey incorporating spotlighting /call-playback | 2hr 25min 1915 - 2140 |
| 3/3/22 | 8/8 cloud, light S wind, showers, temp 21°C | Aural-visual survey incorporating spotlighting /call-playback | 2hrs 2000 - 2200 |
| | | | Total = 8hr 35min |

**Aural /visual transect including spotlighting***

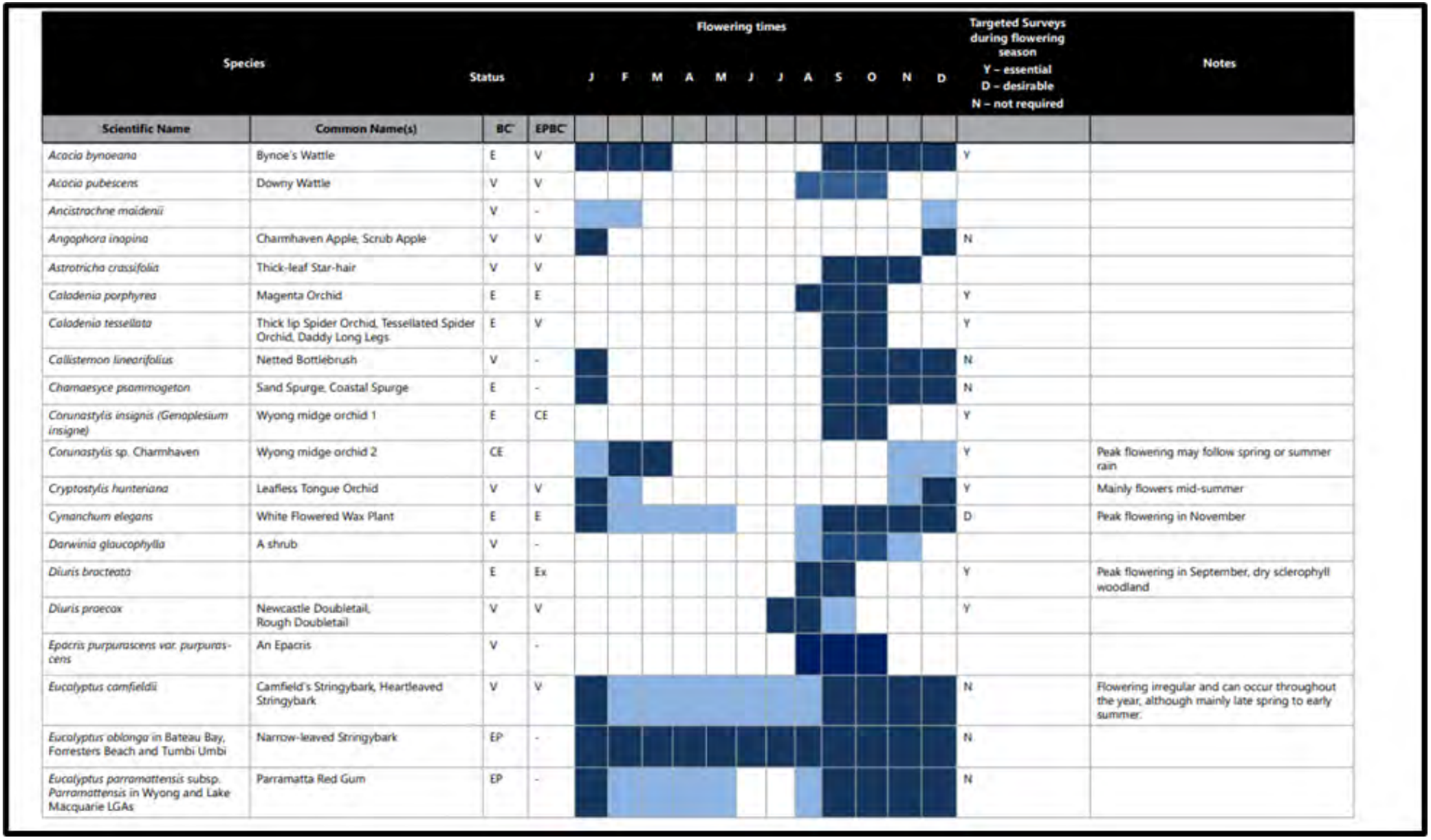
Undertaken by fauna ecologist Corey Mead (Treehouse Ecology)

B = Green & Golden Bell Frog Call Playback

T = Green Thighed Frog Call Playback

W = Wallum Froglet Call Playback

**Figure 10: Amphibian survey effort locations (Feb/ March 2022)**



| Species | | Status | | Flowering times | | | | | | | | | | | | Targeted Surveys during flowering season<br>Y – essential<br>D – desirable<br>N – not required | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | J | F | M | A | M | J | J | A | S | O | N | D | | |
| **Scientific Name** | **Common Name(s)** | **BC** | **EPBC** | | | | | | | | | | | | | | |
| *Acacia bynoeana* | Bynoe's Wattle | E | V | ■ | ■ | ■ | | | | | | ■ | ■ | ■ | ■ | Y | |
| *Acacia pubescens* | Downy Wattle | V | V | | | | | | | | ■ | ■ | ■ | | | | |
| *Ancistrachne maidenii* | | V | - | ▒ | ▒ | | | | | | | | | | ▒ | | |
| *Angophora inopina* | Charmhaven Apple, Scrub Apple | V | V | ■ | | | | | | | | | | | ■ | N | |
| *Astrotricha crassifolia* | Thick-leaf Star-hair | V | V | | | | | | | | | ■ | ■ | ■ | | | |
| *Caladenia porphyrea* | Magenta Orchid | E | E | | | | | | | | ■ | ■ | ■ | | | Y | |
| *Caladenia tessellata* | Thick lip Spider Orchid, Tessellated Spider Orchid, Daddy Long Legs | E | V | | | | | | | | | ■ | ■ | | | Y | |
| *Callistemon linearifolius* | Netted Bottlebrush | V | - | ■ | | | | | | | | ■ | ■ | ■ | ■ | N | |
| *Chamaesyce psammogeton* | Sand Spurge, Coastal Spurge | E | - | ■ | | | | | | | | ■ | ■ | ■ | ■ | N | |
| *Corunastylis insignis (Genoplesium insigne)* | Wyong midge orchid 1 | E | CE | | | | | | | | | ■ | ■ | | | Y | |
| *Corunastylis* sp. Charmhaven | Wyong midge orchid 2 | CE | | ▒ | ■ | ■ | | | | | | | | ▒ | ▒ | Y | Peak flowering may follow spring or summer rain |
| *Cryptostylis hunteriana* | Leafless Tongue Orchid | V | V | ■ | ▒ | | | | | | | | | ▒ | ■ | Y | Mainly flowers mid-summer |
| *Cynanchum elegans* | White Flowered Wax Plant | E | E | ■ | ▒ | ▒ | ▒ | ▒ | | | ▒ | ■ | ■ | ■ | ■ | D | Peak flowering in November |
| *Darwinia glaucophylla* | A shrub | V | - | | | | | | | | ▒ | ■ | ■ | ▒ | | | |
| *Diuris bracteata* | | E | Ex | | | | | | | | ■ | ■ | | | | Y | Peak flowering in September, dry sclerophyll woodland |
| *Diuris praecox* | Newcastle Doubletail, Rough Doubletail | V | V | | | | | | | ■ | ■ | ▒ | | | | Y | |
| *Epacris purpurascens var. purpuras-cens* | An Epacris | V | - | | | | | | | | ■ | ■ | ■ | | | | |
| *Eucalyptus camfieldii* | Camfield's Stringybark, Heartleaved Stringybark | V | V | ■ | ▒ | ▒ | ▒ | ▒ | ▒ | ▒ | ▒ | ■ | ■ | ■ | ■ | N | Flowering irregular and can occur throughout the year, although mainly late spring to early summer. |
| *Eucalyptus oblonga* in Bateau Bay, Forresters Beach and Tumbi Umbi | Narrow-leaved Stringybark | EP | - | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | N | |
| *Eucalyptus parramattensis* subsp. *Parramattensis* in Wyong and Lake Macquarie LGAs | Parramatta Red Gum | EP | - | ■ | ▒ | ▒ | ▒ | ▒ | | | ▒ | ■ | ■ | ■ | ■ | N | |

**Appendix A**

**Required survey times for threatened flora species**

Main or peak flowering

Sporadic or minor flowering

Flowering times of many species vary significantly from year to year depending on weather conditions and some species (particularly orchids) may not flower at all in unfavourable seasons. The recommended flowering times should be used as a guide only. If it is crucial to determine presence/absence of a particular cryptic flora species at a site, local flowering at a known nearby reference population should be confirmed before conducting surveys regardless of the stated recommended range of suitable survey times.

Figure 10a: Optimal detection period for threatened flora as per *Central Coast Council Flora and Fauna guidelines* dated July 2019

| Species | | Status | | Flowering times | | | | | | | | | | | | Targeted Surveys during flowering season<br>Y – essential<br>D – desirable<br>N – not required | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | J | F | M | A | M | J | J | A | S | O | N | D | | |
| **Scientific Name** | **Common Name(s)** | **BC** | **EPBC** | | | | | | | | | | | | | | |
| *Eucalyptus parramattensis subsp. decadens* | Drooping Red Gum, Earp's Gum, Earp's Dirty Gum | V | V | ■ | ▒ | ▒ | ▒ | ▒ | | | ▒ | ■ | ■ | ■ | ■ | N | |
| *Grevillea parviflora subsp. Parviflora* | Small-flower Grevillea | V | V | ▒ | ▒ | | | | | ▒ | ■ | ■ | ■ | ■ | ■ | D | Sporadic flowering in January to February |
| *Grevillea shiressii* | | V | V | ▒ | ▒ | | | | | ▒ | ▒ | ▒ | ▒ | ■ | ■ | D | |
| *Hibbertia puberula* | A Hibbertia | E | - | | | | | | | | | | ■ | ■ | | D | |
| *Hibbertia procumbens* | Spreading Guinea Flower | E | - | | | | | | | | | | ■ | ■ | ■ | Y | Flowers in summer |
| *Maundia triglochinoides* | Maundia | V | - | ■ | | | | | | | | | | ■ | ■ | N | |
| *Melaleuca biconvexa* | Biconvex Paperbark | V | V | | | | | | | | | | ■ | ■ | | N | Flowers over just 3 to 4 weeks |
| *Melaleuca groveana* | Grove's Paperbark | V | - | | | | | | | | | ▒ | ▒ | ▒ | | N | |
| *Microtis angusii* | Angus's Onion Orchid | E | E | | | | | | | ▒ | ▒ | ■ | ■ | | | Y | Sporadic flowering July to August and November |
| *Pultenaea maritima* | Coast Headland Pea | V | - | ▒ | ▒ | ▒ | | | | | ▒ | ▒ | ▒ | ▒ | ▒ | D | |
| *Prostanthera askania* | Tranquility Mintbush | E | E | | | | | | | | | ■ | ■ | ■ | ■ | D | |
| *Prostanthera junonis* | Somersby Mintbush | E | E | | | | | | | | | | ■ | ■ | ■ | Y | |
| *Rhizanthella slateri* | Eastern Underground Orchid | V | E | | | | | | | | | | ■ | ■ | | Y | Difficult or impossible to detect ever, when flowering. |
| *Rutidosis heterogama* | Heath Wrinklewort | V | V | ▒ | ▒ | ▒ | ▒ | ▒ | ▒ | ▒ | ▒ | ▒ | ■ | ■ | ▒ | D | Can flower sporadically throughout the year when climatic conditions are favourable. Not essential to be flowering when surveys are conducted (for experienced surveyors), but it is easier to detect. |
| *Senecio spathulatus* | Coast Groundsel | E | - | ▒ | ▒ | ▒ | ▒ | ▒ | ▒ | ▒ | ▒ | ▒ | ▒ | ▒ | ▒ | Y | |
| *Senna acclinis* | Rainforest Senna | E | - | ■ | | | | | | | | ■ | ■ | ■ | ■ | Y | |
| *Streblus pendulinus* | Siah's Backbone | - | E | ■ | ■ | ■ | ■ | | | | | | | | | N | |
| *Syzygium paniculatum* | Magenta Lilly Pilly, Brush Cherry | E | V | ■ | ■ | | | | | | | | | ■ | ■ | N | |
| *Tetratheca juncea* | Black-eyed Susan | V | V | ▒ | | | | | | | ▒ | ■ | ■ | ▒ | ▒ | Y | Can be detected August and November to January. Full extent of population can only be detected during peak flowering mid-September to mid-October. |
| *Tetratheca glandulosa* | Glandular Pink-bell | V | V | | | | | | | ▒ | ▒ | ■ | ■ | ■ | ▒ | Y | |
| *Thelymitra adorata* | Wyong Sun Orchid | CE | - | | | | | | | | | ■ | ■ | | | Y | Not all plants flower every year |
| *Wilsonia backhousei* | A sub-shrub | V | - | ▒ | | | | | | | | ▒ | ▒ | ▒ | ▒ | Y | |

Figure 10B: Optimal detection period for threatened flora as per *Central Coast Council Flora and Fauna guidelines* dated July 2019

**Appendix A**

**Required survey times for threatened flora species**

Main or peak flowering

Sporadic or minor flowering

Flowering times of many species vary significantly from year to year depending on weather conditions and some species (particularly orchids) may not flower at all in unfavourable seasons. The recommended flowering times should be used as a guide only. If it is crucial to determine presence/absence of a particular cryptic flora species at a site, local flowering at a known nearby reference population should be confirmed before conducting surveys regardless of the stated recommended range of suitable survey times.

### 1.2.4 Other sources and consultant reports

A desktop survey was performed to ensure all relevant documentation is considered when preparing the plan. Documents and other information resources utilised include:

- Aerial photographs (Google Maps, NearMaps & DPI Land Information)
- NSW Land and Property Information SIX Maps Viewer (https://maps.six.nsw.gov.au/)
- The Southeast NSW Native Vegetation Classification and Mapping (NSW OEH 2010) mapped using QGIS software overlaid with cadastral boundaries obtained from the NSW Planning Portal database collection
- Soil Landscapes of the Sydney 1:100,000 Sheet (Chapman and Murphy 1989) using the Espade Version 2.0 managed by the NSW Office of Environment and Heritage accessed 28th January 2022
- Central Coast Council vegetation mapping by Stephen Bell (2019) - accessed via Council's interactive online mapping viewer on the 28th January 2022
- Ecological Assessment Report prepared by Conachers Consulting dated January 2022

# 2 LANDSCAPE FEATURES

## 2.1 IBRA Bioregions and Subregions

Dominant landscape forms have been used to divide Australia into bioregions. The site is within the **NSW Sydney Basin IBRA bioregion** and **Wyong IBRA Subregion** (Figure 11).

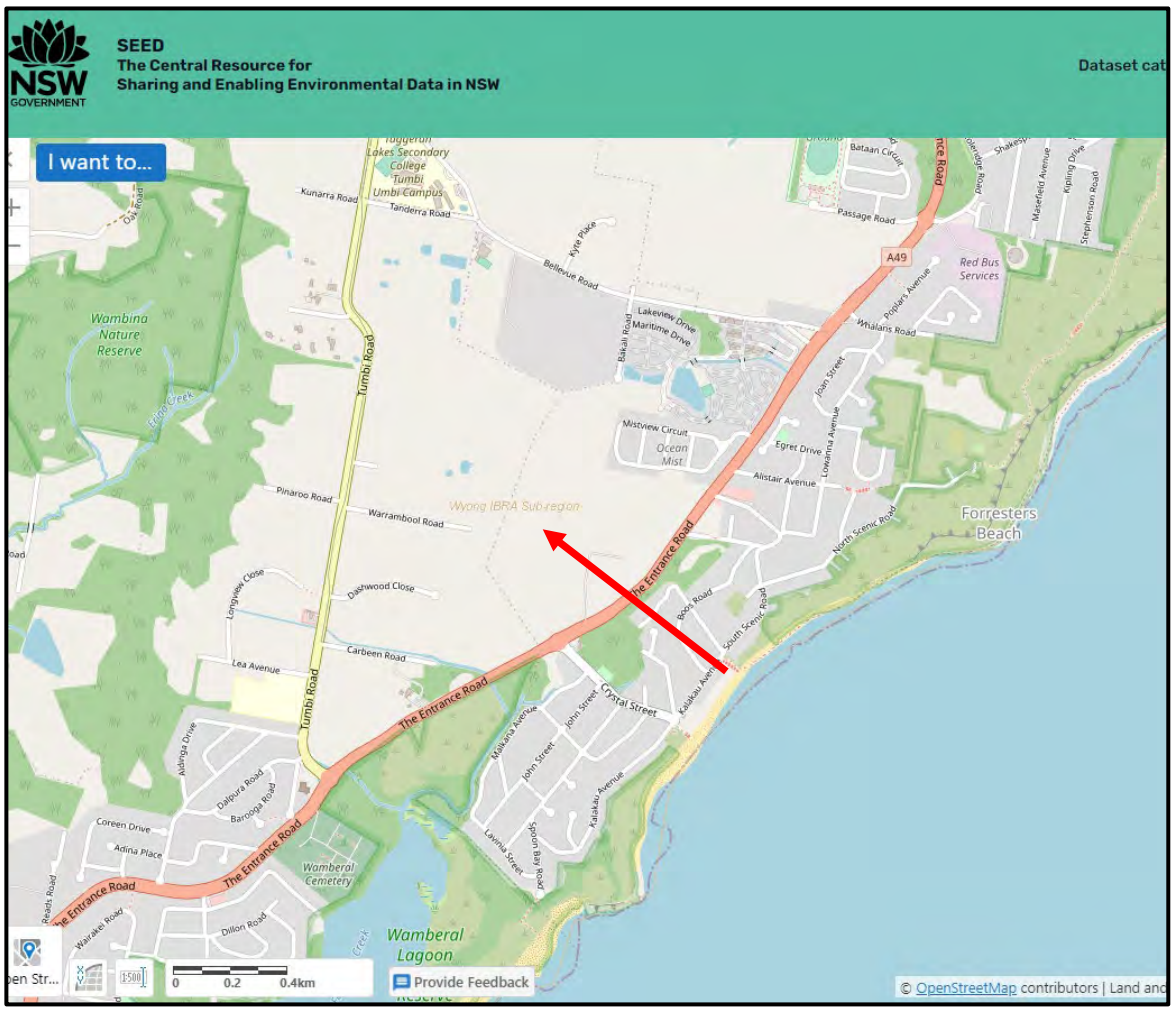



**Figure 12: Location of site within the Wyong IBRA Subregion (red arrow)**

## 2.2 NSW Landscape Regions (Mitchell Landscapes)

Mitchell Landscapes are used to describe areas in NSW in a broad sense and group together areas with relatively homogenous geomorphology, soils and broad vegetation types and are mapped at a scale of 1:250000.

The subject site is within the Sydney – Newcastle Barriers and Beaches Landscape (Figure 12). This landscape region has an estimated cleared fraction of 0.5 and has 'over-cleared' land status.

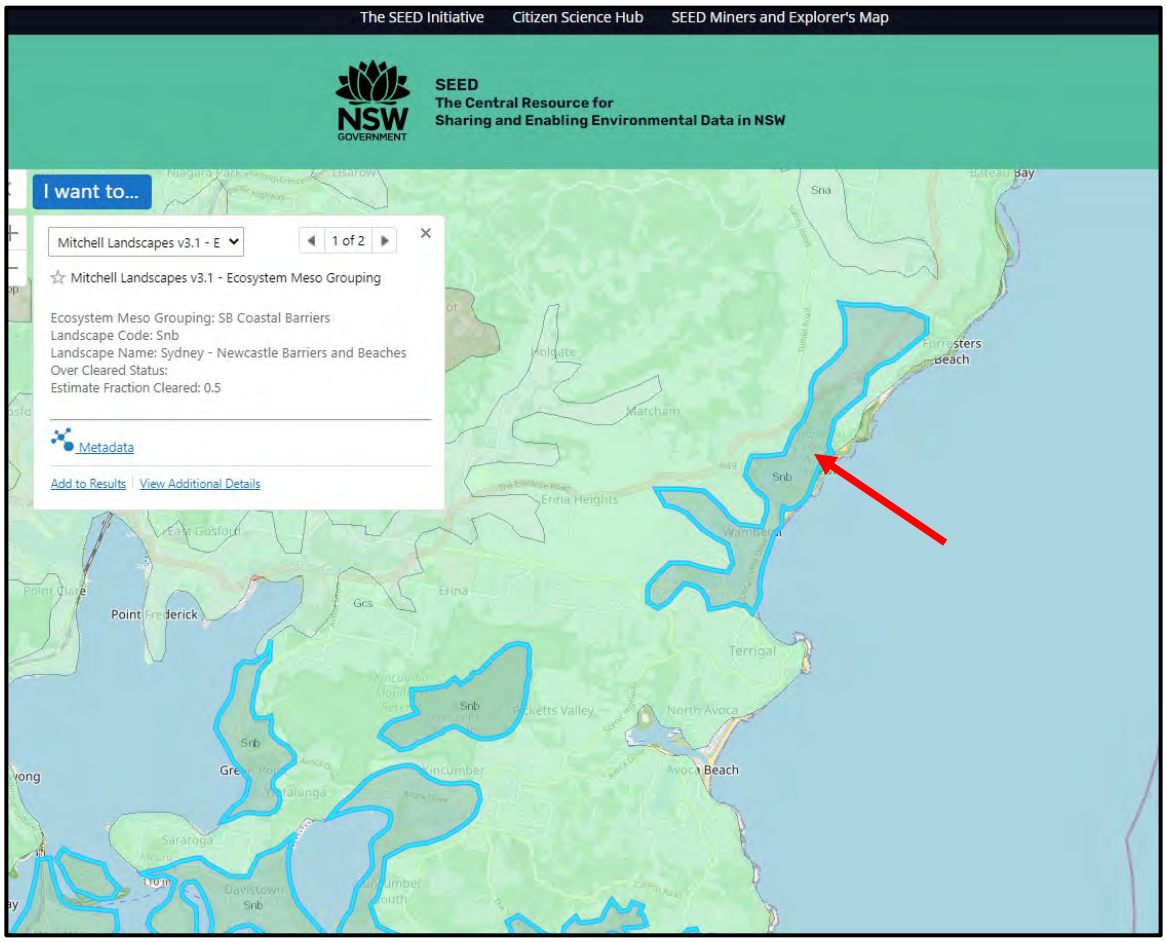



**Figure 13: Location of site within the Sydney – Newcastle Barriers and Beaches Mitchell Landscape (red arrow)**

## 2.2 Native vegetation cover

Native vegetation cover is calculated as a percentage cover on the subject land and the surrounding 1,500 m buffer area. Cover estimates are based on the cover of native woody and non-woody vegetation relative to the approximate benchmarks for the PCT, considering vegetation condition and extent. All areas of native vegetation cover, within the site and within a 1,500 m buffer area surrounding the site, have been mapped (Figure 13).

It is estimated, from this mapping, that the native vegetation cover is 50% (30-70% category) provided within the BDAR manual and this was used in the BAM Offsets calculator (Section 6).

The native vegetation cover is estimated at approximately 50%.


**Figure 14:1500m buffer area of the site**

Yengo IBRA
Wyong IBRA
Pittwater IBRA
Cumberland IBRA
IBRA Subregions

Sydney - Newcastle Coastal Alluvial Plains

Gosford - Cooranbong Coastal Slopes

Sydney - Newcastle Barriers and Beaches

metromap

0 0.2 0.4 0.6 0.8 1 2 Kilometers
Scale: 1:14,000

**SITE : BAKALI Rd Forresters Beach - LOT 522 DP 1077907**

## Native Vegetation Cover

- Subject Land
- 1500m Buffer (934.05 ha)
- Native Vegetation (308.4 ha)
- Drainage

Mitchell Landscapes 3.1
- Gosford - Cooranbong Coastal Slopes
- Sydney - Newcastle Barriers and Beaches
- Sydney - Newcastle Coastal Alluvial Plains

| | |
|---|---|
| Projected Coordinate System | GDA 2020 Zone 56 |
| DATE : 15/08/2021 | Map Version : 1.0 |

Aerial Imagery: MetroMap - 20/09/2021
Revised Vegetation Classification of the Central Coast LGA (Bell 2019)
Although all care has been taken - WiZarDTech accepts no responsibility from the use or inaccuracies of this map and spatial data.


WiZarDTech
Spatial Services

## 2.3 Native vegetation extent (within subject site for proposed development)

All parts of the Subject Land that supported native vegetation have been mapped.

The total area of assessable native vegetation to be cleared from the Subject Land is 1.2ha.

## 2.4 Non-native Vegetation

A majority of the Subject Land comprises 'non-native vegetation', containing weeds and/or planted ornamentals.

Cleared Land / Non-endemic Vegetation is present across approximately 6.78 hectares.

## 2.5 Patch Size

Patch size is used to describe an area of intact native vegetation, that includes native vegetation with a gap of less than 100 m from the next area of moderate to good condition native vegetation.

Patch size as defined by the BAM as an area of native vegetation that:

- occurs on the development site or biodiversity stewardship site, and
- includes native vegetation that has a gap of less than 100m from the next area of moderate to good condition native vegetation (or ≤30m for non-woody ecosystems).

Patch size may extend onto adjoining land that is not part of the development site (OEH 2020a). Patch size was calculated according to the above guidelines.

**The patch size for the vegetation on-site is greater than 100 hectares as part of the BAM-C data entry for offset credit calculations.**

## 2.6 Wetland, Rivers, Streams and Estuaries

No significant wetlands, rivers, streams and estuaries are present within the subject land.

## 2.7 Connectivity Features

The biodiversity value of corridor networks is well known. Landscapes that retain more connections between patches of otherwise isolated areas of vegetation are more likely to maintain more numerous and more diverse populations of various plant and animal species (Lindenmayer and Fischer, 2006). Conversely, a lack of landscape connectivity can have a range of negative impacts on species populations (Lindenmayer and Fischer, 2006). It is thought that if existing remnants are left to persist without sufficient immigration to maintain genetic diversity, continued losses of biodiversity are certain (Parker *et al.* 2008).

In accordance with connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6) the assessor must identify the connectivity of different areas of habitat that may facilitate the movement of threatened species across their range and identify these on the Location Map (Figure 14).

Significant biodiversity links are those that connect different areas of habitat, facilitating movement of threatened species across their distribution. The presence of significant biodiversity links on a site contributes to the biodiversity value of that Subject Land at the landscape scale. Connectivity can be identified at different scales depending on the target species and can include recognised biodiversity corridors in a plan approved by DPIE (e.g. priority investment areas), a local corridor identified by a local council, flyways for migratory species or a riparian buffer of a stream, wetland or estuary.

Fraser Ecological has identified routes of habitat connectivity in the landscape surrounding the Subject Land and has classified them into two categories:

- Habitat Connection – a local-scale habitat connection consisting of a narrow or disturbed vegetation corridor (i.e. canopy connectivity) or series of connected, dense canopies; and
- Significant Biodiversity Link – a locally significant habitat connection consisting of remnant vegetation in reserves, densely vegetation riparian corridors or wetlands.

The Subject Land forms part of a habitat corridor that connects to Wyrrabalong National Park and Wamberal Lagoon Nature Reserve which provides foraging and breeding habitat for a range of birds, mammals, reptiles and amphibians. Threatened species that may utilise this habitat corridor include vulnerable mobile aerial fauna including vulnerable Grey-headed Flying-fox (*Pteropus poliocephalus*), microbats and the Powerful Owl (*Ninox strenua*).

The proposed development will not fragment bushland or significantly impact upon the corridor function of bushland on site as significant areas of forest will be retained around the north-western portion of the development site.


**Figure 15: Corridors within the 1500m native vegetation extent**

**Note: Yellow arrows = local scale habitat connection Red arrows = Significant biodiversity links**

## 2.8 Areas of Geological Significance and Soil Hazard Features

Not present.

## 2.9 Areas of Outstanding Biodiversity Value

Under the BC Act, the Minister for the Environment may declare Areas of Outstanding Biodiversity Value (AOBV). These are special areas that contain irreplaceable biodiversity values that are considered important to NSW, Australia or globally.

No listed AOBV occur within the site or within a 1,500 m buffer around the site.

## 2.10 Important areas mapping – Swift Parrot

The north-western and mid-northern boundary of the proposed rezoning development is identified by the NSW Department of Planning, Industry and Environment as containing 'Swift Parrot -important areas mapping' as identified in Figure 15 below.

The proposed development will avoid or impacts to these areas.

Areas mapped as Swift Parrot Important Habitat Areas are present within the northwest areas of the site, as shown in Figure 15.

These areas are to be included in either an E2-Environmental Protection or RE1- Public Recreation zone. No development or native vegetation clearing is proposed in the land mapped as Swift Parrot Important Habitat Areas (Figure 15).

The extent of the proposed open space (RE1) land covers approximately 4,000 square metres and was determined by Council and the proponent during ongoing discussions. This area will be classified as Community Land and subject to a VPA and the preparation of a Plan of Management as required for public reserves under the provisions of the Local Government Act.

The exclusion of development and ongoing management of the areas included in the Swift Parrot Important Habitat Area are part of the direct impact avoidance measures proposed for the rezoning outcomes (Figure 22 – addressed in more detail in (Section 4.4).

**Figure 16: Swift Parrot Important Habitat Mapping (Source: NSW DPIE)**

# 3 NATIVE VEGETATION

## 3.1 Plant Community Types

Plot-based floristic vegetation surveys were conducted, in accordance with s.5.2.1.9 of the BAM, by Alex Fraser on the 29th January 2022 and their location is shown in Appendix B.

One 20 m x 20 m plot were sampled for the presence of flora species within each of the two (2) PCTs impacted by the proposed re-zoning.

The plot was carefully examined to identify all flora species present. Searches continued until it was confident that all flora species within a plot were detected. Data collected for each species included:

- Stratum and layers in which each species occurs
- Growth form for each species
- Scientific and common name for each species
- Percentage foliage cover (PFC) across the plot, of each species rooted in or overhanging the plot
- Abundance rating for each species

Plant Community Types (PCTs) on the site were identified according to the NSW PCT classification described in the BioNet Vegetation Classification.

Plot data, midline photographs and location of the BAM plot is provided in Appendix B.

The following vegetation communities/ condition classes were observed within the subject site during surveys:

- Disturbed Swamp Oak Forest (EEC);
- Paperbark Swamp Sclerophyll Forest (EEC);
- Managed Land with Swamp Sclerophyll Trees (EEC);
- Managed Land with Coastal Woodland Trees;
- Derived Freshwater Wetland;
- Cleared Land / Non-endemic Vegetation.

Vegetation community/ PCT descriptions are provided below and a detailed species list is provided in Table 2.

The locations of vegetation communities are shown in Figure 16 - 19.

### 3.1.1 DISTURBED SWAMP OAK FOREST (EEC)

(PCT 1728 Swamp Oak – Prickly Paperbark- Tall Sedge Swamp Forest on Coastal Lowlands of theCentral Coast and Lower North Coast)

**Structure:**

| | |
|---|---|
| Upper Stratum: | To 12 metres high, with 70% Projected Foliage Cover |
| (PFC).Mid Stratum: | To 4 metres high, with 10% PFC. |
| Lower Stratum: | To 0.2-0.5 metres high, with 100% PFC. |

**Floristics:**

**(Characteristic Species)**

| | |
|---|---|
| Upper Stratum: | *Casuarina glauca.* |
| Mid Stratum: | *Melaleuca quinquenervia, Senna pendula var. glabrata* and *Lantana camara.* |
| Lower Stratum: | *Hydrocotyle bonariensis, Ageratina adenophora, Asparagus aethiopicus, Zantedeschia aethiopica* and *Stenotaphrum secundatum.* |

**Variation:**
Larger patches generally contain higher densities of trees and an unmanaged understorey, whereas smaller patches occur in areas of managed exotic grassland.

**Disturbance:**
Disturbances include weed invasion, clearing and ongoing understorey management.

**Weed Invasion:**

High levels of weed invasion were present within the understorey layers. Dominant species observed include *Senna pendula var. glabrata, Lantana camara, Hydrocotyle bonariensis, Ageratina adenophora, Asparagus aethiopicus, Zantedeschia aethiopica* and *Stenotaphrum secundatum*

**Location and Distribution:**

This community occurs is scattered, particularly throughout the western sections of the site with a larger patch within the central western area (Figure 19). The area of occupancy within the site is 0.6 hectares.

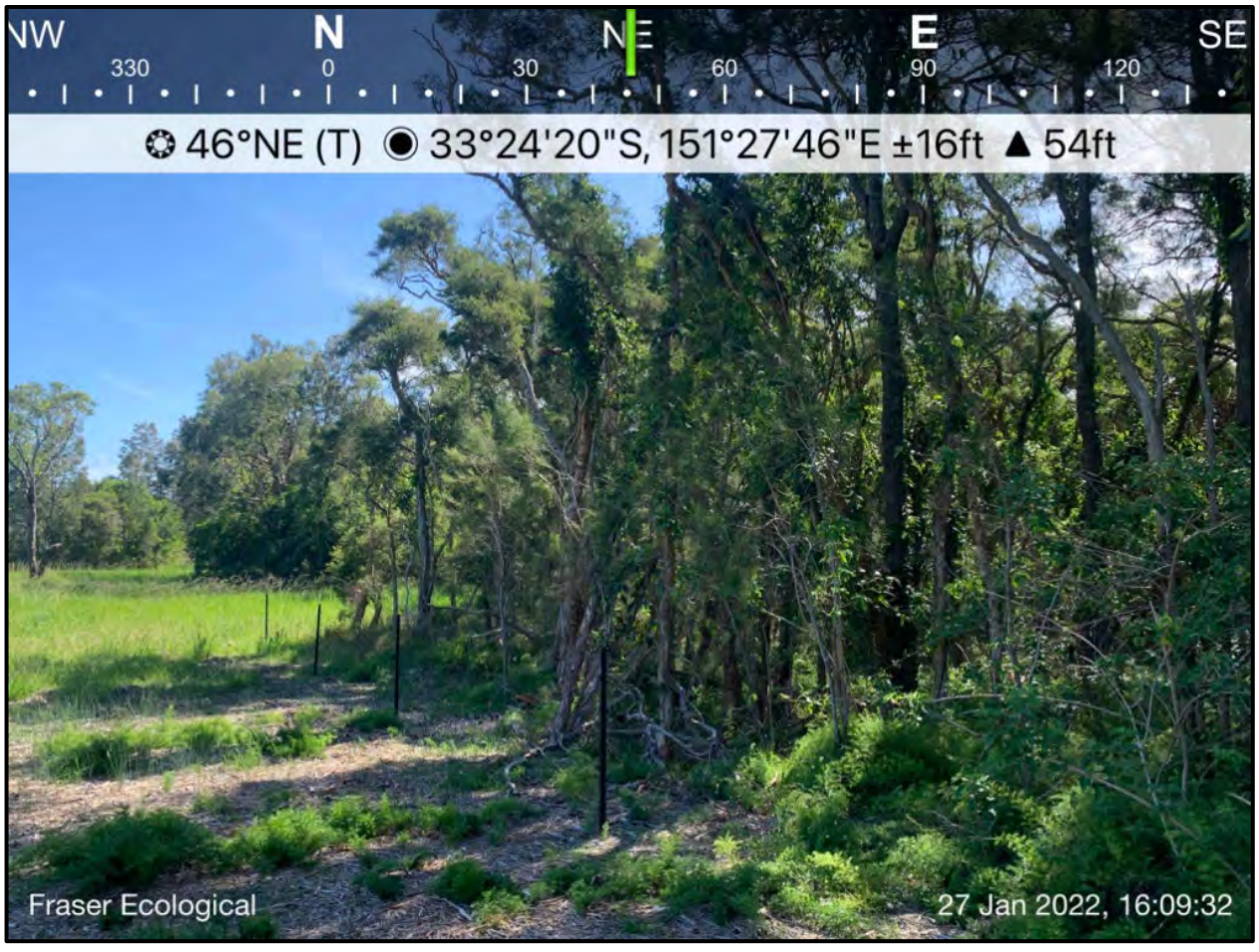
**Classification:**

This vegetation community corresponds to a disturbed variant of Map Unit SF11i Estuarine SwampOak Forest, as described by Bell (2019).

**Note:**

The occurrences of this Endangered Ecological Community in the western part of Lot 522 DP 1077907 is the subject of a Vegetation Management Plan under a Planning Agreement relating to the land. This area, zoned C2 Environmental Conservation, is to be placed under an 88B restriction as to its use and enforced under Section 88E of the *Conveyancing Act 1919*.

**BAM plots were undertaken where it occurs as patches across the proposed development area.**




**Photograph 1: PCT 1728 Swamp Oak – Prickly Paperbark- Tall Sedge Swamp Forest on Coastal Lowlands of theCentral Coast and Lower North Coast**

# *BioNet Vegetation Classification - Community Profile Report*

***Plant Community Type ID (PCT ID):*** 1728

***PCT Name:*** Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast

***Classification Confidence Level:*** 2-High

***Vegetation Description:*** Casuarina dominated Swamp Open Forests with a myrtaceous mid-stratum. The ground stratum be dominated by ferns; sedges or grasses depending on local inundation periods.| This community is found in poorly drained sites from East Gosford north to Tuncurry. Substrates are unconsolidated sediments and elevations are below 20m.

***Variation and Natural Disturbance:***

***Vegetation Formation:*** Forested Wetlands;

***Vegetation Class:*** Coastal Floodplain Wetlands;

***IBRA Bioregion(s):*** NSW North Coast; Sydney Basin;

***IBRA Sub-region(s):*** Hunter; Karuah Manning; Macleay Hastings; Pittwater; Upper Hunter; Wyong; Yengo;

***LGA:*** CESSNOCK; DUNGOG; GOSFORD; GREAT LAKES; GREATER TAREE; LAKE MACQUARIE; MAITLAND; NEWCASTLE; PORT MACQUARIE-HASTINGS; PORT STEPHENS; WYONG;

***Lithology:*** Sandstone

***Landform Pattern:*** Not Assessed

***Landform Element:*** Not Assessed

***Emergent species: None***

***Upper Stratum Species:*** Casuarina glauca;

***Mid Stratum Species:*** Melaleuca styphelioides; Melaleuca nodosa;

***Ground Stratum Species:*** Carex appressa; Juncus usitatus; Hypolepis muelleri; Gahnia clarkei; Entolasia marginata; Cynodon dactylon; Persicaria hydropiper; Baumea articulata;

***Diagnostic Species:***

(Species Name:Group Score, Group Frequency,Non Group Score, Non Group Frequency; Fidelity Class)

Casuarina glauca: 5, 100%, 3, 5%; positive
Melaleuca styphelioides: 2, 64%, 2, 5%; positive
Melaleuca nodosa: 2, 27%, 3, 11%; uninformative
Carex appressa: 3, 64%, 2, 7%; positive
Juncus usitatus: 2, 64%, 1, 3%; positive
Hypolepis muelleri: 5, 36%, 2, 4%; positive
Gahnia clarkei: 2, 55%, 2, 10%; uninformative
Entolasia marginata: 2, 55%, 2, 16%; uninformative
Cynodon dactylon: 3, 27%, 3, 7%; uninformative
Persicaria hydropiper: 3, 27%, 2, 0%; uninformative
Baumea articulata: 1, 27%, 3, 2%; uninformative

***Fire Regime:***

***TEC Assessed:*** Has associated TEC

***TEC List:*** Listed BC Act,E: Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Part);

***Associated TEC Comments:*** Forms part of the Endangered Ecological Community "Swamp oak floodplain forest of the NSW North Coast| Sydney Basin and South East Corner bioregions"

***PCT Percent Cleared:*** 81.00

***PCT Definition Status:*** Approved

### 3.1.2 PAPERBARK SWAMP SCLEROPHYLL FOREST (EEC)

(PCT 1716 Prickly-leaved Paperbark forest on coastal lowlands of the Central Coast and Lower NorthCoast)

**Structure:**

| | |
|---|---|
| Upper Stratum: | To 12 metres high, with 70% Projected Foliage Cover |
| (PFC).Mid Stratum: | To 4 metres high, with 10% PFC. |
| Lower Stratum: | To 0.2-0.5 metres high, with 100% PFC. |

**Floristics:**
**(Characteristic Species)**

| | |
|---|---|
| Upper Stratum: | *Casuarina glauca.* |
| Mid Stratum: | *Melaleuca quinquenervia, Senna pendula var. glabrata* and *Lantana camara.* |
| Lower Stratum: | *Hydrocotyle bonariensis, Ageratina adenophora, Asparagus aethiopicus, Zantedeschia aethiopica* and *Stenotaphrumsecundatum.* |

**Variation:**
Larger patches generally contain higher densities of trees and an unmanaged understorey, whereassmaller patches occur in areas of managed exotic grassland.

**Disturbance:**
Disturbances include weed invasion, clearing and ongoing understorey management.

**Weed Invasion:**
High levels of weed invasion were present within the understorey layers. Dominant species observed include *Senna pendula var. glabrata, Lantana camara, Hydrocotyle bonariensis, Ageratina adenophora, Asparagus aethiopicus, Zantedeschia aethiopica* and *Stenotaphrum secundatum.*

**Location and Distribution:**
This community occurs is scattered, particularly throughout the western sections of the site with alarger patch within the central western area. The area of occupancy within the site is approximately 1.7 hectares (Figure 19).

**Classification:**
This vegetation community corresponds to Map Unit SF10i Estuarine Paperbark Scrub Forest, as described by Bell (2019).

**Note:**

The occurrences of this Endangered Ecological Community in the western part of Lot 522 DP 1077907 is the subject of a Vegetation Management Plan under a Planning Agreement relating to the land. This area, zoned C2 Environmental Conservation, is to be placed under an 88B restriction as to its use and enforced under Section 88E of *The Conveyancing Act, 1919*.

**This vegetation zone will not be impacted by the proposed development, and therefore, BAM plot surveys were not required for this extent of the PCT.**


**Photograph 2: PCT 1716 Prickly-leaved Paperbark forest on coastal lowlands of the Central Coast and Lower North Coast**

# *BioNet Vegetation Classification - Community Profile Report*

***Plant Community Type ID (PCT ID):*** 1716

***PCT Name:*** Prickly-leaved Paperbark forest on coastal lowlands of the Central Coast and Lower North Coast

***Classification Confidence Level:*** 2-High

***Vegetation Description:*** Myrtaceous; seasonally wet; Tall Shrubland/Low Open Forest with emergent Eucalypts. The main canopy may contain a variety of species in association with M. nodosa. The ground stratum is relatively dense and is dominated by grasses.| This community is found on poorly drained areas on the undulating coastal lowlands from Wamberal north to Yarratt State Forest. This community typically occurs on unconsolidated sediments or on fine-grained sedimentary geologies at elevations up to 100m.

***Variation and Natural Disturbance:***

***Vegetation Formation:*** Forested Wetlands;

***Vegetation Class:*** Coastal Swamp Forests;

***IBRA Bioregion(s):*** NSW North Coast; Sydney Basin;

***IBRA Sub-region(s):*** Hunter; Karuah Manning; Macleay Hastings; Mummel Escarpment; Pittwater; Upper Hunter; Wyong; Yengo;

***LGA:*** CESSNOCK; DUNGOG; GLOUCESTER; GOSFORD; GREAT LAKES; GREATER TAREE; LAKE MACQUARIE; MAITLAND; NEWCASTLE; PORT MACQUARIE-HASTINGS; PORT STEPHENS; SINGLETON; WYONG;

***Lithology:*** Sandstone

***Landform Pattern:*** Not Assessed

***Landform Element:*** Not Assessed

***Emergent species: None***

***Upper Stratum Species:*** Eucalyptus resinifera;

***Mid Stratum Species:*** Melaleuca nodosa; Breynia oblongifolia; Glochidion ferdinandi; Acacia longifolia; Melaleuca sieberi; Melaleuca linariifolia;

***Ground Stratum Species:*** Imperata cylindrica; Dichondra repens; Microlaena stipoides; Entolasia marginata; Dianella caerulea; Entolasia stricta; Oplismenus imbecillis; Lomandra longifolia;

***Diagnostic Species:***

(Species Name:Group Score, Group Frequency,Non Group Score, Non Group Frequency; Fidelity Class)

Melaleuca nodosa: 5, 98%, 3, 10%; positive
Breynia oblongifolia: 1, 41%, 1, 31%; uninformative
Glochidion ferdinandi: 2, 37%, 2, 14%; uninformative
Acacia longifolia: 1, 37%, 2, 14%; uninformative
Melaleuca sieberi: 2, 31%, 2, 6%; uninformative
Melaleuca linariifolia: 2, 29%, 2, 6%; uninformative
Imperata cylindrica: 2, 65%, 2, 33%; positive
Dichondra repens: 2, 61%, 2, 37%; positive
Microlaena stipoides: 3, 49%, 2, 40%; positive
Entolasia marginata: 2, 43%, 2, 16%; positive
Dianella caerulea: 2, 84%, 2, 54%; uninformative
Entolasia stricta: 3, 75%, 2, 41%; uninformative
Oplismenus imbecillis: 2, 37%, 2, 18%; positive
Lomandra longifolia: 2, 65%, 2, 58%; uninformative

***Fire Regime:***

***TEC Assessed:*** Has associated TEC

***TEC List:*** Listed BC Act,E: Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Part);

***Associated TEC Comments:***

***PCT Percent Cleared:*** 66.00

***PCT Definition Status:*** Approved

### 3.1.3 MANAGED LAND WITH SWAMP SCLEROPHYLL TREES (EEC)

(PCT 1722 Swamp Mahogany- Paperbarks- Harsh Ground Fern swamp forest of the Central Coast)

**Structure:**

| | |
|---|---|
| Upper Stratum: | To 8 metres high, with 20% Projected Foliage Cover |
| (PFC).Mid Stratum: | To 2.5 metres high, with 2% PFC. |
| Lower Stratum: | To 0.5 metres high, with 100% PFC. |

**Floristics:**

**(Characteristic Species)**

| | |
|---|---|
| Upper Stratum: | *Eucalyptus robusta* and *Angophora floribunda.* |
| Mid Stratum: | *Melaleuca quinquenervia* and *Melaleuca nodosa.* |
| Lower Stratum: | *Cynodon dactylon, Paspalum urvillei*, *Pennisetum clandestinum*, and *Oplismenus aemulus.* |

**Variation:**

Higher levels of *A. floribunda* were observed around the dam and as row of remnant trees along the boundary of Lot 4 DP 1000694 (Photograph 3a).

**Disturbance:**

This vegetation type has been disturbed by the long-term management and removal of understoreyvegetation (Photograph 3).

**Weed Invasion:**

The understorey is dominated by non-endemic species, particularly *C. dactylon* and other commonexotic pasture species.

**Location and Distribution:**

The vegetation type is scattered throughout the site in several small patches as shown in Figure 19.This community occupies approximately 0.6 hectares of the site.

**Classification:**

This vegetation type contains remnant trees characteristic of Map Unit SF07i Narrabeen AlluvialSedge Woodland, as described by Bell (2019).


**Photograph 3: PCT 1722 Swamp Mahogany- Paperbarks- Harsh Ground Fern swamp forest of the Central Coast**


**Photograph 3a: PCT 1722 Swamp Mahogany- Paperbarks- Harsh Ground Fern swamp forest of the Central Coast along the boundary of Lot 4 DP 1000694**

# *BioNet Vegetation Classification - Community Profile Report*

***Plant Community Type ID (PCT ID):*** 1722

***PCT Name:*** Swamp Mahogany - Paperbarks - Harsh Ground Fern swamp forest of the Central Coast

***Classification Confidence Level:*** 2-High

***Vegetation Description:*** Eucalypt dominated Swamp Open Forests with variety of co-dominants possible. The mid-stratum is comprised of tall shrubs and may be dense in places. The ground stratum is characterised by ferns and sedges.| This community is distributed within the study area on poorly drained sites on barrier sands of the lower North Coast and Central Coast at elevations below 100m.

***Variation and Natural Disturbance:***

***Vegetation Formation:*** Forested Wetlands;

***Vegetation Class:*** Coastal Swamp Forests;

***IBRA Bioregion(s):*** NSW North Coast; Sydney Basin;

***IBRA Sub-region(s):*** Hunter; Karuah Manning; Macleay Hastings; Pittwater; Upper Hunter; Wyong;

***LGA:*** CESSNOCK; DUNGOG; GOSFORD; GREAT LAKES; GREATER TAREE; LAKE MACQUARIE; MAITLAND; NEWCASTLE; PORT MACQUARIE-HASTINGS; PORT STEPHENS; WYONG;

***Lithology:*** Sandstone

***Landform Pattern:*** Not Assessed

***Landform Element:*** Not Assessed

***Emergent species: None***

***Upper Stratum Species:*** Eucalyptus robusta; Livistona australis; Acmena smithii; Casuarina glauca;

***Mid Stratum Species:*** Pittosporum undulatum; Glochidion ferdinandi; Melaleuca linariifolia; Melaleuca styphelioides;

***Ground Stratum Species:*** Hypolepis muelleri; Gahnia clarkei; Adiantum aethiopicum; Commelina cyanea;

***Diagnostic Species:***

(Species Name:Group Score, Group Frequency,Non Group Score, Non Group Frequency; Fidelity Class)

Eucalyptus robusta: 2, 60%, 2, 7%; positive
Livistona australis: 2, 60%, 2, 8%; uninformative
Acmena smithii: 1, 60%, 2, 15%; uninformative
Casuarina glauca: 2, 40%, 3, 5%; uninformative
Pittosporum undulatum: 2, 50%, 2, 12%; uninformative
Glochidion ferdinandi: 1, 50%, 2, 15%; uninformative
Melaleuca linariifolia: 2, 30%, 2, 7%; uninformative
Melaleuca styphelioides: 1, 30%, 2, 5%; uninformative
Hypolepis muelleri: 6, 90%, 2, 4%; positive
Gahnia clarkei: 2, 80%, 2, 10%; positive
Adiantum aethiopicum: 1, 30%, 2, 13%; uninformative
Commelina cyanea: 1, 40%, 2, 9%; uninformative

***Fire Regime:***

***TEC Assessed:*** Has associated TEC

***TEC List:*** Listed BC Act,E: Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Part);

***Associated TEC Comments:*** Forms part of the Endangered Ecological Community "Swamp sclerophyll forest on coastal floodplains of the NSW North Coast| Sydney Basin and South East Corner bioregions"

***PCT Percent Cleared:*** 26.00

***PCT Definition Status:*** Approved

### 3.1.4 MANAGED LAND WITH COASTAL WOODLAND TREES

(PCT 1636 Scribbly Gum- Red Bloodwood- Angophora inopina healthy woodland on lowlands of theCentral Coast)

**Structure:**

| | |
|---|---|
| Upper Stratum: | To 8 metres high, with 30% PFC. |
| Mid Stratum: | Absent. |
| Lower Stratum: | To 0.2 metres high, with 10% PFC. |

**Floristics:**

**(Characteristic Species)**

| | |
|---|---|
| Upper Stratum: | *Eucalyptus haemastoma and Eucalyptus capitellata x camfieldi*i. |
| Mid Stratum: | Absent. |
| Lower Stratum: | *Cynodon dactylon, Stenotaphrum secundatum and Entolasia stricta.* |

**Variation:**

The cover of ground stratum vegetation is patchy.

**Disturbance:**

This vegetation type has been disturbed by the removal and management of understorey vegetation.

**Weed Invasion:**

The dominant ground stratum species, *Cynodon dactylon and Stenotaphrum secundatum* are non- endemic.

**Location and Distribution:**

This vegetation type occurs as a small patch within the western section of the site as shown in Figure 19. This community occupies approximately 0.1 hectare of the site.

**Classification:**

This vegetation community contains remnant trees characteristic of Map Unit E31 Narrabeen Doyalson Coastal Woodland, as described by Bell (2019).

**Note:** Access to the property where this PCT is located (Lot 3 DP 1000694) was denied during recent surveys. However, this PCT will not be impacted by the proposal, and therefore, BAM plots were not required. All areas of this vegetation community will be subject to protection as part of future development (i.e. likely by way of the creation of a 'Restricted Development Area' on the title of property during subdivision stage if the application is approved). Furthermore, this area forms part of the Swift Parrot important habitat mapping area and is another reason for its exclusion from future development.


**Photograph 4: PCT 1636 Scribbly Gum- Red Bloodwood- Angophora inopina healthy woodland on lowlands of theCentral Coast**

# *BioNet Vegetation Classification - Community Profile Report*

***Plant Community Type ID (PCT ID):*** 1636

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

***Classification Confidence Level:*** 2-High

***Vegetation Description:*** Eucalypt dominated Woodlands with a shrubby mid-stratum and a graminoid ground cover.| This community occurs on coastal lowlands from northern Tuggerah Lake to the northern end of Lake Macquarie. The substrate is sandstone with moist sandy soils| elevation is usually under 100m.

***Variation and Natural Disturbance:***

***Vegetation Formation:*** Dry Sclerophyll Forests (Shrubby sub-formation);

***Vegetation Class:*** Sydney Coastal Dry Sclerophyll Forests;

***IBRA Bioregion(s):*** Sydney Basin;

***IBRA Sub-region(s):*** Hunter; Pittwater; Wyong;

***LGA:*** CESSNOCK; GOSFORD; LAKE MACQUARIE; NEWCASTLE; WYONG;

***Lithology:*** Sandstone , Conglomerate

***Landform Pattern:*** Not Assessed

***Landform Element:*** Not Assessed

***Emergent species: None***

***Upper Stratum Species:*** Eucalyptus haemastoma; Corymbia gummifera;

***Mid Stratum Species:*** Banksia oblongifolia; Leptospermum trinervium; Lambertia formosa; Xanthorrhoea latifolia; Hakea dactyloides;

***Ground Stratum Species:*** Epacris pulchella; Ptilothrix deusta; Petrophile pulchella; Lomandra obliqua; Themeda australis; Lepyrodia scariosa; Aristida warburgii;

***Diagnostic Species:***

(Species Name:Group Score, Group Frequency,Non Group Score, Non Group Frequency; Fidelity Class)

Eucalyptus haemastoma: 3, 91%, 2, 3%; positive
Corymbia gummifera: 2, 88%, 2, 14%; positive
Banksia oblongifolia: 3, 92%, 2, 7%; positive
Leptospermum trinervium: 2, 92%, 2, 14%; positive
Lambertia formosa: 2, 88%, 2, 6%; positive
Xanthorrhoea latifolia: 3, 80%, 2, 4%; positive
Hakea dactyloides: 2, 73%, 1, 6%; positive
Epacris pulchella: 2, 96%, 2, 7%; positive
Ptilothrix deusta: 3, 67%, 3, 7%; positive
Petrophile pulchella: 2, 64%, 2, 4%; positive
Lomandra obliqua: 2, 63%, 2, 10%; positive
Themeda australis: 3, 63%, 2, 33%; positive
Lepyrodia scariosa: 3, 49%, 3, 6%; positive
Aristida warburgii: 2, 40%, 2, 2%; positive

***Fire Regime:***

***TEC Assessed:*** Has associated TEC

***TEC List:*** Listed BC Act,CE: Kincumber Scribbly Gum Forest in the Sydney Basin Bioregion (Part);

***Associated TEC Comments:***

***PCT Percent Cleared:*** 58.00

***PCT Definition Status:*** Approved

### 3.1.5 DERIVED FRESHWATER WETLAND

(PCT 1737 Typha Rushland)

**Structure:**

| | |
|---|---|
| Upper Stratum: | Absent. |
| Mid Stratum: | Absent. |
| Lower Stratum: | To 1.5 metres high, with 20% PFC. |

**Floristics:**
**(Characteristic Species)**

| | |
|---|---|
| Upper Stratum: | Absent. |
| Mid Stratum: | Absent |
| Lower Stratum: | *Typha orientalis.* |

**Variation:**
Nil.

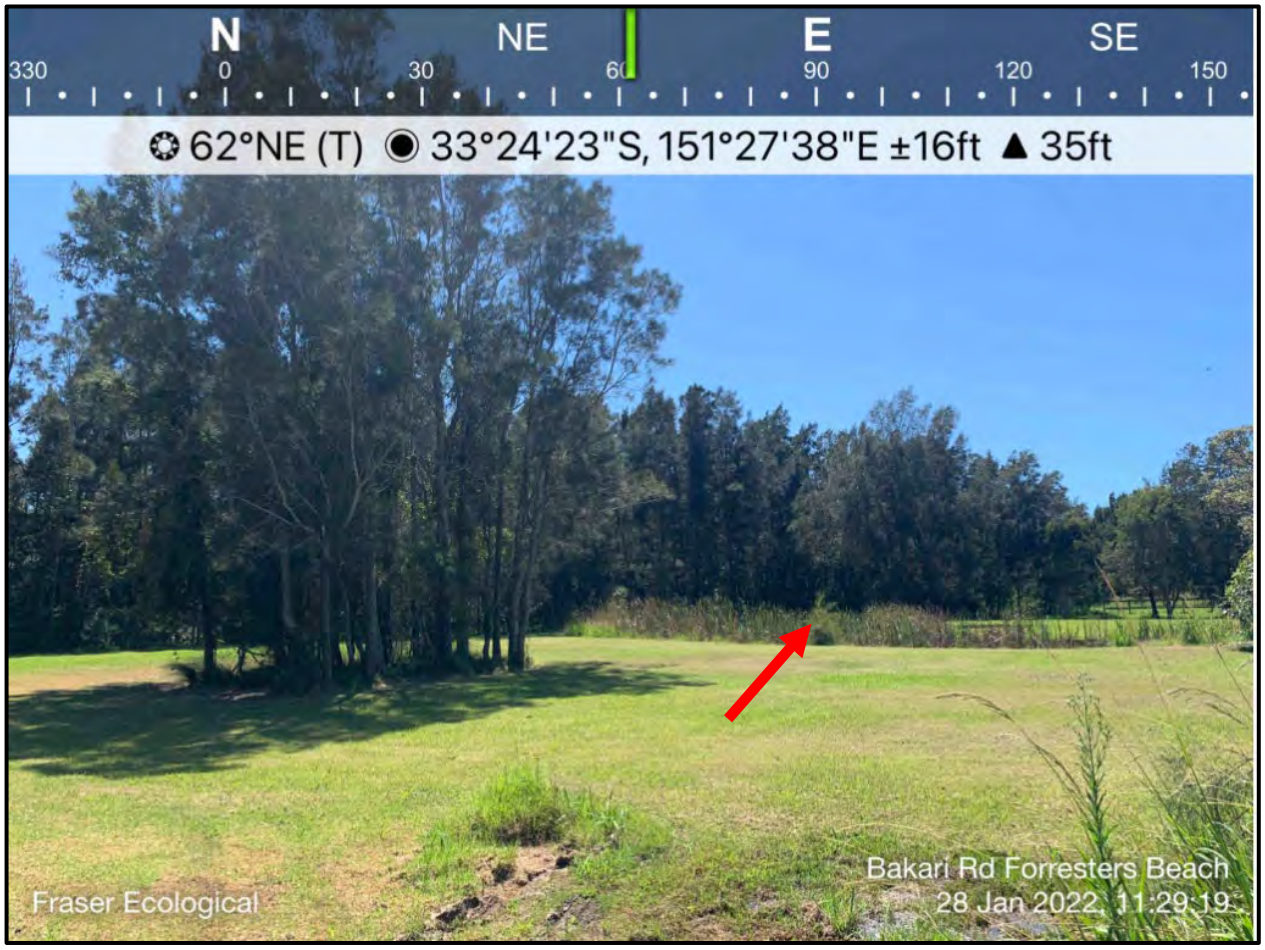
**Disturbance:**
Derived Freshwater Wetland vegetation is present within a man-made dam and is not a naturaloccurrence of Freshwater Wetland vegetation.

**Weed Invasion:**
No exotics were observed within this community.

**Location and Distribution:**
This community occurs within the dam in the western section of the site as shown in Figure 19. Thiscommunity occupies approximately 0.02 hectares of the site.

**Classification:**
This vegetation type is described by Bell (2019) as Map Unit SP02i Freshwater Typha Wetland. This vegetation community does not correspond to the Freshwater Wetlands on Coastal Floodplain EECas it is considered to be an artificial wetland created on previously dry land.

**Note:** Access to the dam where this PCT is located (Lot 3 DP 1000694) was denied during recent surveys. However, this PCT will not be impacted by the proposal, and therefore, BAM plots were not required. All areas of this vegetation community will be subject to protection as part of future development (i.e. likely by way of the creation of a 'Restricted Development Area' on the title of property during subdivision stage if the application is approved).




**Photograph 5: PCT 1737 Typha Rushland**

# *BioNet Vegetation Classification - Community Profile Report*

***Plant Community Type ID (PCT ID):*** 1737

***PCT Name:*** Typha rushland

***Classification Confidence Level:*** 2-High

***Vegetation Description:*** Tall Rushlands dominated by Typha| Melaleuca may occur as isolated emergents| This community typically occurs at the margins of standing fresh water along the coast from about Woy Woy to Hexham| there is one isolated occurrence in the Goulburn River NP. Substrates are generally sands and muds. Coastal occurrences have elevations of less than 50m| the western occurrence has an elevation of 367m.

***Variation and Natural Disturbance:***

***Vegetation Formation:*** Freshwater Wetlands;

***Vegetation Class:*** Coastal Freshwater Lagoons;

***IBRA Bioregion(s):*** NSW North Coast; Sydney Basin;

***IBRA Sub-region(s):*** Hunter; Karuah Manning; Kerrabee; Pittwater; Wyong; Yengo; Wollemi; Upper Hunter;

***LGA:*** Not Assessed

***Lithology:*** Sandstone

***Landform Pattern:*** Not Assessed

***Landform Element:*** Not Assessed

***Emergent species: None***

***Upper Stratum Species:*** Melaleuca quinquenervia;

***Mid Stratum Species:***

***Ground Stratum Species:*** Typha orientalis; Persicaria strigosa; Cladium procerum; Cynodon dactylon;

***Diagnostic Species:***

(Species Name:Group Score, Group Frequency,Non Group Score, Non Group Frequency; Fidelity Class)

Typha orientalis: 4, 100%, 2, 0%; positive
Persicaria strigosa: 6, 43%, 2, 1%; positive
Cladium procerum: 4, 29%, 3, 0%; uninformative
Cynodon dactylon: 4, 29%, 3, 7%; uninformative

***Fire Regime:***

***TEC Assessed:*** Has associated TEC

***TEC List:*** Listed BC Act,E: Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Part);

***Associated TEC Comments:*** This community forms part of the Endangered Ecological Community "Freshwater wetlands on coastal floodplains of the NSW North Coast| Sydney Basin and South East Corner bioregions"

***PCT Percent Cleared:*** 70.00

***PCT Definition Status:*** Approved

### 3.1.6 CLEARED LAND / NON-ENDEMIC VEGETATION

Cleared Land is present within the areas of the site which contain buildings, roads, landscape gardens, previous stock grazing pastures and areas of exotic grassland. The floristics is highly variable and dominated by exotic/non-endemic grasses such as *Pennisetum clandestinum*, *Cynodon dactylon* kikuyu and *Stenotaphrum secundatum.*

There are occurrences of introduced environmental tree species including Coral Tree (*Erythrina x sykesii*). The open cleared areas are historically subject to maintenance slashing when not subject to grazing.

Cleared Land / Non-endemic Vegetation is present across approximately 6.78 hectares of the site as mapped in Figure 19. It is considered 'non-native vegetation' as defined in Section 2.3.

Cleared land and nonendemic vegetation comprises a majority of the proposed development impact area. It is not consistent with a native plant community type (PCT).


**Photograph 6: Cleared areas**


**Figure 17: Council vegetation mapping identifying the site as containing 'Estuarine Paper bark Scrub Forest (source: Central Coast Council interactive online mapping viewer accessed 2 February 2022)**


**Figure 18: Council PCT mapping identifying the site as containing patches of PCT 1716 (Source: Central Coast Council interactive online mapping viewer accessed 2 February 2022)**


**Figure 19: Council EEC mapping (Source: Central Coast Council interactive online mapping viewer accessed 2nd February 2022)**

## Legend

Site Area

Proposed Development Area

**Plant Community Types**

| | |
|---|---|
| 1 | PCT 1636 - Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast |
| 2 | PCT1716 - Prickly-leaved Paperbark forest on coastal lowlands of the Central Coast and Lower North Coast |
| 3 | PCT1722 - Swamp Mahogany - Paperbarks - Harsh Ground Fern swamp forest of the Central Coast |
| 4 | PCT1728 - Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast |
| 5 | PCT 1737 - Typha Rushland |
| 6 | Cleared Land / Exotic & Planted Native Vegetation |

conacher consulting

N

0 50 100 150 200 m

Plan produced as A4 colour

Drawn By: DC
Drawing Version: 1

Drawing No: 21078
Date: 09/12/2021

* Plan for indicative purposes only. Not for detailed measurement.
Source: Aeral © Nearmap (2021) Air Photo Date: 14/01/2021

**Figure 20**
**Map of Plant Community Types**
**Bakali Road, Forresters Beach**

| TABLE 2<br>FLORA SPECIES OBSERVED DURING SURVEYS | | |
|---|---|---|
| **Family Name** | **Scientific Name** | **Common Name** |
| **Upper Stratum** | | |
| Casuarinaceae | *Casuarina glauca* | Swamp Oak |
| Lauraceae | *Cinnamomum camphora** | Camphor Laurel |
| Myrtaceae | *Angophora floribunda* | Rough-barked Apple |
| | *Erythrina sp* | Coral Tree |
| | *Eucalyptus camfieldii x capitellata* | Hybrid Stringybark |
| | *Eucalyptus haemastoma* | Scribbly Gum |
| | *Eucalyptus longifolia* | Woolybutt |
| | *Eucalyptus resinifera* subsp. *resinifera* | Red Mahogany |
| | *Eucalyptus robusta* | Swamp Mahogany |
| | *Melaleuca quinquenervia* | Broad-leaved Paperbark |
| | *Melaleuca styphelioides* | Prickly-leaved Tea Tree |
| Proteaceae | *Grevillea robusta** | Silky Oak |
| **Mid Stratum** | | |
| Araliaceae | *Polyscias sambucifolia* | Elderberry Panax |
| Arecaceae | *Livistona australis* | Cabbage Tree Palm |
| | *Chrysanthemoides monilifera* subsp. | |
| Asteraceae | *rotundata** | Boneseed/Bitou Bush |
| | *Ozothamnus diosmifolius* | Ball Everlasting |
| Euphorbiaceae | *Breynia oblongifolia* | Coffee Bush |
| | *Glochidion ferdinandii* | Cheese Tree |
| Faboideae | *Pultenaea daphnoides* | Large-leaf Bush Pea |
| Mimosoideae | *Acacia elongata* | Swamp Wattle |
| | *Acacia floribunda* | Sally Wattle |
| | *Acacia longifolia* var. *longifolia* | Sydney Golden Wattle |
| | *Acacia suaveolens* | Sweet Scented Wattle |
| Myrtaceae | *Leptospermum polygalifolium* | Lemon Scented Tea-tree |
| | *Melaleuca ericifolia* | Swamp Paperbark |
| | *Melaleuca linariifolia* | Snow in Summer |
| | *Melaleuca nodosa* | Ball Honey Myrtle |
| Oleaceae | *Ligustrum sinense** | Small-leaved Privet |
| Phytolaccaceae | *Phytolacca octandra** | Inkweed |
| Pittosporaceae | *Pittosporum revolutum* | Yellow Pittosporum |
| Verbenaceae | *Lantana camara** | Lantana |
| **Lower Stratum** | | |
| Adiantaceae | *Adiantum aethiopicum* | Common Maidenhair |
| Alliaceae | *Narcissus sp** | Daffodil |
| | *Narcissus sp** | Jonquil |
| Anthericaceae | *Caesia parviflora var. parviflora* | Pale Grass Lily |
| Apiaceae | *Centella asiatica* | Swamp Pennywort |
| | *Hydrocotyle laxiflora* | Stinking Pennywort |
| Araeceae | *Zantedeschia aethiopica** | White Arum Lily |
| Asteraceae | *Ageratina adenophora** | Crofton Weed |

| Family Name | Scientific Name | Common Name |
|---|---|---|
| | *Bidens pilosa** | Cobbler's Pegs |
| | *Cirsium vulgare** | Spear Thistle |
| | *Conyza sumatrensis** | Fleabane |
| | *Euchiton sphaericus* | - |
| | *Euchiton sphaericus* | Cudweed |
| | *Senecio madagascariensis** | Fireweed |
| | *Sigesbeckia orientalis* | Indian Weed |
| | *Taraxacum officinale** | Dandelion |
| Blechnaceae | *Doodia aspera* | Rasp Fern |
| Commelinaceae | *Commelina cyanea* | Scurvy Weed |
| Convolvulaceae | *Dichondra repens* | Kidney Weed |
| Cyperaceae | *Baumea juncea* | - |
| | *Cyperus eragrostis** | Umbrella Sedge |
| | *Gahnia clarkei* | Tall Saw-sedge |
| Dennstaedtiaceae | *Hypolepis muelleri* | Harsh Ground Fern |
| | *Pteridium esculentum* | Bracken |
| Faboideae | *Trifolium repens** | White Clover |
| Goodeniaceae | *Goodenia ovata* | - |
| Haloragaceae | *Gonocarpus teucroides* | Raspwort |
| Juncaceae | *Juncus cognatus** | - |
| | *Juncus usitatus* | Common Rush |
| Lobeliaceae | *Lobelia anceps* | |
| | *Pratia purpurascens* | Whiteroot |
| Lomandraceae | *Lomandra longifolia* | Spiky-headed Mat-rush |
| Malvaceae | *Sida rhombifolia** | Paddy's Lucerne |
| Myrsinaceae | *Anagallis arvensis** | Blue Pimpernel |
| | *Anagallis arvensis** | Scarlet Pimpernel |
| Phormiaceae | *Dianella caerulea* | Blue Flax Lily |
| Plantaginaceae | *Plantago lanceolata** | Ribwort |
| Poaceae | *Briza maxima** | Quaking Grass |
| | *Chloris gayana** | Rhodes Grass |
| | *Cortaderia selloana** | Pampas Grass |
| | *Cynodon dactylon* | Common Couch |
| | *Echinopogon caespitosus* var. *caespitosus* | Tufted Hedgehog Grass |
| | *Echinopogon ovatus* | Forest Hedgehog Grass |
| | *Entolasia marginata* | Bordered Panic |
| | *Entolasia stricta* | Wiry Panic |
| | *Imperata cylindrica* var. *major* | Blady Grass |
| | *Microlaena stipoides* var. *stipoides* | Weeping Rice Grass |
| | *Oplismenus aemulus* | Basket Grass |
| | *Oplismenus imbecillis* | - |
| | *Paspalum dilatatum* | Paspalum |
| | *Paspalum urvillei** | Vasey Grass |
| | *Poa affinis* | - |
| | *Pennisetum clandestinum* | Kikuyu Grass |

| Family Name | Scientific Name | Common Name |
|---|---|---|
| | *Setaria parviflora** | Slender Pigeon Grass |
| | *Sporobolus africanus** | Parramatta Grass |
| | *Sporobolus africanus** | Parramatta Grass |
| | *Sporobolus elongatus* | Slender Rat's Tail Grass |
| | *Stenotaphrum secundatum* | Buffalo Grass |
| Polygonaceae | *Rumex crispus** | Curled Dock |
| Rosaceae | *Rubus fruticosus* | Blackberry |
| Selaginallaceae | *Selaginella uliginosa* | Swamp Selaginella |
| Thymelaeaceae | *Pimelea linifolia* subsp. *linifolia* | Slender Rice Flower |
| Typhaceae | *Typha orientalis* | Cumbungi |
| Verbenaceae | *Verbena bonariensis** | Purpletop |
| Violaceae | *Viola hederacea* | Ivy-leaved Violet |
| **Climbers** | | |
| Apocynaceae | *Parsonsia straminea* | Common Silkpod |
| Basellaceae | *Anredera cordifolia** | Madiera Vine |
| Bignoniaceae | *Pandorea pandorana* | Wonga Vine |
| Caprifoliaceae | *Lonicera japonica** | Japanese Honeysuckle |
| Convolvulaceae | *Ipomoea indica** | Coastal Morning Glory |
| Faboideae | *Glycine clandestina* | Twining Glycine |
| | *Hardenbergia violacea* | False Sarsparilla |
| | *Kennedia rubicunda* | Dusky Coral Pea |
| Lauraceae | *Cassytha glabella* | Slender Devil's Twine |
| | *Cassytha pubescens* | Common Devil's Twine |
| Luzuriagaceae | *Geitonoplesium cymosum* | Scrambling Lily |
| Menispermiaceae | *Sarcopetalum harveyanum* | Pearl Vine |
| Pittosporaceae | *Billardiera scandens* | Apple Dumplings |
| Species name [TS] = Threatened Species * = Introduced Species | | |

## 3.2 Vegetation Zones

For the purposes of the BAM, a vegetation zone is an area of native vegetation on the site that is the same PCT and has a similar broad condition state. The assigned vegetation zone for the PCT occurring on the site are described below.

BAM plots only undertaken for vegetation impacted by future development.

The number of BAM plots surveyed for each PCT and corresponding patch size class is consistent with Table 3 from *Biodiversity Assessment Method 2020* – DPIE (below).

One BAM plot was only required for each of the two PCTs potentially impacted by future development – both with patch sizes less than 1 ha (refer to Table 3). Please refer to patch sizes provided in the next section to show the area of vegetation zones assessed.

**Table 4: Minimum number of plots required per zone area (BAM 2020)**

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**Table 3 Minimum number of plots required per zone area**

| Vegetation zone area (ha) | Minimum number of plots |
|---|---|
| <2 | 1 plot |
| >2–5 | 2 plots |
| >5–20 | 3 plots |
| >20–50 | 4 plots |
| >50–100 | 5 plots |
| >100–250 | 6 plots |
| >250–1000 | 7 plots; more plots may be needed if the condition of the vegetation is variable across the zone |
| >1000 | 8 plots; more plots may be needed if the condition of the vegetation is variable across the zone |

### 3.2.1 Patch Sizes

A patch size area (areas impacted by the proposal) have been assigned to each vegetation zone, as a class. Patch size classes are provided in Table 4.

**Table 5: Patch Size Classes**

| PCT affected by proposal | Minimum number of Vegetation Zones | Total area of vegetation potentially impacted by proposal used in the BAM-C assessment | Patch Size Class impacted by proposal (as defined by the BAM) |
|---|---|---|---|
| PCT 1728 Swamp Oak – Prickly Paperbark- Tall Sedge Swamp Forest on Coastal Lowlands of the Central Coast and Lower North Coast | 1 | 0.6ha | >100 ha |
| PCT 1722 Swamp Mahogany-Paperbarks-Harsh Ground Fern swamp forest of the Central Coast | 1 | 0.6ha | >100 ha |

### 3.2.2 Vegetation Integrity Scores

In accordance with section 9.2. of the BAM (OEH 2020a) if, during the assessment of biodiversity values for any type of development, clearing or biodiversity certification proposal, the assessor determines that:

(a) an area of land does not contain native vegetation, or

- (b) a vegetation zone has a vegetation integrity score <15 where the PCT is representative of an endangered or critically endangered ecological community, or
- (c) a vegetation zone has a vegetation integrity score <17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits), or is representative of a vulnerable ecological community, or
- (d) a vegetation zone has a vegetation integrity score <20 where the PCT is not representative of a TEC or associated with threatened species habitat then for that vegetation zone:
- (e) assessment of native vegetation is not required beyond Section 5.4.

An offset is not needed for impacts on native vegetation if the vegetation integrity score is below those listed in subsection 9.2.1(1.) of the BAM (see above); however, if the entity is at risk of an SAII the assessor will need to address the relevant SAII criteria.

Each vegetation zone identified on the site has been surveyed to obtain a quantitative measure for each zone, of the composition, structure and function attributes listed in Table 3 of the BAM. These attributes are listed below:

- Growth form groups used to assess composition and structure:
  - Tree
  - Shrub
  - Grass and grass like
  - Forb
  - Fern
  - Other
- Attributes used to assess function:
  - Number of large trees
  - Tree regeneration
  - Tree stem size class
  - Total length of fallen logs
  - Litter cover

- High threat exotic vegetation cover
- Hollow-bearing trees

Plot-base surveys were conducted, in accordance with s.5.3.4 of the BAM, by an ecologist (Alex Fraser). Survey plots were established around a central 50 m transect and included:

- One 400 m² (20 m x 20 m) plot to assess the composition and structure attributes listed above.
- One 1000 m² (20 m x 50 m) plot to assess the function attributes: number of large trees, stem size class, tree regeneration and length of logs.
- Five 1 m² sub-plots to assess average litter cover (and other optional groundcover components).

Plot data, location and plot photographs are provided in Appendix B.

Table 5 details the vegetation integrity scores for each vegetation zone.

**Table 6: Vegetation Integrity Scores**

| PCT | Vegetation Zone ID No. | Composition Condition Score | Structure Condition Score | Function Condition Score | Vegetation Integrity Score |
|---|---|---|---|---|---|
| PCT 1728 Swamp Oak – Prickly Paperbark- Tall Sedge Swamp Forest on Coastal Lowlands of the Central Coast and Lower North Coast | 1 | 53.5 | 22.8 | 47.9 | 38.8 |
| PCT 1722 Swamp Mahogany- Paperbarks- Harsh Ground Fern swamp forest of the Central Coast | 2 | 25.3 | 47 | 41.5 | 36.7 |

## 3.3 Fauna habitat and species

The site contains coastal swamp forest/scrub vegetation, areas of disturbed remnant canopy vegetation characteristic of coastal swamp forest and coastal dry sclerophyll forest vegetation and cleared areas.

A range of niche habitats are present throughout the site, these include:

- Several hollow bearing trees (absent in the BAM plots) - refer to Figure 21;
- Areas of forest/scrub and canopy only vegetation;
- Nectar and seed producing trees and shrubs;
- Leaf litter leaf litter and fallen timber;
- Cleared areas;
- Farm dam, ponds in drainage line.

A summary of fauna habitats present and absent is provided in Table 6.

The main development impact area provides fauna habitat in the following forms:

- Seasonal foraging resources when eucalypts and other plants flower provide nectar and insect resources for mobile fauna including Grey-headed Flying Fox, possums, gliders, microchiropteran bats and a variety of woodland bird species (breeding habitat absent)
- Seasonal sources of seed on the forest floor and grasses and acacias for parrots
- Bird species likely to occur include parrots and nectivorous honeyeaters that forage and roost in the upper canopy of the trees. Blossoms from flowering canopy Myrtaceae would attract a variety of nectivores including possums, birds and threatened Grey-headed Flying Fox.
- Southern Myotis (*Myotis macropus*) was observed foraging on site during anabat surveys undertaken by Conachers Environmental (dated January 2022) most likely due to the presence of the dam within proposed Staged 4 area.

Large Forest Owls including threatened Barking Owl (*Ninox connivens*), Masked Owl (*Tyto novaehollandiae*) and Powerful Owl (*Ninox strenua*) may occasionally visit the site depending upon the availability of prey items, however critical breeding resources (suitable hollow-bearing trees) were not observed on site.

Other mobile threatened fauna species, Grey-headed Flying-fox and a variety of microchiropteran bat species are likely to forage over the subject site, important maternity sites were observed during surveys.

Fauna habitat of significant value was not recorded within the proposed development impact area.

The fauna species observed within the subject site are listed in Table 7 (following page).

**TABLE 6**

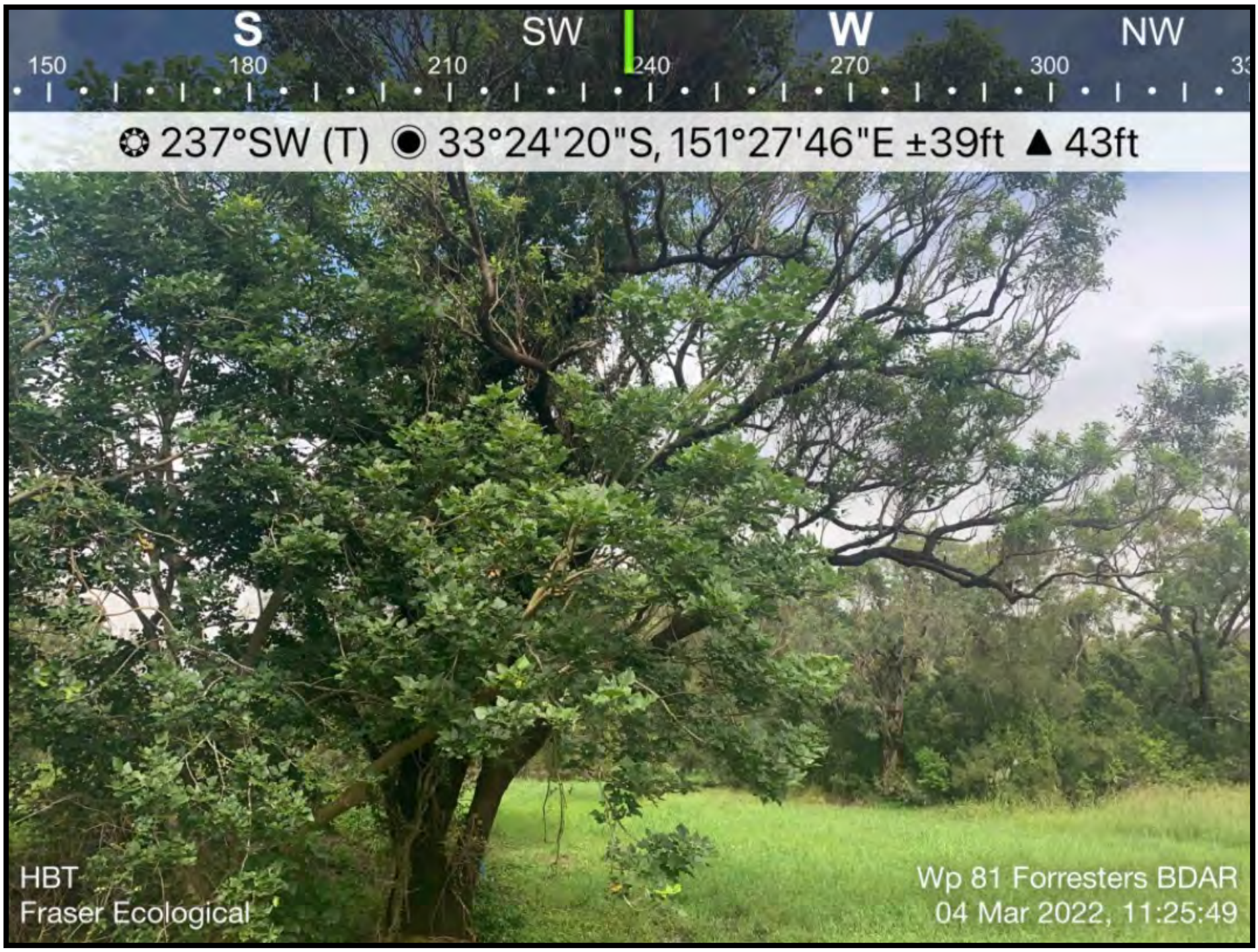
**FAUNA HABITATS**

**RECORDED ON-SITE**

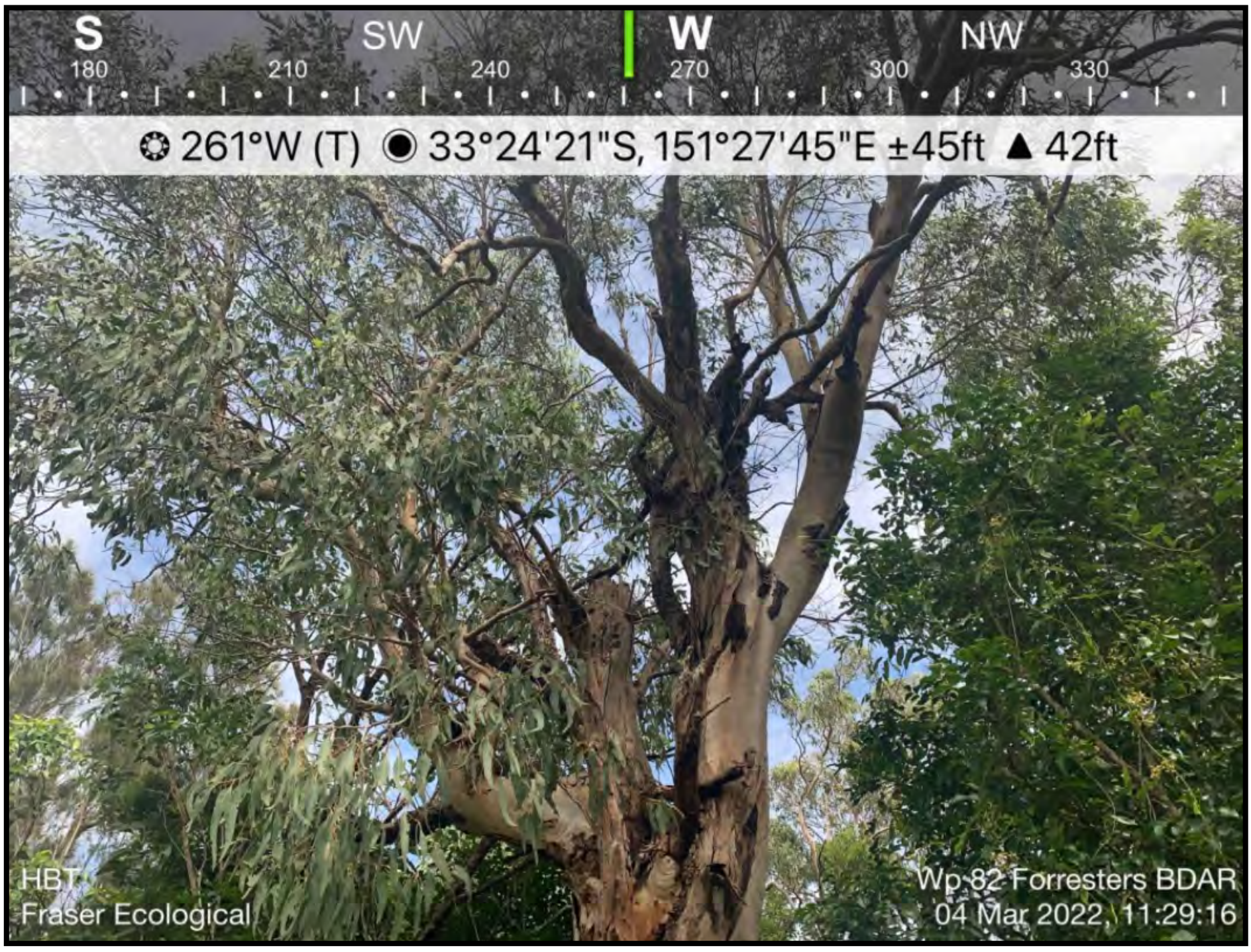
| Key habitat Type | Presence | Comments |
|---|---|---|
| Hollow bearing trees | Yes | No large hollows suitable for large forest owls observed |
| Mature trees | Yes | Many trees present |
| Culverts | No | None observed |
| Rock Shelters / Caves / Crevices | No | None observed |
| Acacia shrubs | Yes | Low densities |
| Banksia shrubs | No | None observed |
| Native Grasses | Yes | Native understory grasses are present |
| Man-made features | Yes | Several dwellings, including one dilapidated dwelling and garage present. |
| The native vegetation types present | Yes | See Section 2 |
| Areas of cleared land and exotic vegetation | Yes | See Section 2 |
| Any exposed areas of bush rock including outcrops | No | None observed |
| Natural burrows | No | None observed |
| Large trees with basal cavities | No | None observed |
| Logs | Yes | Low densities only |
| Wetlands, streams, and waterbodies etc. | Yes | A dam is present within the site<br>A mapped watercourse is also present in the location of a man-made drainage channel |
| Large nests and roosts | No | None observed |
| Wombat burrows | No | None observed |
| Dens used by Petaurus gliders | No | None observed |
| Petaurus glider sap feed trees | No | None observed |
| Distinctive scats | No | None observed |
| Latrine and den sites pf the Spotted-tailed Quoll | No | None observed |
| *Allocasuarina* spp. trees | No | None observed |
| Flying-fox camps | No | None observed |
| Micro chiropteran bat subterranean roosts (culverts, tunnels and disused mineshafts | No | None observed |
| Regent Honeyeater feed or nest trees; | No site use observed | Suitable feed trees present |
| Swift Parrot feed trees; | No site use observed | Suitable feed trees present |
| Winter-flowering eucalypts | Yes | *Eucalyptus robusta* is present. |
| Mistletoes | No | None observed. |
| Permanent soaks and seepages | Yes | The western section of the site contains low lying land which is subject to inundation. |


| Way Point No. (red circle) | Tree species | DBH | Notes |
|---|---|---|---|
| 1 | *E.robusta* | 450 | Very small crevice observed - possibly microbats |
| 2 | *E.sclerophylla* | 500 | Multiple crevices and spouts observed- retained in Open Space Area |
| 3 | *Dead (stag)* | 380 | Stag - retained in Open Space Area |
| 4 | *E.robusta* | 450 | Termite nest - retained in Open Space Area |

**Figure 21: Location of hollow-bearing trees**

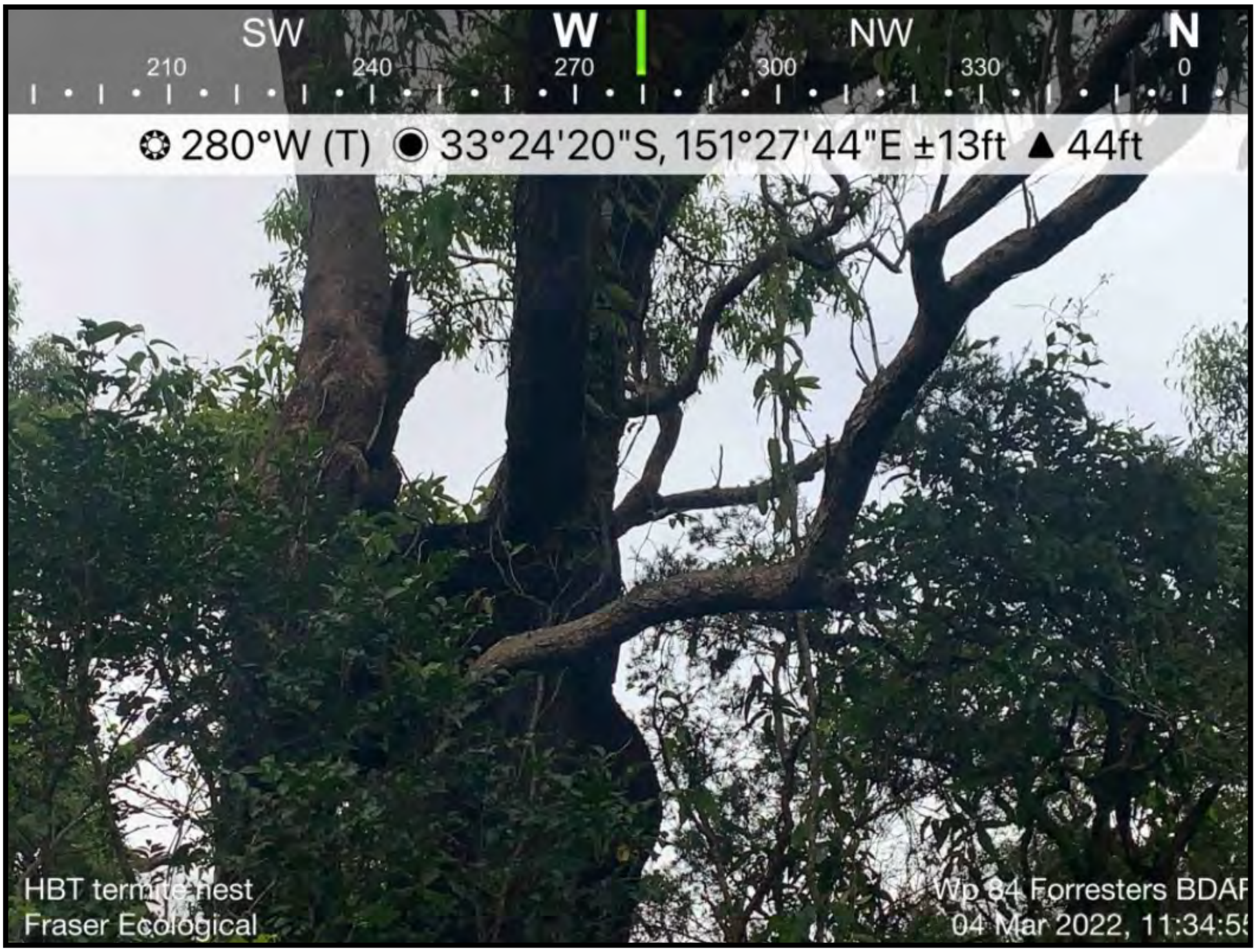



**Photograph A: Hollow-bearing tree # 1 (Proposed Open Space Area)**




**Photograph B: Hollow-bearing tree # 2 (Proposed E2 zoned land)**


**Photograph B: Hollow-bearing tree # 3 (Proposed E2 zoned land)**




**Photograph C: Hollow-bearing tree # 4 (Proposed E2 zoned land)**

**TABLE 7: FAUNA RECORDED WITHIN THE SUBJECT SITE**

| Common Name | Scientific Name | Observation Type |
|---|---|---|
| Rufous Whistler | *Pachycephala rufiventris* | OW |
| Magpie-lark | *Grallina cyanoleuca* | OW |
| Eastern Whipbird | *Psophodes olivaceus* | W |
| Brown Thornbill | *Acanthiza pusilla* | OW |
| White-browed Scrubwren | *Sericornis frontalis* | OW |
| Superb Fairy-wren | *Malurus cyaneus* | OW |
| Lewin's Honeyeater | *Meliphaga lewinii* | OW |
| Yellow-faced Honeyeater | *Lichenostomus chrysops* | OW |
| Noisy Miner | *Manorina melanocephala* | OW |
| Noisy Friarbird | *Philemon corniculatus* | OW |
| Double-barred Finch | *Taeniopygia bichenovii* | OW |
| Red-browed Finch | *Neochmia temporalis* | OW |
| Pied Currawong | *Strepera graculina* | OW |
| Pied Butcherbird | *Cracticus nigrogularis* | W |
| Grey Butcherbird | *Cracticus torquatus* | W |
| Australian Magpie | *Cracticus tibicen* | OW |
| Little Wattlebird | *Anthochaera chrysoptera* | OW |
| Domestic Fowl* | *Gallus gallus domesticus* | OW |
| Australian Raven | *Corvus coronoides* | OW |
| Red-whiskered Bulbul* | *Pycnonotus jocosus* | O |
| **Mammals** | | |
| Sugar Glider | *Petaurus breviceps* | Q |
| Brush tailed Possum | *Trichosurus vulpecula* | Q |
| Brown Antechinus | *Antechinus stuartii* | Q |
| Bush Rat | *Rattus fuscipes* | T |
| Rabbit * | *Oryctolagus cuniculus* | P |
| Cat * | *Felis catus* | O |
| Grey-headed Flying-fox TS | *Pteropus poliocephalus* | O |
| Gould's Long-eared Bat | *Nyctophilus gouldi* | U |
| Gould's Wattled Bat | *Chalinolobus gouldii* | U |
| Eastern False Pipistrelle TS | *Falsistrellus tasmaniensis* | U |
| Eastern Bentwing-bat TS | *Miniopterus schreibersii* | U |
| Southern Myotis TS | *Myotis macropus* | U |
| | | U |

**Key to Observation Type**

E - Nest / Roost
F - Tracks / Scratchings / Chew Marks
Burrow
G - Crushed Cones
H - Hair / Feathers / Skin
K - Dead
M - Miscellaneous Record
O - Observed
OW - Observed and Heard CallFB -
P - Scat
Q - Camera
T - Trapped
U - Ultrasonic Recording
W - Heard

Note: * indicates introduced species. TS indicates threatened species

**Table 9: Amphibian species recorded within the study area (survey undertaken Feb/ March 2022 by Treehouse Ecology)**

| Common name | Scientific name | Method observed |
|---|---|---|
| **AMPHIBIANS** | | |
| Common Eastern Froglet | *Crinia signifera* | W |
| Dusky Toadlet | *Uperoleia fusca* | W P O |
| Dwarf Tree Frog | *Litoria fallax* | W |
| Peron's Tree Frog | *Litoria peronii* | W |
| Striped Marsh Frog | *Limnodynastes peronii* | W |

Note: All species listed are identified to a high level of certainty unless otherwise noted as:

$^{PR}$ indicates species identified to a 'probable' level of certainty – more likely than not
$^{PO}$ indicates species identified to a 'possible' level of certainty – low-moderate level of confidence

| | | | |
|---|---|---|---|
| E - Nest / roost<br>F - Tracks / scratchings<br>FB - Burrow<br>G - Crushed cones | H - Hair / feathers / skin<br>K - Dead<br>O - Observed<br>OW - Observed & heard call | P - Scat<br>Q - Camera<br>T - Trapped / netted<br>U - Ultrasound recording | W - Heard call<br>X - In scat<br>Y - Bone / teeth / shell<br>Z - In raptor / owl pellet |

# 4 THREATENED SPECIES

## 4.1 Ecosystem Credit Species

Ecosystem credit species are those where the likelihood of occurrence of the species or elements of the species' habitat, can be predicted by vegetation surrogates and landscape features, or for which targeted survey has a low probability of detection.

The Threatened Biodiversity Data Collection (TBCD) has identified several ecosystem credit species as requiring assessment as shown on the following page.

## 4.2 Species Credit Species (Candidate Species)

Species credit species (or candidate species) are those where the likelihood of occurrence of the species or elements of suitable habitat for the species, cannot be confidently predicted by vegetation surrogates and landscape features and can be reliably detected by survey.

In accordance with S.6.5.1.1. a species survey must be undertaken for all species credit species identified as likely to occur on the site based upon the application of Steps 1-3 in Section 6.4.

Based upon the low quality of fauna habitat within future development areas proposed for removal and the extensive targeted fauna surveys undertaken by Conachers Environmental as part of the Flora and Fauna Assessment (dated January 2022) and additional amphibian surveys (Treehouse Ecology dated Feb/March 2022), species credit species are unlikely to occur on-site.

However, Southern Myotis (*Myotis macropus*) was observed foraging on site during anabat surveys undertaken by Conachers Environmental (dated January 2022). The species polygon provided on the following pages for this species covers the entire site, and therefore, credit retirement would be required.

The TBDC has identified several candidate species as requiring assessment as provided on the following page (Table 10).

We have supplemented the candidate threatened species list with local records in the BIONET Atlas and justified any exclusions for all candidate species within Table 10.

## Table 10 Candidate species assessment – BAKALI ROAD FORRESTERS BEACH RE-ZONING

| Common name | Scientific name | BC Act status | SAII Entity | Targeted surveys conducted | Ideal survey period (TBDC) | Relevant guidelines | Habitat Constraints (from BAM- C) | Habitat requirements | Justification for exclusion | Biodiversity risk weighting | Sensitivity to gain class | No. of BIONET records in the locality (accessed 4/3/22) | Biodiversity Offset Credits required? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Large-eared Pied Bat (foraging) | *Chalinolobus dwyeri* | *Endangered* | Yes | *Yes – anabat surveys were undertaken* | *Nov-January* | *n/a* | *Cliffs*<br><br>*Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels* | *This species is known to occur within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels. Whilst hilly terrain was observed within the surrounding locality of the Subject Land, aerial imagery revealed no such geological features (caves, overhangs escarpment etc.) within or adjacent to the Subject Land.* | *It is unlikely suitable habitat features would occur within the area surrounding the Subject Land. As such, this species was excluded from the assessment.*<br><br>*This species was not detected during targeted surveys.* | Very High -3 | Very High Sensitivity to Potential Gain | 0 | No |
| Regent Honeyeater (breeding) | *Anthochaera phrygia* | *Critically Endangered* | Yes | *Yes* | *n/a* | *No. The Subject Land is not located on the important areas map.* | *As per mapped areas* | *Suitable foraging habitat may occur for this species in the form of nectar-bearing trees however, it is not mapped as occurring in the area therefore requires no further address.* | *The Subject Land is not included in the DPIE 'map of important habitat'.* | Very High -3 | High Sensitivity to Potential Gain | 1 | No |
| Swift Parrot (breeding) | *Lathamus discolor* | *Endangered* | Yes | *Yes* | *n/a* | *The Subject Land is located on the important areas map.*<br><br>*National Recovery Plan for the Swift Parrot Lathamus discolor, Birds Australia, Melbourne. Saunders, D.L. and Tzaros, C.L. 2011* | *As per mapped areas* | *Suitable foraging habitat may occur for this species in the form of nectar-bearing trees.*<br><br>*The Subject Land is included in the DPIE 'map of important habitat'.*<br><br>*The proposed development has been designed to avoid or mapped areas. Breeding habitat is not present.*<br><br>non-breeding season; present in northern NSW for a shorter period than southern NSW.<br>The species is a dual credit species, with the species credit component mapped as an important area. These mapped areas do NOT require survey as it is presumed that the species is present. Any impact from development could potentially be serious and irreversible. Ecosystem credit areas are unlikely to have potential serious and irreversible impacts.<br><br>Important habitat maps (formally Important Mapped Area): Only select species have important habitat maps. These maps identify land that is considered important to support critical life stages of the species and are classed as species credits. Mapping is in accordance with the Guide for mapping threatened species for inclusion in the NSW regulatory framework. Maps may include breeding areas, key areas that migratory species forage/over-winter in, or sites where multiple records have been located over multiple years. Important habitat maps are generally restricted to species that are highly mobile and difficult to reliably detect by survey, and where long-term location data exists. If the subject land is within a mapped area, no survey is required for that species and it is assumed present. The part of the subject land within the important habitat map forms the species polygon | *The Subject Land is included in the DPIE 'map of important habitat'.*<br><br>*The proposed development has been designed to avoid or mapped areas. Breeding habitat is not present.* | Very High -3 | Moderate Sensitivity to Potential Gain | 90 | No |

| Common name | Scientific name | BC Act status | SAII Entity | Targeted surveys conducted | Ideal survey period (TBDC) | Relevant guidelines | Habitat Constraints (from BAM- C) | Habitat requirements | Justification for exclusion | Biodiversity risk weighting | Sensitivity to gain class | No. of BIONET records in the locality (accessed 4/3/22) | Biodiversity Offset Credits required? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | used to generate species credits. Where only part of the subject land is mapped as important habitat, the remaining areas are assessed for ecosystem credits. | | | | | |
| Barking Owl (breeding) | *Ninox connivens* | *Vulnerable* | *No* | *Yes. Targeted nocturnal surveys using call playback and spotlighting were conducted over three nights in 2021. No individuals were recorded. No trees of a suitable size for nesting occur in or near the Subject Land.* | *May-Dec* | *NSW Department of Environment & Conservation (DEC) (2004) Threatened Species Survey and Assessment: Guidelines for developments and activities (working draft) BioNet Species Profile (DPIE 2021d)* | *Hollow bearing trees Living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground* | *Occurs in dry sclerophyll woodland. In the south west it is often associated with riparian vegetation while in the south east it generally occurs on forest edges. It nests in large hollows in live eucalypts, often near open country. It feeds on insects in the non-breeding season and on birds and mammals in the breeding season {Garnett, 2000 #21}.* | *No suitable breeding habitat.*<br><br>*No hollows of suitable height or dimension occur within the Subject Land.* | Very High -3 | High Sensitivity to Potential Gain | 7 | No |
| Powerful Owl (breeding) | *Ninox strenua* | *V* | *No* | *Yes. Targeted nocturnal surveys using call playback and spotlighting were conducted over three nights in 2021. No individuals were recorded. No trees of a suitable size for nesting occur in or near the Subject Land.* | *May-Aug* | *NSW Department of Environment & Conservation (DEC) (2004) Threatened Species Survey and Assessment: Guidelines for developments and activities (working draft) BioNet Species Profile (DPIE 2021d)* | *NIL* | *A sedentary species with a home range of approximately 1000 hectares it occurs within open eucalypt, casuarina or callitris pine forest and woodland. It often roosts in denser vegetation including rainforest of exotic pine plantations. Generally feeds on medium-sized mammals such as possums and gliders but will also eat birds, flying-foxes, rats and insects. Prey are generally hollow dwelling and require a shrub layer and owls are more often found in areas with more old trees and hollows than average stands {Garnett, 2000 #21}.* | *No suitable breeding habitat.*<br><br>*No hollows of suitable height or dimension occur within the Subject Land.* | Very High -3 | High Sensitivity to Potential Gain | 52 | No |
| Eastern Osprey (breeding) | *Pandion cristatus* | *Vulnerable* | *No* | *Yes* | *April-Nov* | *n/a* | *Presence of stick-nests in living and dead trees (>15m) or artificial structures within 100m of a floodplain for nesting)* | *Favour coastal areas, especially the mouths of large rivers, lagoons and lakes.*<br>*Feed on fish over clear, open water.*<br>*Breed from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea. .*<br>*Incubation of 2-3 eggs, usually by the female, is about 40 days. Female remains with young almost until they fly, usually after about nine weeks in the nest.* | *No suitable breeding habitat.* | Very High -3 | Moderate Sensitivity to Potential Gain | 7 | No |
| Gang-gang Cockatoo (breeding) | *Callocephalon fimbriatum* | *Vulnerable* | *No* | *Yes* | Oct-Jan | TBA | *Hollow bearing trees Eucalypt tree species with hollows greater than 9 cm diameter* | *In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests.*<br>*In autumn and winter, the species often moves to lower altitudes in drier* | *No suitable breeding habitat.*<br><br>*No hollows of suitable height or dimension occur* | Very High -3 | High Sensitivity to Potential Gain | 1 | No |

| Common name | Scientific name | BC Act status | SAII Entity | Targeted surveys conducted | Ideal survey period (TBDC) | Relevant guidelines | Habitat Constraints (from BAM- C) | Habitat requirements | Justification for exclusion | Biodiversity risk weighting | Sensitivity to gain class | No. of BIONET records in the locality (accessed 4/3/22) | Biodiversity Offset Credits required? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | *more open eucalypt forests and woodlands,particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas.*<br>*May also occur in sub-alpine Snow Gum (Eucalyptus pauciflora ) woodland and occasionally in temperate rainforests.*<br>*Favours old growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are 10 cm in diameter or larger in eucalypts* | *within the Subject Land.* | | | | |
| Green-thighed Frog | *Litoria brevipalmata* | *Vulnerable* | *No* | *Yes* | Sept-April | TBA | *Semi-permanent/ephemeral wet areas\|Swamps\|Waterbodies* | *Green-thighed Frogs occur in a range of habitats from rainforest and moist eucalypt forest to dry eucalypt forest and heath, typically in areas where surface water gathers after rain. It prefers wetter forests in the south of its range, but extends into drier forests in northern NSW and southern Queensland.*<br>*Breeding occurs following heavy rainfall from spring to autumn, with larger temporary pools and flooded areas preferred. Frogs may aggregate around breeding sites and eggs are laid in loose clumps among waterplants, including water weeds.*<br>*The larvae are free swimming.*<br>*The frogs are thought to forage in leaf-litter* | *This species was not recorded during targeted amphibian surveys in Feb/ March 2022.* | Very High -3 | Moderate Sensitivity to Potential Gain | 0 | No |
| Wallum Froglet | *Crinia tinnula* | *Vulnerable* | No | *Yes* | All year round | TBA | *NIL* | *Wallum Froglets are found in a wide range of habitats, usually associated with acidic swamps on coastal sand plains. They typically occur in sedgelands and wet heathlands. They can also be found along drainage lines within other vegetation communities and disturbed areas, and occasionally in swamp sclerophyll forests.*<br>*The species breeds in swamps with permanent water as well as shallow ephemeral pools and drainage ditches. Breeding is thought to peak in the colder months, but can occur throughout the year following rain. Eggs of 1.1-1.2mm are deposited in water with a pH of <6 and tadpoles take 2-6 months to develop into frogs. Wallum Froglets shelter under leaf litter, vegetation, other debris or in burrows of other species. Shelter sites are wet or very damp and often located near the water's edge. Males may call throughout the year and at any time of day, peaking following rain.* | *This species was not recorded during targeted amphibian surveys in Feb/ March 2022.* | Very High -3 | Moderate Sensitivity to Potential Gain | 1 | No |
| Mahony's Toadlet | *Uperoleia mahonyi* | *Endangered* | No | *Yes* | Dec-March | TBA | *NIL* | *Current observations indicate Mahony's Toadlet inhabits ephemeral and semi-permanent swamps and swales on the coastal fringe of its range. Known records occur in heath or wallum habitats almost exclusively associated with leached (highly nutrient impoverished) white sand. Commonly associated with acid paperbark swamps, Mahony's Toadlet also is known to occur in wallum heath, swamp mahogany-paperbark swamp forest, heath shrubland and Sydney red gum woodland. Recent studies suggest intact vegetation* | *This species was not recorded during targeted amphibian surveys in Feb/ March 2022.* | Very High -3 | High Sensitivity to Potential Gain | 0 | No |

| Common name | Scientific name | BC Act status | SAII Entity | Targeted surveys conducted | Ideal survey period (TBDC) | Relevant guidelines | Habitat Constraints (from BAM- C) | Habitat requirements | Justification for exclusion | Biodiversity risk weighting | Sensitivity to gain class | No. of BIONET records in the locality (accessed 4/3/22) | Biodiversity Offset Credits required? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | *adjacent to and within water bodies is an important habitat feature for this species.*<br>*Known records are associated with shallow ephemeral/semi-permanent water bodies with limited flow of water. Aquatic vegetation at breeding sites includes sedges (Shoenoplectus spp., Baumea spp. and Lepironia articulata) and Broadleaf Cumbungi (Typha orientalis).*<br>*Females have been recorded up to 400m from water-bodies indicating moderate dispersal distances and use of multiple habitat types.*<br>*Tadpoles have been observed using leaf litter in the shallow verges of water bodies on sandy substrate. Rocks, logs and leaf litter may also be used for shelter and provide important foraging areas for invertebrate prey items.* | | | | | |
| White-bellied Sea-Eagle (breeding) | *Haliaeetus leucogaster* | *Vulnerable* | *No* | *Yes* | July-Dec | TBA | *Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines* | *Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea.*<br>*Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest).*<br>*Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Nests are large structures built from sticks and lined with leaves or grass.*<br>*Feed mainly on fish and freshwater turtles, but also waterbirds, reptiles, mammals and carrion.*<br>*Hunts its prey from a perch or whilst in flight (by circling slowly, or by sailing along 10–20 m above the shore). Prey is usually carried to a feeding platform or (if small) consumed in flight, but some items are eaten on the ground.*<br>*May be solitary, or live in pairs or small family groups consisting of a pair of adults and dependent young.*<br>*Typically lays two eggs between June and September with young birds remaining in the nest for 65-70 days.* | *No suitable breeding habitat.* | Very High -3 | High Sensitivity to Potential Gain | 17 | No |
| Little Eagle (breeding) | *Hieraaetus morphnoides* | *Vulnerable* | *No* | *Yes* | Aug-Oct | TBA | *Nest trees - live (occassionally dead) large old trees within vegetation)* | *Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used.*<br>*Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter.*<br>*Lays two or three eggs during spring, and young fledge in early summer.* | *No suitable breeding habitat.* | Very High -3 | Moderate Sensitivity to Potential Gain | 2 | No |

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| | | | | | | | | *Preys on birds, reptiles and mammals, occasionally adding large insects and carrion.* | | | | | |
| Giant Dragonfly | *Petalura gigantea* | *Endangered* | *Yes* | *Yes* | Dec - Jan | TBA | *Within 500 m of swamps* | *Live in permanent swamps and bogs with some free water and open vegetation.*<br>*Adults emerge from late October and are short-lived, surviving for one summer after emergence.*<br>*Adults spend most of their time settled on low vegetation on or adjacent to the swamp. They hunt for flying insects over the swamp and along its margins.*<br>*Adults fly over the swamp and along its margins hunting for flying insects. Males sometimes congregate waiting for females to mate with.*<br>*Females lay eggs into moss, under other soft ground layer vegetation, and into moist litter and humic soils, often associated with groundwater seepage areas within appropriate swamp and bog habitats. The species does not utilise areas of standing water wetland, although it may utilise suitable boggy areas adjacent to open water wetlands.*<br>*Larvae dig long branching burrows under the swamp. Larvae are slow growing and the larval stage may last 10 years or more.*<br>*It is thought that larvae leave their burrows at night and feed on insects and other invertebrates on the surface and also use underwater entrances to hunt for food in the aquatic vegetation.* | *This species was not recorded during targeted surveys by Coachers Environmental.* | Very High -3 | Very High Sensitivity to Potential Gain | 3 | No |
| Brush-tailed Phascogale | *Phascogale tapoatafa* | *Vulnerable* | *No* | *Yes* | Dec-June | TBA | *NIL* | *Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter.*<br>*Also inhabit heath, swamps, rainforest and wet sclerophyll forest.*<br>*Agile climber foraging preferentially in rough barked trees of 25 cm DBH or greater..*<br>*Feeds mostly on arthropods but will also eat other invertebrates, nectar and sometimes small vertebrates.*<br>*Females have exclusive territories of approximately 20 - 40 ha, while males have overlapping territories often greater than 100 ha.*<br>*Nest and shelter in tree hollows with entrances 2.5 - 4 cm wide and use many different hollows over a short time span.*<br>*Mating occurs May - July; males die soon after the mating season whereas females can live for up to three years but generally only produce one litter.* | *This species was not recorded during targeted surveys by Coachers Environmental.* | Very High -3 | High Sensitivity to Potential Gain | 0 | No |
| Green and Golden Bell Frog | *Litoria aurea* | *Endangered* | No | *Yes* | Nov-March | TBA | *N/A\|Semi-permanent/ephemeral wet areas*<br>*Within 1km of wet areas\|Swamps*<br>*Within 1km of swamp\|Waterbodies*<br>*Within 1km of waterbody* | *Breeding habitat consists of shallow (<1m) ponds or slowly moving waterways which undergo disturbance regimes such as fluctuating water flow or inflow of saline water with both areas of*<br>*open water and dense low vegetation.* | *This species was not recorded during targeted amphibian surveys in Feb/ March 2022.* | Very High -3 | High Sensitivity to Potential Gain | 0 | No |
| Grey-headed Flying Fox (breeding) | *Pteropus policephalus* | *Endangered* | No | *Yes* | Oct-Dec | TBA | *Breeding camps* | *Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.* | *No breeding camps were recorded on -site* | Very High -3 | High Sensitivity to Potential Gain | 3627 | Recorded by Conachers Environmental<br><br>No credits required |

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| | | | | | | | | *Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.*<br>*Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young.*<br>*Annual mating commences in January and conception occurs in April or May; a single young is born in October or November.*<br>*Site fidelity to camps is high; some camps have been used for over a century.*<br>*Can travel up to 50 km from the camp to forage; commuting distances are more often <20 km.*<br>*Feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines.*<br>*Also forage in cultivated gardens and fruit crops.* | | | | | (breeding habitat absent) |
| Bush Stone-curlew | *Burhinus grallarius* | *E* | No | | *All year round* | | *Fallen/standing dead timber including logs* | *Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber. 1*<br>*Largely nocturnal, being especially active on moonlit nights. 2*<br>*Feed on insects and small vertebrates, such as frogs, lizards and snakes. 3*<br>*Nest on the ground in a scrape or small bare patch. 4*<br>*Two eggs are laid in spring and early summer.* | *This species was not recorded during targeted surveys by Coachers Environmental.* | 2 | High Sensitivity to Gain | 1 | No |
| Glossy Black-Cockatoo (Breeding) | *Calyptorhynchus lathami* | *V* | No | | Jan-Sept | | *Hollow bearing trees*<br>*Living or dead tree with hollows greater than 15cm diameter and greater than 8m above ground* | *Habitat Order*<br>*Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (Allocasuarina littoralis) and Forest Sheoak (A. torulosa) are important foods. 1*<br>*Inland populations feed on a wide range of sheoaks, including Drooping Sheoak, Allocasuaraina diminuta, and A. gymnathera. Belah is also utilised and may be a critical food source for some populations. 2*<br>*In the Riverina, birds are associated with hills and rocky rises supporting Drooping Sheoak, but also recorded in open woodlands dominated by Belah (Casuarina cristata). 3*<br>*Feeds almost exclusively on the seeds of several species of she-oak (Casuarina and Allocasuarina species), shredding the cones with the massive bill. 4*<br>*Dependent on large hollow-bearing eucalypts for nest sites. A single egg is laid between March and May.* | *No suitable breeding habitat.*<br><br>*This species was not recorded during targeted surveys by Coachers Environmental.* | 2 | High Sensitivity to Gain | 8 | No |
| Eastern Pygmy-possum | *Cercartetus nanus* | *V* | No | | Jan-Dec<br><br>Species is very difficult to detect, especially via spotlighting. | | | *Habitat Order*<br>*Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. They may* | *This species was not recorded during targeted surveys by Coachers Environmental.*<br><br>*Suitable habitat absent.* | 2 | High Sensitivity to Gain | 2 | No |

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| | | | | | | | | *occupy small patches of vegetation in fragmented landscapes and although the species prefers habitat with a rich shrub understory, they are known to occur in grassy woodlands and the presence of Eucalypts alone is sufficient to support populations in low densities. 1*<br>*Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable. 2*<br>*Also feeds on insects throughout the year; this feed source may be more important in habitats where flowers are less abundant such as wet forests. 3*<br>*Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum (Pseudocheirus peregrinus) dreys or thickets of vegetation, (e.g. grass-tree skirts); nest-building appears to be restricted to breeding females; tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks. 4*<br>*Appear to be mainly solitary, each individual using several nests, with males having non-exclusive home-ranges of about 0.68 hectares and females about 0.35 hectares. 5*<br>*Young can be born whenever food sources are available, however most births occur between late spring and early autumn. 6*<br>*Agile climbers, but can be caught on the ground in traps, pitfalls or postholes; generally nocturnal. 7*<br>*Frequently spends time in torpor especially in winter, with body curled, ears folded and internal temperature close to the surroundings.* | | | | | |
| Stephens' Banded Snake | *Hoplocephalus stephensii* | *V* | N | | Oct-March | | *Hollow bearing trees*<br>*Or within 500 m of this habitat\|Other*<br>*Within 500 m of aboreal vine tangles\|Fallen/standing dead timber including logs*<br>*Or within 500 m of this habitat* | *Rainforest and eucalypt forests and rocky areas up to 950 m in altitude. 1*<br>*Stephens' Banded Snake is nocturnal, and shelters between loose bark and tree trunks, amongst vines, or in hollow trunks limbs, rock crevices or under slabs during the day. 2*<br>*At night it hunts frogs, lizards, birds and small mammals.*<br>*The species uses very old primary forest with many large old hollow bearing trees. Habitat needs to be well connected and geographically large. Juveniles and subadults will regularly inhabit small hollows, while adults are usually found in larger hollows. The species reproduces usually triennially or less often, never annually.* | *This species was not recorded during targeted surveys by Coachers Environmental.*<br><br>*Suitable habitat absent.* | 2 | High Sensitivity to Gain | 1 | No |
| Square-tailed Kite (Breeding) | *Lophoictinia isura* | *V* | No | | Sept-Jan | | *Nest trees* | *Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. 1*<br>*In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and* | *This species was not recorded during targeted surveys by Coachers Environmental.* | 1.5 | Moderate Sensitivity to Gain | 1 | No |

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| | | | | | | | | *patches of low open eucalypt woodland. 2*<br>*Is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage. 3*<br>*Appears to occupy large hunting ranges of more than 100km2. 4*<br>*Breeding is from July to February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.* | *Suitable habitat absent.* | | | | |
| Large Bent-winged Bat (Breeding) | *Miniopterus orianae oceanensis* | *V* | Yes | | Dec-Feb | | *Caves*<br>*Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat code "IC - in cave<br>" observation type code "E nest-roost<br>" with numbers of individuals >500* | *Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. 1*<br>*Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. 2*<br>*Maternity caves have very specific temperature and humidity regimes. 3*<br>*At other times of the year, populations disperse within about 300 km range of maternity caves. 4*<br>*Cold caves are used for hibernation in southern Australia. 5*<br>*Breeding or roosting colonies can number from 100 to 150,000 individuals. 6*<br>*Hunt in forested areas, catching moths and other flying insects above the tree tops.* | *This species was not recorded during targeted surveys by Coachers Environmental.*<br><br>*Suitable habitat absent.* | 2 | Very High Sensitivity to Gain | 22 | No |
| Southern Myotis | *Myotis macropus* | *V* | No | | Oct-March | | *Hollow bearing trees*<br>*Within 200 m of riparian zone*<br><br>*Bridges, caves or artificial structures within 200 m of riparian zone*<br><br>*Waterbodies- This include rivers, creeks, billabongs, lagoons, dams and other waterbodies on or within 200m of the site* | *Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. 1*<br>*Forage over streams and pools catching insects and small fish by raking their feet across the water surface. 2*<br>*In NSW females have one young each year usually in November or December.* | **Present**<br><br>**Species credits shall be retired** | 2 | High Sensitivity to Gain | 2 | Recorded by Conachers Environmental<br><br>**YES** |
| Squirrel Glider | *Petaurus norfolcensis* | *V* | | | All year | | | *Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and coastal forest with heath understorey.*<br>*Shelters in tree hollows.*<br><br>Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. 1<br>Prefers mixed species stands with a shrub or Acacia midstorey. 2<br>Live in family groups of a single adult male one or more adult females and offspring. 3<br>Require abundant tree hollows for refuge and nest sites. 4<br>Diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein. | *This species was not recorded during targeted surveys by Coachers Environmental.* | 2 | High Sensitivity to Gain | 4 | No |

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| Koala (Breeding) | *Phascolarctos cinereus* | *V* | No | | *All year* | | *Areas identified via survey as important habitat (see comments))* | *Inhabit eucalypt woodlands and forests. 1*<br>*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. 2*<br>*Inactive for most of the day, feeding and moving mostly at night. 3*<br>*Spend most of their time in trees, but will descend and traverse open ground to move between trees. 4*<br>*Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size. 5*<br>*Generally solitary, but have complex social hierarchies based on a dominant male with a territory overlapping several females and sub-ordinate males on the periphery. 6*<br>*Females breed at two years of age and produce one young per year.* | *This species was not recorded during targeted surveys by Coachers Environmental.* | 2 | High Sensitivity to Gain | 5 | No |
| Red-crowned Toadlet | *Pseudophryne australis* | *V* | No | | All year | | | *Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. 1*<br>*Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. 2*<br>*Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter. 3*<br>*Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters. Red-crowned Toadlets have not been recorded breeding in waters that are even mildly polluted or with a pH outside the range 5.5 to 6.5. 4*<br>*Eggs are laid in moist leaf litter, from where they are washed by heavy rain; a large proportion of the development of the tadpoles takes place in the egg. 5*<br>*Disperses outside the breeding period, when they are found under rocks and logs on sandstone ridges and forage amongst leaf-litter. 6*<br>*Red-crowned Toadlets are quite a localised species that appear to be largely restricted to the immediate vicinity of suitable breeding habitat. Red-crowned Toadlets are usually found as small colonies scattered along ridges coinciding with the positions of suitable refuges near breeding sites. Due to this tendency for discrete populations to concentrate at particular sites, a relatively small localised disturbance may have a significant impact on a local population if it occurs on a favoured breeding or refuge site.* | *This species was not recorded during targeted amphibian surveys in Feb/ March 2022.* | 2 | Moderate Sensitivity to Potential Gain | 37 | No |
| Masked Owl (Breeding) | *Tyto novaehollandiae* | *V* | No | | May-Aug | | *Hollow bearing trees*<br>*Living or dead trees with hollows greater than 20cm diameter* | *Lives in dry eucalypt forests and woodlands from sea level to 1100 m. 1*<br>*A forest owl, but often hunts along the edges of forests, including roadsides. 2*<br>*The typical diet consists of tree-dwelling and ground mammals, especially rats. 3* | *This species was not recorded during targeted surveys by Coachers Environmental.*<br><br>*Suitable habitat absent.* | 2 | High Sensitivity to Potential Gain | 7 | No |

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| | | | | | | | | *Pairs have a large home-range of 500 to 1000 hectares. 4*<br>*Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.* | | | | | |
| Sooty Owl (Breeding) | *Tyto tenebricosa* | *V* | Yes | | April-Aug | | *Caves*<br>*Caves or clifflines/ledges\|Hollow bearing trees*<br>*Living or dead trees with hollows greater than 20cm diameter* | *Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. 1*<br>*Roosts by day in the hollow of a tall forest tree or in heavy vegetation; hunts by night for small ground mammals or tree-dwelling mammals such as the Common Ringtail Possum (Pseudocheirus peregrinus) or Sugar Glider (Petaurus breviceps). 2*<br>*Nests in very large tree-hollows.* | *This species was not recorded during targeted surveys by Coachers Environmental.*<br><br>*Suitable habitat absent.* | 3 | Very High Sensitivity to Potential Gain | 13 | No |
| Eastern Cave Bat | *Vespadelus troughtoni* | *V* | Yes | | Nov-Jan | | | *Very little is known about the biology of this uncommon species. 1*<br>*A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. 2*<br>*Occasionally found along cliff-lines in wet eucalypt forest and rainforest. 3*<br>*Little is understood of its feeding or breeding requirements or behaviour.* | *This species was not recorded during targeted surveys by Coachers Environmental.* | 3 | Very High Sensitivity to Potential Gain | 1 | No |
| Varied Sittella | *Daphoenositta chrysoptera* | V | NO | | n/a | | | *Habitat Order*<br>*Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. 1*<br>*Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy. 2*<br>*Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years. 3*<br>*Generation length is estimated to be 5 years.* | *This species was not recorded during targeted surveys by Coachers Environmental.* | | Moderate Sensitivity to Potential Gain | 2 | No |
| Spotted-tailed Quoll (breeding) | *Dasyurus maculatus* | V | No | | n/a | | | *recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. 1*<br>*Quolls use hollow-bearing trees, fallen logs, other animal burrows, small caves and rock outcrops as den sites. 2*<br>*Mostly nocturnal, although will hunt during the day; spend most of the time on the ground, although also an excellent climber and will hunt possums and gliders in tree hollows and prey on roosting birds. 3*<br>*Use communal 'latrine sites', often on flat rocks among boulder fields, rocky cliff-faces or along rocky stream beds or banks. Such sites may be visited by multiple individuals and can be recognised by the accumulation of the sometimes characteristic 'twisty-* | *This species was not recorded during targeted surveys by Coachers Environmental.* | | Moderate | 5 | No |

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| | | | | | | | | *shaped' faeces deposited by animals. 4*<br>*A generalist predator with a preference for medium-sized (500g-5kg) mammals. Consumes a variety of prey, including gliders, possums, small wallabies, rats, birds, bandicoots, rabbits, reptiles and insects. Also eats carrion and takes domestic fowl. 5*<br>*Females occupy home ranges of 200-500 hectares, while males occupy very large home ranges from 500 to over 4000 hectares. Are known to traverse their home ranges along densely vegetated creeklines. 6*<br>*Average litter size is five; both sexes mature at about one year of age. Life expectancy in the wild is about 3-4 years.* | | | | | |
| Yellow-bellied Glider | *Petaurus australis* | *V* | No | | n/a | | | *Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. 1*<br>*Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south.2*<br>*Feed primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein. 3*<br>*Extract sap by incising (or biting into) the trunks and branches of favoured food trees, often leaving a distinctive 'V'-shaped scar. 4*<br>*Live in small family groups of two - six individuals and are nocturnal. 5*<br>*Den, often in family groups, in hollows of large trees. 6*<br>*Very mobile and occupy large home ranges between 20 to 85 ha to encompass dispersed and seasonally variable food resources.* | *This species was not recorded during targeted surveys by Coachers Environmental.* | | HIgh | 35 | No |
| Yellow-bellied Sheathtail-bat | *Saccolaimus flaviventris* | *V* | No | | n/a | | | *Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. 1*<br>*When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. 2*<br>*Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory. 3*<br>*Breeding has been recorded from December to mid-March, when a single young is born. 4*<br>*Seasonal movements are unknown; there is speculation about a migration to southern Australia in late summer and autumn.* | *This species was not recorded during targeted surveys by Coachers Environmental.* | 2 | High | 1 | No |
| Eastern Coastal Freetail-bat | *Micronomus norfolkensis* | *V* | No | | n/a | | | *t Order*<br>*Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. 1*<br>*Roost maily in tree hollows but will also roost under bark or in man-made structures. 2*<br>*Usually solitary but also recorded roosting communally, probably insectivorous.* | *This species was not recorded during targeted surveys by Coachers Environmental.* | 2 | High | 4 | No |

| Common name | Scientific name | BC Act status | SAII Entity | Targeted surveys conducted | Ideal survey period (TBDC) | Relevant guidelines | Habitat Constraints (from BAM- C) | Habitat requirements | Justification for exclusion | Biodiversity risk weighting | Sensitivity to gain class | No. of BIONET records in the locality (accessed 4/3/22) | Biodiversity Offset Credits required? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Greater Broad-nosed Bat | *Scoteanax rueppellii* | V | No | | n/a | | | *Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. 1*<br>*Although this species usually roosts in tree hollows, it has also been found in buildings. 2*<br>*Forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m. 3*<br>*Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects; this species has been known to eat other bat species. 4*<br>*Little is known of its reproductive cycle, however a single young is born in January; prior to birth, females congregate at maternity sites located in suitable trees, where they appear to exclude males during the birth and raising of the single young.* | *This species was not recorded during targeted surveys by Coachers Environmental.* | 2 | High | 12 | No |
| **FLORA** | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| Sand Spurge | *Chamaesyce psammogeton* | *E* | No | | All year round | | | *Results 1-5 of 5*<br>*Habitat Order*<br>*Grows on fore-dunes, pebbly strandlines and exposed headlands, often with Spinifex (Spinifex sericeus) and Prickly Couch (Zoysia macrantha) 1*<br>*Flowering recorded in spring and summer. 2*<br>*Sand Spurge seeds float, so some dispersal between beaches may occur. 3*<br>*Longevity of the species is approximately 5 – 30 years with a primary juvenile period of less than 1 year. 4*<br>*Plant growth occurs in spring and summer.* | *This species was not recorded during targeted surveys*<br><br>*Suitable habitat is absent* | | High | 10 | No |
| | *Diuris praecox* | *V* | No | | August<br><br>Survey season differs based on location. Survey Newcastle area and north of Newcastle early Aug. Survey remainder of distribution any time during Aug. Recommend checking a local reference population before surveying to identify flowering times. | | | *Grows on hills and slopes of near-coastal districts in open forests which have a grassy to fairly dense understorey. 1*<br>*Exists as subterranean tubers most of the year. It produces leaves and flowering stems in winter.* | *This species was not recorded during targeted surveys*<br><br>*Suitable habitat is absent* | | High | 114 | No |
| Camfield's Stringybark | *Eucalyptus camfieldii* | *V* | No | | All year round<br><br>Identifiable throughout year by epicormic growth or juvenile foliage. Juvenile foliage isn't representative of E. camfieldii in the northern | | | *Poor coastal country in shallow sandy soils overlying Hawkesbury sandstone. Coastal heath mostly on exposed sandy ridges. 1*<br>*Occurs mostly in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas. 2* | *This species was not recorded during targeted surveys*<br><br>*Suitable habitat is absent* | | High | 30 | No |

| Common name | Scientific name | BC Act status | SAII Entity | Targeted surveys conducted | Ideal survey period (TBDC) | Relevant guidelines | Habitat Constraints (from BAM- C) | Habitat requirements | Justification for exclusion | Biodiversity risk weighting | Sensitivity to gain class | No. of BIONET records in the locality (accessed 4/3/22) | Biodiversity Offset Credits required? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | populations. | | | *Associated species frequently include stunted species of E. oblonga Narrow-leaved Stringybark, E. capitellata Brown Stringybark and E. haemastoma Scribbly Gum. 3*<br>*Population sizes are difficult to estimate because its extensive lignotubers may be 20 m across. A number of stems arise from these lignotubers giving the impression of individual plants. 4*<br>*Flowering period is irregular, flowers recorded throughout the year. 5*<br>*Poor response to too frequent fires.* | | | | | |
| Biconvex Paperbark | *Melaleuca biconvexa* | *V* | No | | All year round | | | *Habitat Order*<br>*Biconvex Paperbark generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. 1*<br>*Flowering occurs over just 3-4 weeks in September and October. 2*<br>*Resprouts following fire.* | *This species was not recorded during targeted surveys* | | High | 83 | No |
| Coast Headland Pea | *Pultenaea maritima* | *V* | No | | All year round | | | *The species occurs in grasslands, shrublands and heath on exposed coastal headlands and adjoining low coastal heath. 1*<br>*Found on clay or sandy loam or clay loam over sandstone at altitude 5–30 m . 2*<br>*Associated with Banksia integrifolia and Themeda australis. 3*<br>*Flowers from (June) August to March; fruit occurs from January to March.* | *This species was not recorded during targeted surveys*<br><br>*Suitable habitat is absent* | | High | 10 | No |
| Coast Groundsel | *Senecio spathulatus* | *E* | No | | Survey: Flowers sporadically throughout the year. Check local reference sites for flowering period. Survey when flowering as species is more obvious and identifiable, as easily confused with with S. pinnatifolius var pinnatifoloius. Strongly recommend expert report to discount presence or absence if flowering is not observed. | | *Headlands within 500 m of the coast* | *Coast Groundsel grows on frontal dunes.* | *This species was not recorded during targeted surveys*<br><br>*Suitable habitat is absent* | | High | 4 | No |
| | *Syzygium paniculatum* | *E* | No | | April – May<br><br>Survey: Use fruit to identify. Naturally occurring plants generally produce low numbers of fruit, while cultivated individuals and offspring generally produce high numbers of fruit. Samples need to be verified by RBG to detect hybridisation. Recruitment | | | *On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest.1*<br>*On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.* | *This species was not recorded during targeted surveys* | | High | 17 | No |

| Common name | Scientific name | BC Act status | SAII Entity | Targeted surveys conducted | Ideal survey period (TBDC) | Relevant guidelines | Habitat Constraints (from BAM- C) | Habitat requirements | Justification for exclusion | Biodiversity risk weighting | Sensitivity to gain class | No. of BIONET records in the locality (accessed 4/3/22) | Biodiversity Offset Credits required? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | strategy: Apomictic clonal species with extremely low genetic diversity across its whole distribution. | | | | | | | | |
| Narrow-leafed Wilsonia | *Wilsonia backhousei* | *V* | No | *Yes* | All year round | | *Beaches and rock platforms adjacent to beaches, or anywhere saline\|Waterbodies Margins of salt marshes and lakes on the coast* | *This is a species of the margins of salt marshes and lakes. 1 Flowering occurs in spring and summer.* | *This species was not recorded during targeted surveys*<br><br>*Suitable habitat is absent* | | Moderate | 1 | No |
| Tall Knotweed | *Persicaria elatior* | *V* | *No* | *Yes* | | *No* | *Semi-permanent/ephemeral wet areas or within 50 m\|Swamps or within 50 m\|Waterbodies including Wetlands, or within 50 m* | *This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.* | *This species was not recorded during targeted surveys* | Very High -3 | High Sensitivity to Potential Gain | 0 | No |
| Tranquility Mintbush | *Prostanthera askania* | *E* | *No* | *Yes* | *September-November* | | | *Occurs adjacent to, but not immediately in, drainage lines on flat to moderately steep slopes formed on Narrabeen sandstone and alluvial soils derived from it.1 Occurs in moist sclerophyll forest and warm temperate rainforest communities, and the ecotone between them. These communities are generally tall forests with a mesic understorey; Sydney Blue Gum Eucalyptus saligna and Turpentine Syncarpia glomulifera are usually present, though canopy species present can be highly variable. 2 Ecological knowledge about this species is very limited. 3 The species is likely to be fire-sensitive given the moist forest habitats it occupies, however, its fire ecology is currently unknown. 4 May be a colonising species that takes advantage of increased light following natural canopy-cover disturbance. May be out competed by invading weed species such as Lantana. 5 Appears in some locations to propagate vegetatively by 'stem-layering' where prostrate branches take root where they remain in contact with the soil. This characteristic and the species' tendency at many sites to form dense clumps make accurate counting of individual plants within populations difficult. 6 Flowering usually occurs in spring, however, it is known that the timing of both flowering and fruiting can be variable.* | *This species was not recorded during targeted surveys*<br><br>*Suitable habitat is absent* | 2 | High Sensitivity to Potential Gain | 50 | No |
| Eucalyptus oblonga | *Eucalyptus oblonga population at Bateau Bay, Forresters Beach and Tumbi Umbi in the Wyong local government area* | *E1* | *No* | *Yes* | *All year* | | | *Normally found on in dry open forest with infertile sandy soils on sandstone. The population at Bateau Bay occurs on coastal sands.* | *This species was not recorded during targeted surveys*<br><br>*Suitable habitat is absent* | 2 | High Sensitivity to Potential Gain | 18 | No |
| Scrub Turpentine | *Rhodamnia rubescens* | *CE* | *Yes* | *Yes* | *All year* | | | *Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. 1* | *This species was not recorded during targeted surveys* | 2 | High Sensitivity to Potential Gain | 57 | No |

| Common name | Scientific name | BC Act status | SAII Entity | Targeted surveys conducted | Ideal survey period (TBDC) | Relevant guidelines | Habitat Constraints (from BAM- C) | Habitat requirements | Justification for exclusion | Biodiversity risk weighting | Sensitivity to gain class | No. of BIONET records in the locality (accessed 4/3/22) | Biodiversity Offset Credits required? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | *This species is characterised as highly to extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.* | *Suitable habitat is absent* | | | | |
| Native Guava | *Rhodomyrtus psidioides* | *E4* | *Yes* | | *All year* | | | *Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines. 1 This species is characterised being extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.* | *This species was not recorded during targeted surveys*<br><br>*Suitable habitat is absent* | 2 | High Sensitivity to Potential Gain | 3 | No |

**BC Act listings:**

CE = Critically Endangered Species
E= Endangered
V =Vulnerable
E1= Endangered population
E4= Presumed extinct


0 20 40 60 80 100 200 Meters

Scale: 1:1,800

**SITE : BAKALI Rd Forresters Beach - LOT 522 DP 1077907**

**Fig 22:Southern Myotis (Myotis macropus) species polygon map**

- Subject Land
- NSW Cadastre
- Fauna Habitat

| | |
|---|---|
| Projected Coordinate System | GDA 2020 Zone 56 |
| DATE : 09/03/2022 | Map Version : 1.0 |

Aerial Imagery: MetroMap - 20/09/2021



WiZarDTech
Spatial Services

## 4.3 Description of Impacts

### 4.3.1 Serious and irreversible impacts

Species and ecological communities with a 'very high' biodiversity risk weighting will be a potential serious and irreversible impact (SAII). These 'potential SAII entities' are identified within the BAM calculator (OEH 2018b).

The determination of serious and irreversible impacts on biodiversity values is to be made by the consent authority in accordance with the principles set out in the BC Regulation.

To assist the consent authority, the guidance document Guidance to assist a decision-maker to determine a serious and irreversible impact includes criteria that enable the application of the four principles set out in clause 6.7 of the BC Regulation to identify the species and ecological communities that are likely to be the subject of serious and irreversible impacts.

None of the PCTs identified on site are listed as threatened entities.

### 4.3.2 Potential Direct Impacts

#### Vegetation and habitat removal

The proposed development will predominantly occur in existing cleared areas as described in Section 3.1.6. The cleared land is present within the areas of the site which contain buildings, roads, landscape gardens, previous stock grazing pastures and areas of exotic grassland. The floristics is highly variable and dominated by exotic/non-endemic grasses such as *Pennisetum clandestinum, Cynodon dactylon kikuyu and Stenotaphrum secundatum.* There are occurrences of introduced environmental tree species including Coral Tree (*Erythrina x sykesii*). The open cleared areas are historically subject to maintenance slashing when not subject to grazing.

Cleared Land / Non-endemic Vegetation is present across approximately 6.78 hectares of the site as mapped in Figure 19 and does require a offset credit obligation.

Degraded patches of following PCT's would be impacted by future development for the following area measurements:

- 0.6ha of PCT 1728 Swamp Oak – Prickly Paperbark- Tall Sedge Swamp Forest on Coastal Lowlands of the Central Coast and Lower North Coast
- 0.6ha of PCT 1722 Swamp Mahogany- Paperbarks- Harsh Ground Fern swamp forest of the Central Coast

The above-mentioned vegetation is considered to be in poor condition and occurs as isolated occurrences surrounded by existing cleared areas.

Better quality large patches of native vegetation communities including PCT 1716 and 1728 will be protected and enhanced as part of a Vegetation Management Plan (proposed to be zoned C2 Environmental Conservation).

No services will be constructed through the land zoned C2 Environmental Conservation.

Any drainage works required as part of the subdivision will not to be constructed on land to be zoned C2 Environmental Conservation and are to have no adverse impact on the wetland vegetation.

#### Risk of runoff, erosion and sedimentation, during construction

Surface water quality may be affected during construction activities. Construction activities could potentially encourage soil erosion and increase the sediment loads in downstream areas. Further, accidental leaks/spills of oil, fuel, cement or other substances entering watercourses could pollute surface waters.

The Construction Environment Management Plan (CEMP) can be provided as part of the subdivision application stage.

This is important to protect the adjacent large patch of Swamp Oak and Swamp Sclerophyll Forest endangered ecological communities (and other identified vegetation communities) proposed for retention.

No services will be constructed through the land zoned C2 Environmental Conservation.

Any drainage works required as part of the subdivision will not to be constructed on land to be zoned C2 Environmental Conservation and are to have no adverse impact on the wetland vegetation.

#### Temporary noise, dust, light and vibration disturbance, during construction work

Impacts of noise, dust, light and vibration upon fauna are difficult to predict. Potential impacts may include effects on predator-prey interactions and changes to mating and nesting behaviour.

The Construction Environment Management Plan (CEMP) can be provided as part of the subdivision application stage.

### 4.3.3 Potential Indirect Impacts

Potential indirect impacts to flora and fauna include:

#### Hydrological changes

Hard surfaces created as a result of future construction typically cause some hydrological changes.

A detailed hydraulic engineering report would be required as part of the subdivision application process.

No services will be constructed through the land zoned C2 Environmental Conservation.

Any drainage works required as part of the subdivision will not to be constructed on land to be zoned C2 Environmental Conservation and are to have no adverse impact on the wetland vegetation.

This is important to protect the adjacent large patch of Swamp Oak and Swamp Sclerophyll forest endangered ecological communities (and other identified vegetation communities) proposed for retention.

### 4.3.4 Indirect impacts

Indirect impacts occur when the proposal or activities relating to the construction or operation of the proposal affect native vegetation, threatened ecological communities and threatened species habitat beyond the Subject Site.

All Asset Protection Zones will be located outside the area which is subject to the Vegetation Management Plan and the 88B restriction as to its use.

Impacts may also result from changes to land-use patterns, such as an increase in vehicular access and human activity on native vegetation, threatened ecological communities and threatened species habitat (Table 11 below).

## Table 11: Indirect impacts, extent and duration and consequences

| Indirect Impact | Extent and duration | Threatened species, threatened ecological communities and their habitats likely to be affected. | Consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats. |
|---|---|---|---|
| (a) inadvertent impacts on adjacent habitat or vegetation | The proposed development may lead to enhanced weed infiltration into adjacent habitat by enhanced edge effects. | The large patch of Swamp Oak and Swamp Sclerophyll forest endangered ecological communities (and other identified vegetation communities) proposed for retention within north-western portion of the subject site. | Edge effects will not be created and increase weed intensity and reduce vegetation integrity. |
| (b) reduced viability of adjacent habitat due to edge effects | The proposed development may lead to enhanced weed infiltration into adjacent habitat by enhanced edge effects. | The large patch of Swamp Oak and Swamp Sclerophyll forest endangered ecological communities (and other identified vegetation communities) proposed for retention within north-western portion of the subject site. | Edge effects will not be created and increase weed intensity and reduce vegetation integrity. |
| (c) reduced viability of adjacent habitat due to noise, dust or light spill | The proposed works are unlikely to significantly exacerbate any of these issues which are all currently in effect within surrounding lots, or otherwise unlikely to occur within the Subject Site. | The large patch of Swamp Oak and Swamp Sclerophyll forest endangered ecological communities (and other identified vegetation communities) proposed for retention within north-western portion of the subject site. | Nil |
| (d) transport of weeds and pathogens from the site to adjacent vegetation | The proposed development may lead to enhanced weed infiltration into adjacent | The large patch of Swamp Oak and Swamp Sclerophyll forest endangered ecological | Edge effects will not be created and increase weed |

| Indirect Impact | Extent and duration | Threatened species, threatened ecological communities and their habitats likely to be affected. | Consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats. |
|---|---|---|---|
| | habitat by enhanced edge effects. Active weed control efforts will be undertaken prior to and post construction. | communities (and other identified vegetation communities) proposed for retention within north-western portion of the subject site. | intensity and reduce vegetation integrity. |
| (e) increased risk of starvation, exposure and loss of shade or shelter | This issue is unlikely to occur on the Subject Site. It is unlikely that any threatened fauna relies on habitat within the Subject Site, such that the proposed impacts will lead to increased risks from starvation, exposure, shade and shelter. All habitat resources removed will be replaced through implementation of the recommendations outlined in this report. | The large patch of Swamp Oak and Swamp Sclerophyll forest endangered ecological communities (and other identified vegetation communities) proposed for retention within north-western portion of the subject site. | Nil |
| (f) loss of breeding habitats | No significant critical breeding habitat features are proposed for removal | The large patch of Swamp Oak and Swamp Sclerophyll forest endangered ecological communities (and other identified vegetation communities) proposed for retention within north-western portion of the subject site. | The implementation of the actions prescribed in this report should see an increase in the availability of potential habitat for these threatened species within the Subject Site. |
| (g) tramplingofthreatened flora species | This issue is not likely to affect the Subject Site. No threatened flora species were identified within the Subject Site. | The large patch of Swamp Oak and Swamp Sclerophyll forest endangered ecological communities (and other identified vegetation communities) proposed | Nil |

| Indirect Impact | Extent and duration | Threatened species, threatened ecological communities and their habitats likely to be affected. | Consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats. |
|---|---|---|---|
| | | for retention within north-western portion of the subject site. | |
| (h) inhibition of nitrogen fixation and increased soil salinity | This issue is not likely to affect the Subject Site. | The large patch of Swamp Oak and Swamp Sclerophyll forest endangered ecological communities (and other identified vegetation communities) proposed for retention within north-western portion of the subject site. | Nil |
| (i) fertiliser drift | This issue is not likely to affect the Subject Site. | Nil | Nil |
| (j) rubbish dumping | Future development and adjacent areas may increase rubbish dumping in retained forest. | The large patch of Swamp Oak and Swamp Sclerophyll forest endangered ecological communities (and other identified vegetation communities) proposed for retention within north-western portion of the subject site. | Nil |
| (k) wood collection | Future development and adjacent areas may increase wood collection in retained forest. | The large patch of Swamp Oak and Swamp Sclerophyll forest endangered ecological communities (and other identified vegetation communities) proposed for retention within north-western portion of the subject site. | Nil |
| (l) bush rock removal and disturbance | No bush rock occurs on-site. | Nil | Nil |

| Indirect Impact | Extent and duration | Threatened species, threatened ecological communities and their habitats likely to be affected. | Consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats. |
|---|---|---|---|
| (m) increase in predatory species populations | Future development and adjacent areas may increase introduced species predation in retained forest as a result of domestic animal ownership. | The large patch of Swamp Oak and Swamp Sclerophyll forest endangered ecological communities (and other identified vegetation communities) proposed for retention within north-western portion of the subject site. | Nil |
| (n) increase in pest animal populations | Future development and adjacent areas may increase introduced species predation in retained forest as a result of domestic animal ownership.. | The large patch of Swamp Oak and Swamp Sclerophyll forest endangered ecological communities (and other identified vegetation communities) proposed for retention within north-western portion of the subject site. | Nil |
| (o) increased risk of fire | This issue is not relevant to the Subject Site as there is little identified bushfire hazard. | Nil | Nil |
| (p)disturbancetospecialist breeding and foraging habitat, e.g. beach nesting for shorebirds. | Thereisnospecialist breedingor foraging habitat on the Subject Site. The site contains a standof mixed, nectar producing canopy trees which can provide intermittent nectarresourcesfor several threatened fauna species. | The large patch of Swamp Oak and Swamp Sclerophyll forest endangered ecological communities (and other identified vegetation communities) proposed for retention within north-western portion of the subject site. | Nil |

### 4.3.5 Prescribed and Uncertain Impacts

This section of the BDAR addresses relevant prescribed impacts identified in Section 6.

This list of impacts includes all of those impacts on biodiversity values not caused by direct vegetation clearing or development that have been prescribed by the Biodiversity Conservation Regulation 2017 (Table 12).

**Table 12: Potential Prescribed or Uncertain Impacts of the Proposed Action**

| Will there be impacts on any of the following | Yes/No | If Yes, must address all of the assessment questions from section 9.2.1 of the BAM |
|---|---|---|
| Species or ecological communities associated with karst, caves, crevices, cliffs and other features of geological significance | No | n/a |
| Habitat of threatened species or ecological communities associated with rocks | No | n/a |
| Habitat of threatened species or ecological communities associated with human made structures | No | n/a |
| Habitat of threatened species or ecological communities associated with non-native vegetation | No | n/a |
| Connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range | Yes | Habitat connectivity continues to exist across the site. It is unlikely that the small area of impact will interrupt connectivity for any threatened fauna or flora species. |
| Movement of threatened species that maintains their life cycle | No | Habitat connectivity continues to exist across the site. It is unlikely that the small area of impact will interrupt movement of any threatened fauna or |
| Water quality, water bodies and hydrological processes that | No | n/a |

| Will there be impacts on any of the following | Yes/No | If Yes, must address all of the assessment questions from section 9.2.1 of the BAM |
|---|---|---|
| sustain threatened species and threatened ecological communities (including subsidence or upsidence resulting from underground mining or other development) | | |
| Wind turbine strikes on protected animals | No | n/a |
| Vehicle strikes on threatened species of animals or on animals that are part of a TEC | No | n/a |

## 4.4 Avoidance of Impacts

Consideration has been given to avoiding and minimising impacts to biodiversity throughout each phase of the project to date, in accordance with Section 7 of BAM 2020.

In relation to the recommendations for avoiding and minimising impacts on native vegetation and habitat during the proposal design and planning phase, as per Section 7.1 and 7.2 of BAM 2020.

Ongoing consideration of the avoid and minimise direct impacts on biodiversity has been undertaken during the initial planning and ecological assessment by both Council and the proponent.

Areas mapped as Swift Parrot Important Habitat Areas are present within the northwest areas of the site, as shown in Figure 3.2. These areas are to be included in either an E2-Environmental Protection or RE1- Public Recreation zone.

No development or native vegetation clearing is proposed in the land mapped as Swift Parrot Important Habitat Areas. The extent of the proposed open space (RE1) land covers approximately 4,000 square metres and was determined by Council and the proponent during ongoing discussions. This area will be classified as Community Land and subject to a VPA and the preparation of a Plan of Management as required for public reserves under the provisions of the Local Government Act.

The exclusion of development and ongoing management of the areas included in the Swift Parrot Important Habitat Area are part of the direct impact avoidance measures proposed for the rezoning outcomes.

These areas of vegetation to be retained include:

- All areas of mapped Swift Parrot Important Habitat Map.
- Areas of Swamp Sclerophyll Forest Endangered Ecological Community in the north-west and southern parts of the site.
- Areas of Swamp Oak Floodplain Forest Endangered Community in the north-west part of the site.
- The constructed dam and adjoining fringe areas in the northern part of Lot 3 DP 1000694.

All hollow-bearing trees will be retained within the proposed E2 zoned land and Open Space area (refer to Figure 21: Location of hollow-bearing trees).

The existing dam and surrounding vegetation occurring on proposed Stage 4 land (buffering mapped Swift Parrot Important Area Habitat) can be retained as part of an 88b instrument as part of suture subdivision applications.

GIS mapping and area calculations quantifying the following areas of impact/ avoidance:

- EZ Zoned Land (good quality) & Open Space Land (2.24 ha impact avoided)

- No future development likely to occur - group of remnant trees can be protected via way of Restriction-as-to-User (88b Instrument) as part of future subdivision—includes mapped Swift Parrot area (0.86 ha impact avoided)
- 1.2ha of poor quality (isolated trees with weedy understorey) PCT 1722 and 1728 likely to be impacted

Refer to Figure 23: Impact avoidance map.

Detailed plans of the proposal have been provided within Appendix A of this report.

Design measures to avoid or minimise impacts on biodiversity values are further considered against the items under Section 7.1.2 of BAM 2020 in Table 13 below.

**Table 13: Justification of project design**

| No | Requirement | Design Justification |
|---|---|---|
| 1a) | Reducing the proposal's clearing footprint by minimising the number and type of facilities | All future development as part of the rezoning will occur within degraded or existing cleared areas. All good quality forest in the north-west portion of the site and all mapped Swift Parrot important areas will be retained. |
| 1b) | Locating ancillary facilities in areas that have no biodiversity values | All future development as part of the rezoning will predominantly occur within degraded or existing cleared areas. All good quality forest in the north-west portion of the site and all mapped Swift Parrot important areas will be retained.<br><br>All hollow-bearing trees will be retained within the proposed E2 zoned land and Open Space area (refer to *Figure 21: Location of hollow-bearing trees*).<br><br>The existing dam occurring on proposed Stage 4 land can be retained as part of an 88b instrument as part of suture subdivision applications.<br><br>Refer to *Figure 23: Impact avoidance map*. |
| 1c) | Locating ancillary facilities in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas with the lowest vegetation integrity scores) | All future development as part of the rezoning will predominantly occur within degraded or existing cleared areas. All good quality forest in the north-west portion of the site and all mapped Swift Parrot important areas will be retained.<br><br>GIS mapping and area calculations quantifying the following areas of impact/ avoidance:<br>- EZ Zoned Land (good quality) & Open Space Land (2.24 ha impact avoided)<br>- No future development likely to occur - group of remnant trees can be protected via way of Restriction-as-to-User (88b Instrument) as part of future subdivision—includes mapped Swift Parrot area (0.86 ha impact avoided)<br>- 1.2ha of poor quality (isolated trees with weedy understorey) PCT 1722 and 1728 likely to be impacted<br><br>Refer to *Figure 23: Impact avoidance map*. |

| No | Requirement | Design Justification |
|---|---|---|
| | | |
| 1d) | Locating ancillary facilities in areas that avoid habitat for species and vegetation that has a high threat status (e.g. an endangered ecological community (EEC) or critically endangered ecological community (CEEC) or is an entity at risk of a serious and irreversible impact (SAII) | All future development as part of the rezoning will occur within degraded or existing cleared areas. All good quality forest in the north-west portion of the site and all mapped Swift Parrot important areas will be retained. No SAII entities will be impacted by the proposal. |
| 1e) | Actions and activities that provide for rehabilitation, ecological restoration and/or ongoing maintenance of retained areas of native vegetation, threatened species, threatened ecological communities and their habitat on the subject land | - All areas of mapped Swift Parrot Important Habitat Map to be avoided.<br>- Areas of Swamp Sclerophyll Forest Endangered Ecological Community in the north-west and southern parts of the site to be avoided.<br>- Areas of Swamp Oak Floodplain Forest Endangered Community in the north-west part of the site to be avoided.<br>- The constructed dam and adjoining fringe areas in the northern part of Lot 3 DP 1000694 to be avoided. |
| 2 | The BDAR or BCAR must document and justify efforts to avoid or minimise impacts through design | - Inclusion of retained areas in appropriate zones as supported by a Voluntary Planning Agreement.<br>- Preparation of a Vegetation Management Plan for retained areas of vegetation in accordance with Councils VMP Guidelines.<br>- Preparation of a Fauna Management Strategy.<br>- Implementation of a tree hollow/artificial nestbox strategy for hollow removal and habitat augmentation.<br>- Ecological inspection of habitats/trees prior to clearing.<br>- Preparation and Implementation of an Erosion and Sediment Control Plan for all components of site development (tree clearing, grubbing, topsoil removal, site regrading, installation of roads/services etc) in accordance with Councils DCP requirements.<br>- Preparation of a site or stage specific Construction Environment Management Plan Implementation of a contractor.<br>- Environmental induction program. |

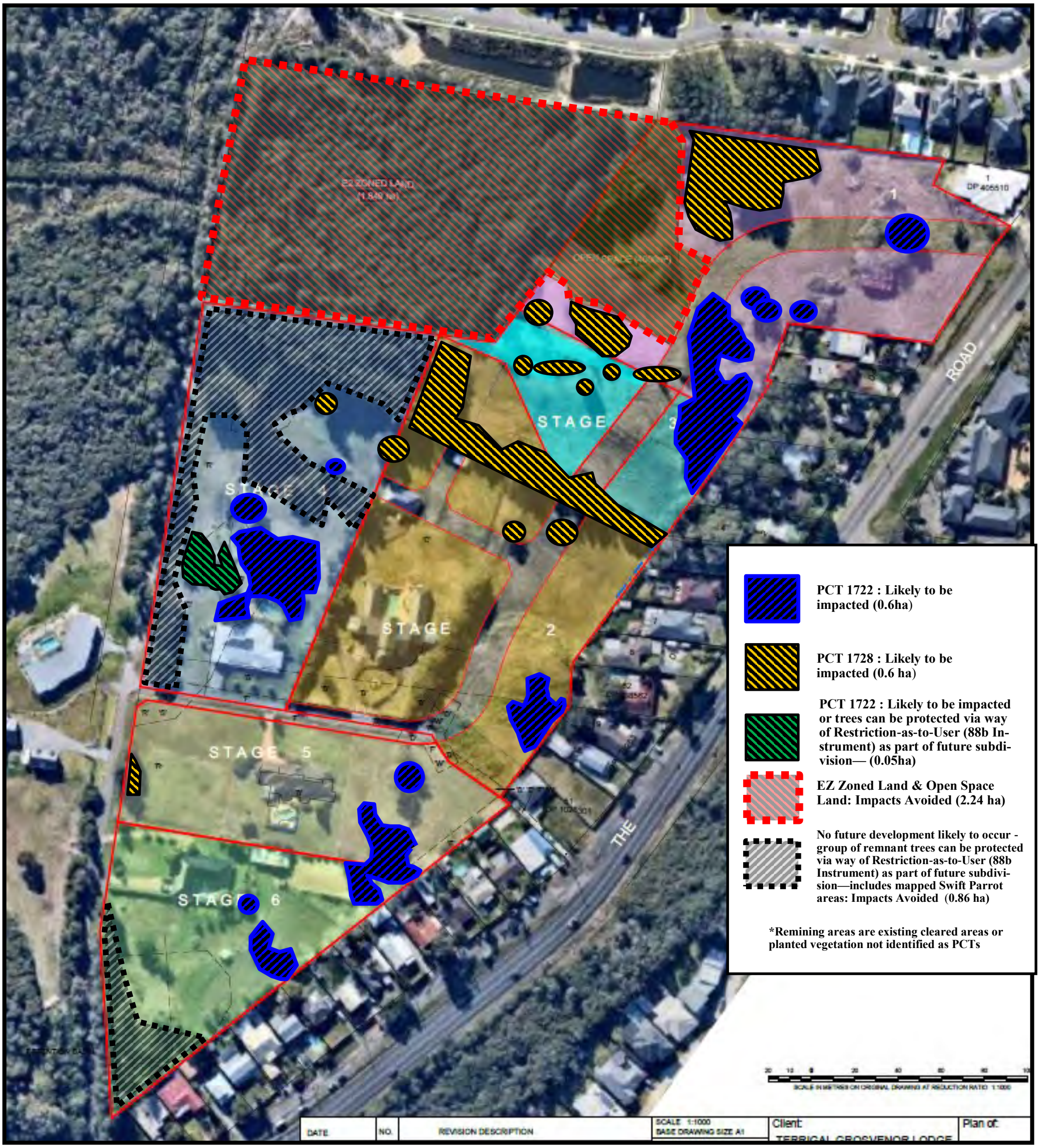


**Figure 23: Impact and avoidance map**

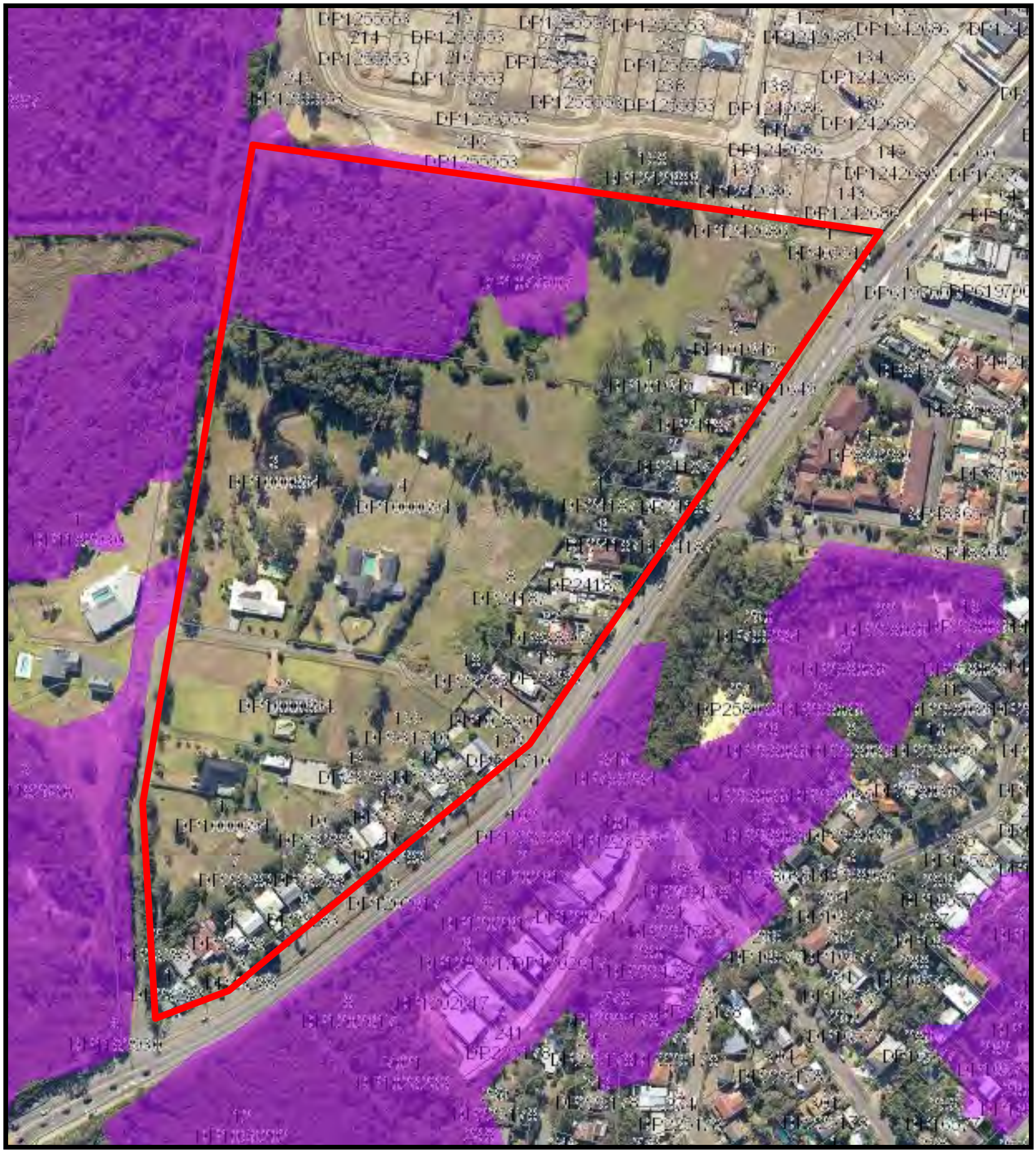

**Figure 23a: DPIE Swift Parrot important habitat mapping (purple shaded area) (Source: DPIE 2022c)**

## 4.5 Minimisation of Impacts

Several mitigation measures are proposed to minimise potential impacts; these are summarised in Table 12. These include measures to be implemented in the pre-construction, construction and post-construction phases. It is considered that these measures would serve to minimise any potential direct or indirect impacts.

Impact minimisation and habitat amelioration to be implemented would include:

- Inclusion of retained areas in appropriate zones as supported by a Voluntary Planning Agreement.
- Preparation of a Vegetation Management Plan for retained areas of vegetation in accordance with Councils VMP Guidelines.
- Preparation of a Fauna Management Strategy.
- Implementation of a tree hollow/artificial nestbox strategy for hollow removal and habitat augmentation.
- Ecological inspection of habitats/trees prior to clearing.
- Preparation and Implementation of an Erosion and Sediment Control Plan for all components of site development (tree clearing, grubbing, topsoil removal, site regrading, installation of roads/services etc) in accordance with Councils DCP requirements.
- Preparation of a site or stage specific Construction Environment Management Plan Implementation of a contractor.
- Environmental induction program.

## Table 14: Mitigation measures proposed to minimise potential impacts

| Action | Outcome/measure | Risk/ consequence of residual impacts | Timing | Responsibility |
|---|---|---|---|---|
| **Project location** | The location of the proposed development has been positioned in order to avoid and minimise the potential resulting impacts on biodiversity values within the<br>Subject Site, where possible. | Risk = low<br>Consequence =<br>Harm to native<br>vegetation and<br>native fauna | Pre-construction<br>phase | Proponent |
| **Project design** | The proposed development has been designed to avoid and minimise impacts on native vegetation and habitat where possible within the Subject Site. Where this is not possible, mitigation measures have been designed and recommended to reduce potential ecological impact.<br>The design of the proposed development includes the retention of a majority of the native vegetation within the study area and subject site. | Risk = low<br>Consequence =<br>Harm to native<br>vegetation and<br>native fauna | Pre-construction<br>phase | Proponent |
| **Avoidance of hollow-bearing trees** | No hollow-bearing trees occur within the proposed development footprint. | Risk = low<br>Consequence = Loss of fauna habitat. Loss of native vegetation. | Construction phase | Proponent |
| **Avoidance of woody debris** | Woody debris was generally absent within the proposed future impact area. | Risk = low<br>Consequence = Loss of fauna habitat. | Construction phase | Proponent |
| **Erosion and sedimentation** | Appropriate erosion and sediment control must be erected and maintained at all times during construction. This will be described in more detail as part of future subdivision development application stage processes. As minimum such measures should comply with the relevant industry guidelines such as 'the Blue Book' (Landcom 2004). | Risk = low<br>Consequence = Degradation of vegetation, | Construction phase | Construction Contractor |
| **Erosion protection fencing** | Appropriate erosion and sediment control must be erected and maintained at all times during construction. This will be described in more detail as part of future subdivision development application stage processes. As minimum such measures should comply with the relevant industry guidelines such as 'the Blue Book' (Landcom 2004). | Risk = high<br>Consequence = Permanent damage or degradation of vegetation. | Construction phase | Construction Contractor |

| Action | Outcome/measure | Risk/ consequence of residual impacts | Timing | Responsibility |
|---|---|---|---|---|
| **Weed eradication and suppression** | All priority weeds should be eradicated across all areas of the areas proposed for retention.<br><br>Preparation of a Vegetation Management Plan for retained areas of vegetation in accordance with Councils VMP Guidelines has been proposed.<br><br>Weeds are to be continually managed on the C2 Environmental Conservation zoned land of Lot 522 DP 1077907 and Lot 3 DP 1000694 such that the ecological integrity of the Endangered Ecological Community is maintained. No solid fencing is to be erected along the boundary between these two properties. | Risk = moderate<br><br>Consequence = Harm to native vegetation and native fauna habitat. | Construction phase<br><br>and<br><br>Post-construction phase | Proponent |
| **Stormwater** | The following has been proposed:<br><br>Preparation and Implementation of an Erosion and Sediment Control Plan for all components of site development (tree clearing, grubbing, topsoil removal, site regrading, installation of roads/services etc) in accordance with Councils DCP requirements.<br><br>No services will be constructed through the land zoned C2 Environmental Conservation.<br><br>Any drainage works required as part of the subdivision will not to be constructed on land to be zoned C2 Environmental Conservation and are to have no adverse impact on the wetland vegetation. | Risk = low<br><br>Consequence = Harm to native vegetation and<br>native fauna habitat. | Construction phase | Proponent<br>Construction Architect |

# 5 IMPACT SUMMARY

## 5.1 Serious and Irreversible Impacts

The OEH (2017) *Guidance to Assist a Decision-maker to Determine a Serious and Irreversible Impact* lists the ecological communities and species that are 'potential serious and irreversible impact (SAII) entities'. None of the ecological communities, or species relevant to this assessment are potential SAII entities.

## 5.2 Impacts Which Require an Offset

Tables 15 and 16 provide a summary of the impacts that require an offset, under the BAM.

**Table 15: Vegetation Zones Requiring an Offset**

| Vegetation Zone ID No. | PCT | Area Impacted (ha) | Current Vegetation Integrity Score | Future Vegetation Integrity Score | Number of Ecosystem Credits Required |
|---|---|---|---|---|---|
| 1 | PCT 1728 Swamp Oak – Prickly Paperbark- Tall Sedge Swamp Forest on Coastal Lowlands of the Central Coast and Lower North Coast | 0.6 | 38.8 | 0 | 11 |
| 2 | PCT 1722 Swamp Mahogany- Paperbarks- Harsh Ground Fern swamp forest of the Central Coast | 0.6 | 36.7 | 0 | 12 |

**Table 16: Threatened Species Requiring an Offset**

| Species | Area of Impacted Habitat | Number of Species Credits Required |
|---|---|---|
| Southern Myotis (*Myotis macropus*) | NIL | 23 |

## 5.3 Impacts Not Requiring an Offset

N/A

## 5.4 Identification of Areas Not Requiring Assessment

Section 3.1.2 describes PCT 1716 Prickly-leaved Paperbark forest on coastal lowlands of the Central Coast and Lower North Coast.

The occurrences of this Endangered Ecological Community in the western part of Lot 522 DP 1077907 is the subject of a Vegetation Management Plan under a Planning Agreement relating to the land. This area, zoned C2 Environmental Conservation, is to be placed under an 88B restriction as to its use and enforced under Section 88E of *The Conveyancing Act, 1919*.

This vegetation zone will not be impacted by the proposed development, and therefore, BAM plot surveys were not required for this large patch of this PCT.

## 5.5 Serious and Irreversible Impacts (SAII's)

An impact is to be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct because:

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

These principles are set out in clause 6.7 of the Biodiversity Conservation Regulation 2017.

No SAII entities are impacted by the proposed development.

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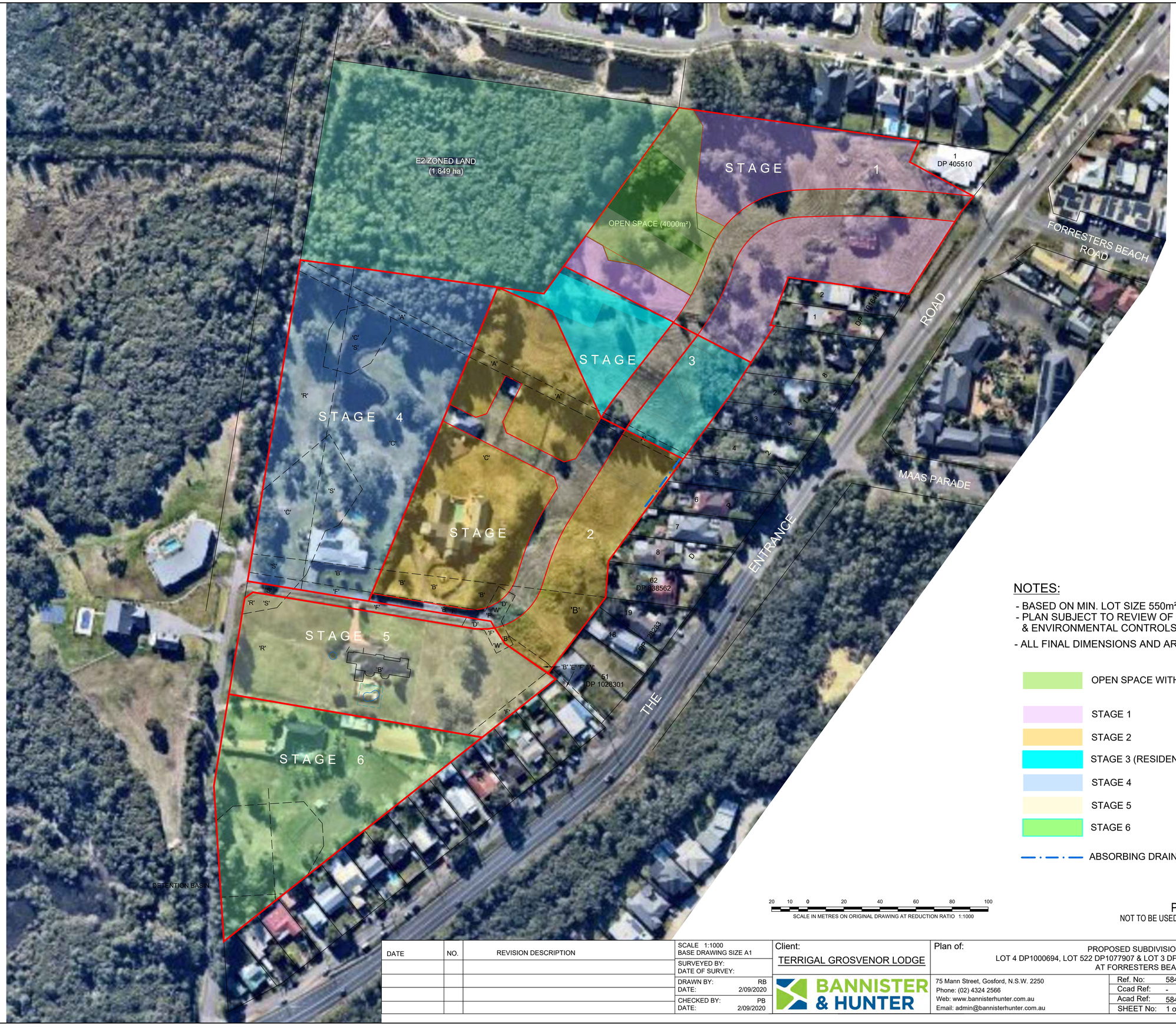
# APPENDIX A SITE PLANS




## NOTES:

- BASED ON MIN. LOT SIZE 550m²
- PLAN SUBJECT TO REVIEW OF ENGINEERING, BUSHFIRE & ENVIRONMENTAL CONTROLS
- ALL FINAL DIMENSIONS AND AREAS SUBJECT TO SURVEY

OPEN SPACE WITHIN STAGE 1 (4000m² )

STAGE 1

STAGE 2

STAGE 3 (RESIDENTIAL)

STAGE 4

STAGE 5

STAGE 6

ABSORBING DRAIN 1m X 0.5m

20 10 0 20 40 60 80 100

SCALE IN METRES ON ORIGINAL DRAWING AT REDUCTION RATIO 1:1000

**PRELIMINARY**
NOT TO BE USED FOR CONSTRUCTION PURPOSES

| DATE | NO. | REVISION DESCRIPTION |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

SCALE 1:1000
BASE DRAWING SIZE A1
SURVEYED BY:
DATE OF SURVEY:
DRAWN BY: RB
DATE: 2/09/2020
CHECKED BY: PB
DATE: 2/09/2020

Client:
TERRIGAL GROSVENOR LODGE

Plan of:
PROPOSED SUBDIVISION OF
LOT 4 DP1000694, LOT 522 DP1077907 & LOT 3 DP101649 AND LOT 2 DP1000694
AT FORRESTERS BEACH

BANNISTER & HUNTER
75 Mann Street, Gosford, N.S.W. 2250
Phone: (02) 4324 2566
Web: www.bannisterhunter.com.au
Email: admin@bannisterhunter.com.au

Ref. No: 58463
Ccad Ref: -
Acad Ref: 58463-31s
SHEET No: 1 of 1

Date: 7th February 2022
Datum: -
REVISION -

# APPENDIX B BAM PLOT DATA SHEETS

# BAM Site – Field Survey Form

| Survey Name | | Date | Zone ID | Recorders | |
|---|---|---|---|---|---|
| Bakali Road Forresters Beach | | 28th January 2022 | 1 | Alex Fraser | |
| Zone: 56 | Datum: MGA | Plot ID: 1 | Plot dimensions: 50x20 m | | Photo #: |
| Easting: 357036 | Northing: 6302567 | IBRA region: Sydney Basin Wyong IBRA subregion | | Midline bearing from 0 m: | |
| **Vegetation Class:** Coastal Floodplain Wetlands **Formation**: Forested wetlands | | | | | Confidence High |
| Plant Community Type: PCT 1728 - Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast | | | | EEC: Yes | Confidence High |

*Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.*

| BAM Attribute (400m$^2$ plot) | Sum values | |
|---|---|---|
| | Count of native richness | Cover |
| **Trees** | **3** | **34** |
| **Shrubs** | **1** | **2** |
| **Grasses etc.** | **3** | **7** |
| **Forbs** | **5** | **37** |
| **Ferns** | **1** | **15** |
| **Other** | **3** | **6** |
| **High threat weed cover** | | **22** |

**Cover:** 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

| BAM Attribute (1000m$^2$ plot) | | |
|---|---|---|
| **DBH** | **#Tree Stems Count** | **#Stems with Hollows** |
| **80 + cm** | - | - |
| **50 – 79 cm** | - | - |
| **30 – 49 cm** | **7** | - |
| **20 – 29 cm** | **20** | - |
| **10 – 19 cm** | **23** | - |
| **5 – 9 cm** | **12** | - |
| **<5 cm** | **6** | |
| **Length of logs (m) (≥ 10 cm diameter, >50cm in length)** | **Tally: 3** | **Total:** 0 |

*Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.*

*For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

| BAM Attribute (1 x 1 m plots) | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Litter cover %** | | | | | **Bare ground cover %** | | | | | **Cryptogam cover %** | | | | | **Rock cover %** | | | | |
| **Subplot score % in each** | 5 | 15 | 25 | 35 | 45 | 5 | 15 | 25 | 35 | 45 | 5 | 15 | 25 | 35 | 45 | 5 | 15 | 25 | 35 | 45 |
| | 60 | 40 | 60 | 50 | 40 | | | | | | | | | | | | | | | |
| **Average of the 5 subplots** | **48** | | | | | n/a | | | | | n/a | | | | | n/a | | | | |

*Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)*

# BAM Site – Plot Species List

| 400m² plot: Sheet ___ of ___ | Survey Name | Plot ID | Recorders |
|---|---|---|---|
| **Date:** 28/1/22 | Balaki Rd Forresters Beach | PCT 1722 | ALEX FRASER |

| GF Code | Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable | N, E or HTE | Cover | Abund | Stratum | Voucher | Photo # |
|---|---|---|---|---|---|---|---|
| Tree | *Casuarina glauca* | N | 30 | 15 | C | | |
| | *Senna pendula var glabrata* | HTE | 3 | | | | |
| | *Ageratina adenophora* | HTE | 3 | | | | |
| Tree | *Glochidion ferdinandi* | N | 3 | 2 | E | | |
| Forb | *Hydrocotyle peduncularis* | N | 10 | >100 | E | | |
| | *Lantana camara* | E | | | | | |
| Forb | *Persicaria deciphens* | N | 20 | >50 | G | | |
| | *Zanteschia* | E | | | | | |
| Fern | *Hypolepis muelleri* | N | 15 | >30 | G | | |
| | *Bidens pilosa* | E | | | | | |
| OG | *Stephania japonica* | N | 3 | >50 | M | | |
| GG | *Typha orientalis* | N | 2 | 3 | | | |
| GG | *Echinopogon caespitosus* | N | 2 | >50 | G | | |
| FG | *Stellaria flaccida* | N | 3 | >20 | G | | |
| | *Pennisetum clandestinum* | E | | | | | |
| | *Phoenix canariensis* | E | | | | | |
| FG | *Commelina cyanea* | N | 2 | >20 | G | | |
| GG | *Cynodon dactylon* | N | 3 | >20 | G | | |
| OG | *Parsonsia straminea* | N | 1 | >20 | M | | |
| | *Cinnamomum camphora* | E | | | | | |
| OG | *Glycine clandestina* | N | 2 | 30 | G | | |
| Tree | *Guoia semiglauca* | N | 1 | 1 | M | | |
| FG | *Centella asiatica* | N | 2 | 20 | G | | |
| | *Rubus fruticosus* | HTE | 3 | | | | |
| | *Cyperus spp.* | E | | | | | |
| | *Sida rhombifolia* | E | | | | | |
| S | *Melaleuca nodosa* | N | 1 | 2 | M | | |
| | *Ipomoea purpurea* | | | | | | |
| | | | | | | | |
| | | | | | | | |

**N**: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'

**Cover**: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

**Abundance**: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000

**Stratum**: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

**Location of BAM plot for PCT 1728**



Location of BAM plot
View eastwards



Location of BAM plot
View westwards


SW
W
NW
N
240
270
300
330
0
30
310°NW (T) 33°24'23"S, 151°27'44"E ±22ft ▲35ft
Fraser Ecological
Bakari Rd Forresters Beach
28 Jan 2022, 10:13:52


W
NW
N
NE
240
270
300
330
0
30
323°NW (T) 33°24'24"S, 151°27'45"E ±13ft ▲38ft
Fraser Ecological
Bakari Rd Forresters Beach
28 Jan 2022, 10:12:04

# BAM Site – Field Survey Form

| Survey Name | | Date | Zone ID | Recorders | |
|---|---|---|---|---|---|
| Bakali Road Forresters Beach | | 28th January 2022 | 1 | Alex Fraser | |
| Zone: 56 | Datum: MGA | Plot ID: 1 | Plot dimensions: 50x20 m | | Photo #: |
| Easting: 357117 | Northing: 6302606 | IBRA region: Sydney Basin Wyong IBRA subregion | | Midline bearing from 0 m: | |
| **Vegetation Class:** Coastal Swamp Forests **Formation**: Forested wetlands | | | | | Confidence High |
| Plant Community Type: PCT 1722 - Swamp Mahogany - Paperbarks - Harsh Ground Fern swamp forest of the Central Coast | | | | EEC: Yes | Confidence High |

*Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.*

| BAM Attribute (400m$^2$ plot) | Sum values | |
|---|---|---|
| | Count of native richness | Cover |
| **Trees** | **2** | **16** |
| **Shrubs** | **0** | **0** |
| **Grasses etc.** | **3** | **24** |
| **Forbs** | **2** | **16** |
| **Ferns** | **2** | **6** |
| **Other** | **-** | **-** |
| **High threat weed cover** | | **15** |

**Cover:** 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

| BAM Attribute (1000m$^2$ plot) | | |
|---|---|---|
| **DBH** | **#Tree Stems Count** | **#Stems with Hollows** |
| **80 + cm** | 8 | - |
| **50 – 79 cm** | 2 | - |
| **30 – 49 cm** | 2 | - |
| **20 – 29 cm** | - | - |
| **10 – 19 cm** | - | - |
| **5 – 9 cm** | - | - |
| **<5 cm** | | |
| **Length of logs (m) (≥ 10 cm diameter, >50cm in length)** | **Tally: 0** | **Total:** 0 |

*Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.*

*For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

| BAM Attribute (1 x 1 m plots) | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Litter cover %** | | | | | **Bare ground cover %** | | | | | **Cryptogam cover %** | | | | | **Rock cover %** | | | | |
| **Subplot score % in each** | 5 | 15 | 25 | 35 | 45 | 5 | 15 | 25 | 35 | 45 | 5 | 15 | 25 | 35 | 45 | 5 | 15 | 25 | 35 | 45 |
| | 15 | 15 | 15 | 15 | 15 | | | | | | | | | | | | | | | |
| **Average of the 5 subplots** | **15** | | | | | n/a | | | | | n/a | | | | | n/a | | | | |

*Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)*

# BAM Site – Plot Species List

| 400m² plot: Sheet ___ of ___ | Survey Name | Plot ID | Recorders |
|---|---|---|---|
| **Date:** 28/1/22 | Balaki Rd Forresters Beach | PCT 1722 | ALEX FRASER |

| GF Code | Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable | N, E or HTE | Cover | Abund | Stratum | Voucher | Photo # |
|---|---|---|---|---|---|---|---|
| Tree | *Eucalyptus robusta* | N | 15 | 4 | C | | |
| FG | *Hydrocotyle peduncularus* | N | 15 | 100+ | G | | |
| - | *Pennisetum clandestinum* | E | | | | | |
| FG | *Commelina cyanea* | N | 1 | 20+ | G | | |
| | *Dandelion -Taraxacum officialinale* | E | | | | | |
| | *Plantago lanceolata* | E | | | | | |
| | *Bidens pilosa* | HTE | 5 | | | | |
| | *Rubus fruticosus* | HTE | 3 | | | | |
| | *Senecio madagascarensis* | HTE | 2 | | | | |
| | *Paspalum dilatum* | E | | | | | |
| Fern | *Pteridium esculentum* | N | 3 | 10 | | | |
| Tree | *Glochidion ferdinandi* | N | 1 | 1 | | | |
| GG | *Carex apressa* | N | 1 | 20 | | | |
| | *Erhryna spp x sykesi* | HTE | 5 | 5 | | | |
| GG | *Imperata cylindrica* | N | 20 | 25 | | | |
| GG | *Gahnia sieberiana* | N | 3 | 10 | | | |
| Fern | *Hypolepsis muelleri* | N | 3 | 25 | | | |
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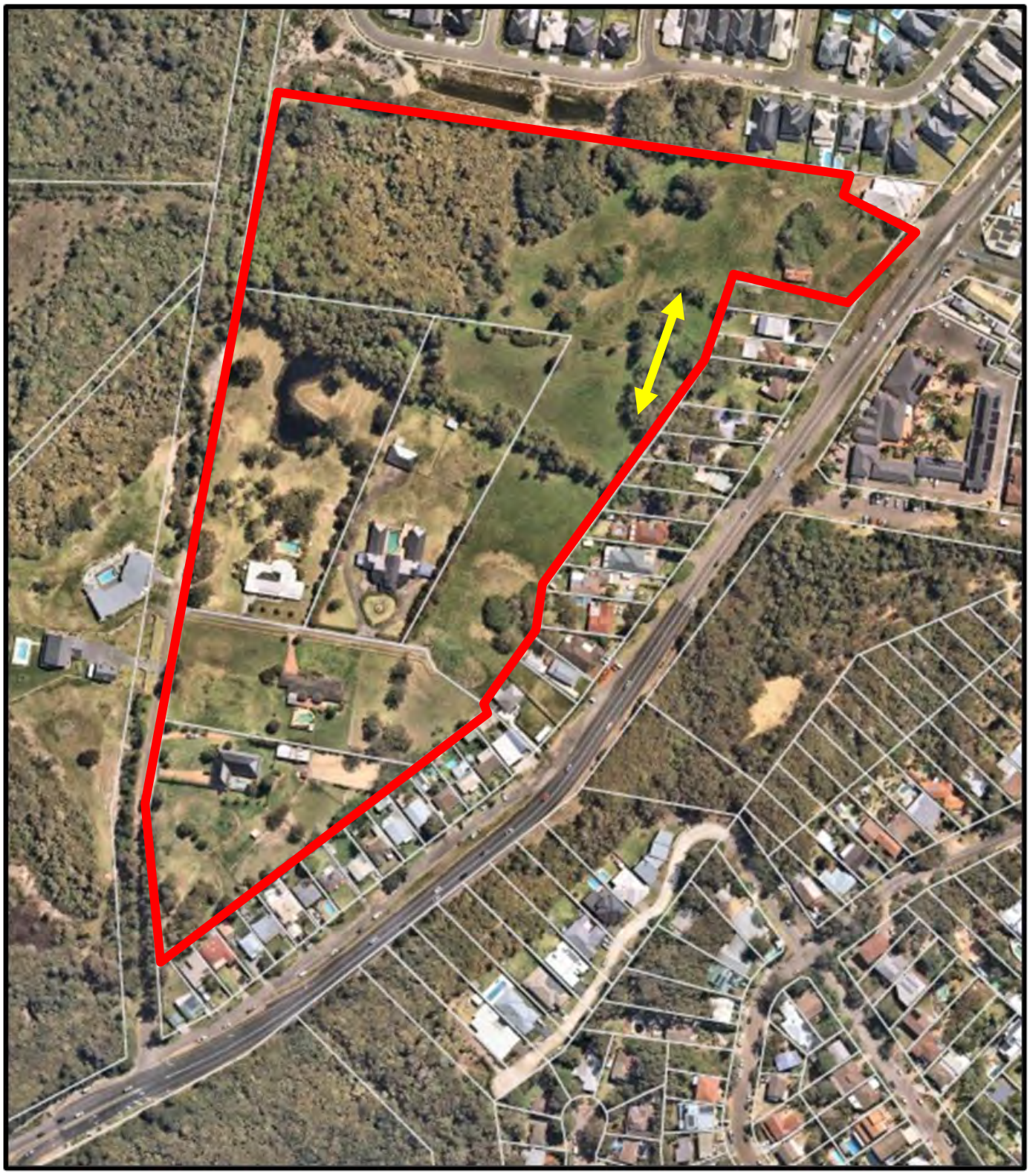
| | | | | | | | |

**N**: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'

**Cover**: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

**Abundance**: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000

**Stratum**: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer



**Location of BAM plot for PCT 1722**



Location of BAM plot
View south-west


Location of BAM plot
View north east

# APPENDIX C QUALIFICATION, LICENSING AND CERTIFICATION

# Alexander Fraser

alohafraser@gmail.com | 0423238193 | 665 The Scenic Rd Macmasters Beach, NSW 2251

## Key skills

- 12+ years private ecological consulting (Fraser Ecological Consulting)
- 15 + years local government ecological assessment for DAs (Hornsby Shire Council – current employer)
- 10 + years Land & Environment Court expert witness experience
- 2 years state government ecological assessment (NSW OEH)
- High level botanical field identification skills, plot surveys and project management
- Fauna survey and field assistant experience
- Biodiversity Assessment Reporting (BDAR) preparation and Stewardship Site (BSAR) under the NSW BOS Credit Scheme

## Qualifications

Bachelor Environmental Science (Honours) Southern Cross University

Certificate 3 Natural Area Restoration

Certificate 3 Vertebrate Animal Pest Control (NSW DPI, Orange)

NPWS Scientific Licence - S10445

**A**nimal Ethics Authority - 11/4299

Accredited under the Biodiversity Assessment Methodology - BAM (Accreditation No. BAAS18156)

Practising member of NSW Ecological Consultants Association (ECA)

## Summary

Alex Fraser (Principal Ecologist, Fraser Ecological) has extensive experience in DA related ecological assessment as both an assessor (Hornsby Shire Council) and private consultancy (Fraser Ecological) which actively and currently involve a wide array projects. Fraser Ecological is based locally on the Central Coast, however, project experience extends to South Coast, Blue Mountains, Mid-north Coast and mainly in the Sydney Basin Bioregion.

Previous work roles include ecological consulting for Parsons Brinckerhoff (large infrastructure), NPWS threatened species unit (biodiversity surveys), former NSW Department of Climate Change/ OEH (SIS DGRs and major projects assessment) and Hornsby Shire Council (DA assessment officer) have focussed primarily on ecological survey, development assessment, project management and policy development for consent authorities.

Alex offers high level botanical ID and field survey skills which includes targeted surveys and BAM plot surveys. Fraser Ecological has extensive experience in the preparation of over 15 BDARs under the new BC Act 2016 BOS credit trading scheme. Alex has experience dealing with consent authorities including Council, Crown Lands, Metropolitan Land Council, RFS, Biodiversity Conservation Trust and Department of Planning for major projects including SSDI proposals.

Fraser Ecological has established a wide network of ecological specialists including the Royal Botanic Gardens and Australian Museum as well academic institutions for expert advice when required. Alex is a current member of the North Sydney Regional Land Managers Group that includes staff from Central Coast Council, Northern Beaches, Ku-ring-gai Council, Hornsby Council (HSC), NPWS and Crown Lands) as project manager developing the Natural Area Recreation Strategy for HSC. Current main role at Council is development assessment and review of Flora and Fauna Reports and Biodiversity Assessment Reports.

Fraser Ecological has been engaged by various Councils (Central Coast, Ku-ring-gai, Liverpool City, Blacktown City Council, Hornsby Shire Council and Hawkesbury City Council) to undertake biodiversity assessments for major civil works projects. He is continuously providing biodiversity assessments for private clients for a range od development proposals across coastal and western NSW. We have also undertaken threatened flora and fauna species survey and monitoring for the NSW OEH Save our Species grants.

**Key skills:**

- Targeted flora and fauna surveys
- BAM plots in accordance with the BAM
- Ecological monitoring & Opportunity and Constraints mapping
- Preparation of BDARs, BAM calculator and credit reporting
- Retirement of credits for approved projects via BCT and brokers
- Establishment of stewardship sites and other offset packages
- Expert witness reporting and attendance in the LAEC
- Compliance investigations and auditing
- Preparation of Vegetation Management Plans
- Preparation of Nestbox Monitoring Plans

# CERTIFICATE OF ACCREDITATION AS A BIODIVERSITY ASSESSMENT METHOD ASSESSOR under the *Biodiversity Conservation Act 2016* (NSW)

| **BAM Assessor** | | |
|---|---|---|
| Alexander Fraser | | |
| **Accreditation number** | **Accreditation date (Date of issue)** | **Expiry Date of** |
| BAAS18156 | 17 October 2021 | 17 October 2024 |

The person named above is accredited under section 6.10 of the *Biodiversity Conservation Act 2016* (NSW) (**BC Act**) as a Biodiversity Assessment Method Assessor to apply the Biodiversity Assessment Method in connection with the preparation of biodiversity stewardship site assessment reports, biodiversity development assessment reports and biodiversity certification assessment reports pursuant to Part 6 of the BC Act.

The accreditation is in force until and including the Expiry Date. The accreditation is subject to the conditions set out in the *Accreditation Scheme for the Application of the Biodiversity Assessment Method*, under the BC Act, and the conditions specified on the reverse of this certificate.

**LUCIAN MCELWAIN**

Manager Ecosytem Programs
Department of Planning, Industry & Environment

NOTES

- DPIE maintains a register of Accredited Biodiversity Assessment Method (BAM) Assessors accessible from the DPIE website.
- The BAM Assessor's accreditation expires on the Expiry Date unless renewed in accordance with the *Accreditation Scheme for the Application of the Biodiversity Assessment Method*. It is the BAM Assessor's responsibility to monitor the Expiry Date of their accreditation, and apply for any renewal with sufficient time for the application to be processed prior to the Expiry Date.
- Words and expressions used in this accreditation instrument and which are also used in the Act have the same meaning.

**SUMMARY OF CONDITIONS UNDER SCHEME**

The following are conditions of all accreditations granted under the Scheme:

1. an accredited person must prepare Biodiversity Assessment Reports (and conduct surveys and other activities in connection with the preparation of such reports) in accordance with:
   a. the Biodiversity Assessment Method Manual,
   b. the Credit Calculator Operational Manual,
   c. Accredited Person Code of Conduct.
   d. this Scheme,
   e. any guidance materials published by the Department of Planning, Industry and Environment in connection with preparation of Biodiversity Assessment Reports or the application of the BAM
   f. any accreditation requirements notified by the Department of Planning, Industry and Environment to the accredited assessor from time to time.
2. an accredited person must maintain a detailed and up to date working knowledge of, and comply with, all relevant legislation.
3. an accredited person must maintain records of surveys and assessments, including field data sheets and targeted flora and fauna surveys, undertaken and used as part of the preparation of a Biodiversity Assessment Report, for at least ten years after certification of the relevant Biodiversity Assessment Report.
4. all records required kept by an accredited person must be in legible form, or in a form that can be readily be reduced to a legible form.
5. an accredited person must provide to the Department of Planning, Industry and Environment any information related to biodiversity assessment reports required to be provided by all accredited persons, or by a group of accredited persons, by way of a notice specified on a website maintained by it, in the form and within the time frames required in that notice.
6. an accredited person must comply with any scientific licence conditions relating to survey records.
7. an accredited person must possess, or operate under, an appropriate scientific licence as required for the type work, they are completing in the Biodiversity Offsets Scheme.

**Note.** Information that the Environment Agency Head (EAH) may require to be provided may include information collected during the application of the BAM such as site specific survey data.

**Note.** In addition to the conditions above, accredited persons must comply with obligations under the BC Act and regulations, including Part 6 Division 3 of the BC Act. Failure to comply with any of the conditions above may result in the EAH exercising the power to vary, suspend or cancel that accreditation under Part 5 of this Scheme.

# COREY MEAD

## FAUNA ECOLOGIST


Address: 3 Rysdyk Pde, Wamberal NSW 2260
ACN: 644 302 796
Mob: 0401 557 882
Email: corey@treehouseecology.com.au
Website: www.treehouseecology.com.au


Brighton Downs Qld – Night Parrot re-discovery 2013

With over 15 years' experience in undertaking fauna surveys and preparing habitat and impact assessment reports for threatened biodiversity and 25 years' working generally with wildlife, I feel fortunate to do what I do. From finding rare animals in remote parts of Australia to appreciating locally common species, I love the challenges of working out both habitat values and outcomes for clients. In more recent years I have gained valuable insights from working alongside several industry recognised experts, yet still feel most comfortable connecting on my own. My current interest is enhancing / relocating natural large hollows and complete trunk sections or excavating hollows in living trees for forest owls and cockatoos to avoid and minimise impacts.

### EDUCATION / QUALIFICATIONS

- Southern Cross University – B App. Sc 1994
- BAM Accredited Assessor (BAAS.19050)
- Accredited Biobanking Assessor (No.231)
- NSW NPWS – Introduction to Arcview GIS
- Frog, Reptile & Bat Survey, ID & Mgt Training – NSW Forestry
- Anabat Techniques Training – Titley Scientific – Smiths Lake
- Report Writing – Pollack Learning Alliance
- Tree climbing techniques and chainsaw operation
- Risk Assessment Training (Taronga Zoo)
- Australian bat Lyssavirus vaccinations
- NSW RFS – Firefighters Certificate
- Cert III – Building & Carpentry (nest boxes)
- First Aid Certificate (St John's Ambulance Service)
- Class C vehicle, Boat & Divers Licences

### SKILLS / EXPERIENCE

- Report writing (BDAR / BCAR / BSSAR / KAR / and other fauna related assessment, monitoring and management reports)
- Maintain ecological report templates, content and formatting
- Remote and independent terrestrial vertebrate surveys
- Threatened fauna target surveys & assessment
- BAM-C fauna data and credit assessment
- Fauna support for Land & Environment Court cases
- Microbat ultrasonic call identification & active monitoring
- AnalookW, Anapocket, Insight & CFC Read bat analysis software
- Kaleidoscope Pro song-meter clustering & classifier analysis
- Prepare song classifiers for threatened owls, frogs & gliders
- Radio-tracking Surveys
- Owl roost and nest locations
- Coordinate the relocation of large owl hollow sections and entire 9 tonne trees containing large hollows with cranes and climbers
- Tree climbing and chainsaw qualified
- Project Ecologist during habitat clearance
- Habitat tree assessment / Audits
- Construct and supply long-life nest boxes
- Advanced animal captive management
- Fire trail audits & bushfire risk analysis
- Advanced venomous snake handling & training for zoo staff
- Education/training program development
- Sub-1m GPS data collection, transfer and management
- Scientific License & Animal Ethics License

### EMPLOYMENT HISTORY

- May 2011 – Recent – Senior Fauna Ecologist – Travers Bushfire & Ecology
- Oct 2007 – May 2011 – Fauna Ecologist – Travers Bushfire & Ecology
- Jan 2006 – Oct 2007 – Field Tech / Fauna Ecologist – Conacher Travers Environmental Consultants
- Feb 2003 – Jan 2006 – Head Reptile Keeper – Australian Reptile Park
- Jan 2003 – Sept 2005 – Visitor Services Officer – National Parks & Wildlife Service
- Dec 2002 – Jan 2003 – Marine Turtle Project Officer – National Park & Wildlife Service
- Aug 2000 – Feb 2003 – Venom Room Attendant – Australian Reptile Park
- Apr 1997 – Sept 2000 – Environmental Education Officer – Australian Reptile Park

# COREY MEAD

## FAUNA ECOLOGIST

### PHONE REFEREES

- John Travers - Director *Travers Bushfire & Ecology* - 0418 630 048
- Elizabeth Ashby - Director *Keystone Ecology* - 0418 680 566
- Rochelle Lawson - Senior Ecologist Central Coast Council - 0429 124 316

### FIELDWORK WITH SPECIALISTS

- Dr Steve Phillips in the application of Koala grid based surveys (Glenning Valley).
- John Young on owl nest/roost searches (Lake Macquarie, Spring Farm, Chain Valley Bay) and rare birds through remote Queensland
- Gerry Swan on Heath Monitor ecology (Beacon Hill and Belrose)
- Prof Michael Mahony on Giant Burrowing Frog target surveys (Belrose)
- Dr Ross Goldingay on Yellow-bellied Glider target surveys, monitoring and seasonal habitat resources (Cattai)
- Dr Ross Goldingay on Eastern Pygmy Possum target surveys and detailed habitat assessments (Belrose)
- Ross Wellington on Green-thighed Frog, Giant Barred Frog and Stuttering Frog habitat assessments (Mardi)
- Dr Richard Noske on assessment of Varied Sittella (Spring Farm)

### SIGNIFICANT CAREER ACHIEVEMENTS

- Prepared the *Guideline for the Relocation of Large Tree Hollows* for Central Coast Council and cited by the BCT
- Assisted John Young in the re-discovery of the Night Parrot recording the first call and breeding location in over 100 years in 2013.
- Provided the only then capture of *Pseudechis weigeli* brown snake in remote Kimberley's for Discovery Channel documentary in 2002.
- Provided Western Diamondback Rattlesnake handling assistance for Steve Irwin.
- Assisted Malcolm Douglas in breeding and management of Saltwater Crocodiles
- Captures of *Morelia carinata* python in remote WA providing new understanding of the species ecology.
- Article on Australian Snakes for Outdoor Magazine Australia.
- Developed and implemented a Wildlife Education Program for schools across Australia.
- Developed a Fire Trail Auditing system for Gosford City Council Natural Areas.
- Collation of state-wide Marine Turtle records for NSW National Parks & Wildlife Service and development of awareness programs.
- Developed a comprehensive staff training program at the Australian Reptile Park.
- Venomous Snake Handling Training for Dreamworld and Currumbin Sanctuary zoo staff.
- Undertaken independent travel with fauna experience through the Americas and Africa.

### NOTABLE PROJECTS

Surveys and BDAR at a 223 ha site (183 ha vegetated) at Mardi for a 244 lot residential subdivision in 2019. Twenty threatened fauna species were recorded. Eight breeding locations were recorded for Green-thighed Frog (known to only call on one or two nights in the year) and subsequent detailed habitat mapping of the floodplain contours to identify all breeding potential and PCT overlays for species polygons calculations. Eighteen frog species were recorded. Despite specialist advice to assume presence, target surveys ruled out Green and Golden Bell Frog, Stuttering Frog and Giant Barred Frog from the extensive floodplain and moist forest creeks from detailed surveys combined with song-meters and preparation of recogniser files, saving over $6,000,000 in species credits.

Squirrel Glider target trapping and radio-tracking surveys were undertaken at Morrisett Country Club in 2012 as part of ecological constraints investigations. The radio-transmitter collars were found to be faulty after capturing the first male so a makeshift collar was constructed from cable-tie, tape and an old working bandicoot transmitter. This animal was recaptured and the collar was replaced when the new batch arrived. Den sites, road crossing points and foraging areas were mapped to guide appropriate course expansion and design.

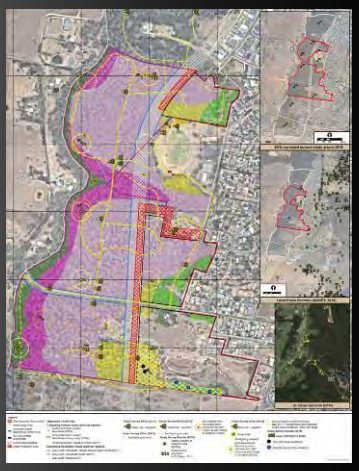
Subdivision site at Duffy's Forest recorded presence of a female **Rosenberg's Goanna** in 2011. Extensive previous surveys of this site by other consultants, which included SIS and Land and Environment Court proceedings, all failed to identify the importance of the subject plateau for the species. By applying knowledge from keeping goannas as Head Keeper of Reptiles (Aust. Reptile Park) I undertook detailed habitat assessment of the plateau and demonstrated it to be a critical breeding area. Nesting mounds were not otherwise present in the adjacent and extensive National Park. Surveillance cameras placed on burrows also identified a suspected important winter burrow for the local female. Winter burrows are central to core home ranges.

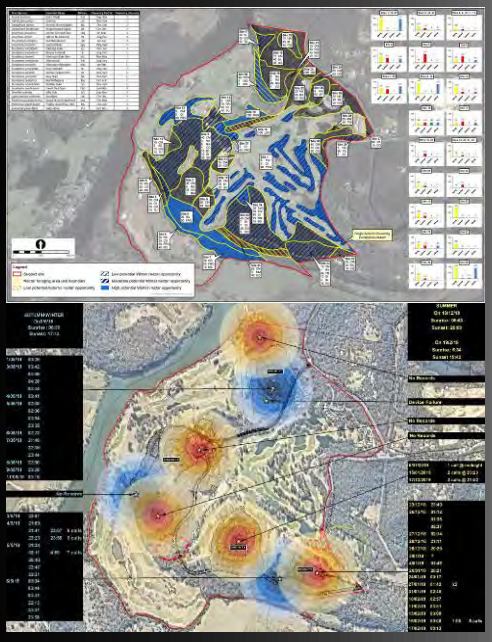
Rosenberg's goanna target surveys and habitat assessments have also been applied to large sites at Belrose, Beacon Hill and Narraweena. Burrows were searched for recent tracks indicating activity and these were inspected for presence using an industrial endoscope with a camera / video screen. The adjacent image is of a juvenile in the burrow as well as a plateau habitat assessment of the site and the adjacent Garigal National Park. This showed the local extent of high, moderate and low quality habitats.


Constraints level surveys for the Aboriginal Lands Council at North Hawkes Nest recorded a relatively concentrated population area of Spotted-tailed Quoll. Photos of trapped quolls and surveillance camera images of characteristic markings gave an estimate of the number of individuals utilising the 110 ha study area. Some threatened fauna also recorded included New Holland Mouse, Long-nosed Potoroo and Glossy Black-Cockatoo.

Analysis of important roosting and nesting habitat areas for Bush Stone-curlew within a holiday estate at Kingscliff, Northern NSW. This was to determine connectivity impacts and appropriate mitigation measures for a proposed residential subdivision on adjacent lands. Localised wetland surveys also recorded Beach Stone-curlew, Black-necked Stork, Black Bittern, Eastern Curlew and Pied Oystercatcher amongst others.

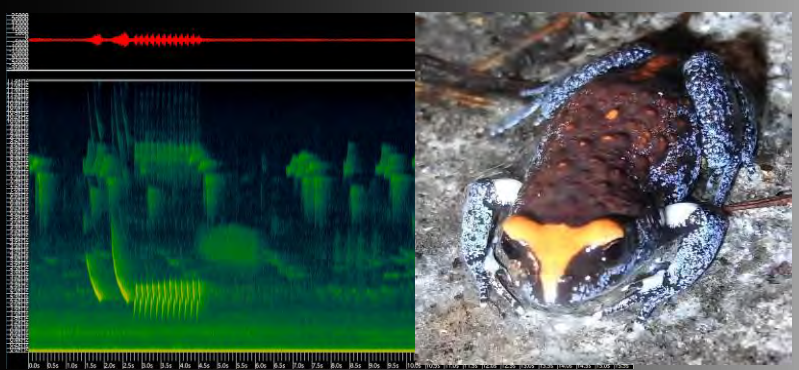
The Georges River Koala population occurs in areas of low soil fertility, subsequently this region has a low carrying capacity to support Koala activity. They can be extra difficult to locate with females occupying a home range of approx 50ha and males up to 100 ha. Target grid based Koala surveys were undertaken to review the extents of use and activity levels within a 58 ha rezoning site at Appin containing just over 50 ha of forest and woodland vegetation. SAT points recorded varying activity ratings assisting in determining habitat use areas. It was also suspected that the recognised primary feed tree Forest Red Gum in other locations within the state and located within much of the proposed development footprint, were of lesser local value compared to Grey Gums and Blue-leaved Stringybark. Therefore SATs also recorded additional data on scratches on these trees (which may last longer than scats). This more long-term data was able to support regional findings by Koala experts *Biolink* and demonstrate how the proposed 34.9 ha of conserved areas were of greater value to Koalas and how activity had increased in the site between 2015 and 2018.





Preparation of a Yellow-bellied Glider Habitat Assessment and Monitoring report under the guidance of glider expert Dr Ross Goldingay for a revised masterplan development at Cattai. The site contains up to 100 ha of available remnant dry open forest habitat with additional narrow canopy corridors between golf course fairways. Initial species monitoring included observations of YBG foraging movements and preferences of sap, manna, honeydew, invertebrates and nectar. Sap feed trees were identified however local floristics were considered most important for consideration of habitat retention. The habitat assessment incorporated a detailed analysis of seasonal flowering trees species within sub-communities across the entire area to ascertain any unique areas of retention value. Following this and request by The Hills Shire Council, seasonal monitoring of the site use by glider family groups was undertaken by use of long-deployment song-meters. External 12V 17Ah deep cycle batteries were allied with SM4 devices to permit a nocturnal recording schedule over a 3 month period. A Yellow-bellied Glider recognizer file (advanced classifier) was constructed from recorded vocalisations. This was applied to clustered recordings within Kaleidoscope Pro V5.1.9 software to identify all recorded calls in the period. Song-meter locations over the two recording periods (summer & autumn) and trends of site use were summarised on the adjacent lower image.

Historical Squirrel Glider records on the Coal Point peninsula at Lake Macquarie prompted council to request an analysis of glider connectivity and impacts from a proposed residential development at Carey Bay. Glider movement options through the residential landscape at road crossing points were identified and the viability of these were considered based on gliding ratios.

Red-crowned Toadlet breeding locations have been identified from habitat and tadpole searches across numerous sites on the Central Coast and northern Sydney. These are typically allied with the more selective and periodic breeding of Giant Burrowing Frog target surveys using song-meters and constructed recogniser files on Kaleidoscope Pro software. Four Giant Burrowing Frog breeding locations at Belrose, Beacon Hill and Narraweena have be found using this method.

## LARGE HOLLOW / TRUNK SECTION RELOCATIONS

My mission is to provide services to relocate large hollows and trunk sections in order to avoid impacts on large hollow dependent species...and bring back the birds! *TreeHouse Ecology* does not support the relocation of hollows occupied by rare or threatened species. Often however, large hollows are not found to be occupied by such animals during surveys for development. For example, Masked Owl males will use a number of satellite roosting hollows to defend the core nesting area occupied by the female during breeding, and more at other times of the year. So such hollows in proposed development landscapes may have been previously occupied or are an opportunity for future use. As a tree climbing ecologist with now many years of owl roost and nest experience, I can first provide assistance to projects by analysing the termite mud in the base of hollows for evidence of historical use. Where large hollows are cleared for removal, these may in fact be an otherwise limited natural resource in the locality, therefore relocation is a potentially important opportunity to enhance remaining conservation and stewardship areas and minimise indirect impacts on large hollow-dependent fauna…

Above, middle & far below: A Barn Owl roost tree was proposed for removal for subdivision road access at Wadalba in 2016.

Given (1) the apparent quality of two large hollows within this tree (one at approximately 28m high); (2) that a Powerful Owl breeding pair were already known in the locality; and (3) that similar large hollows were otherwise absent in the adjacent conservation corridor, I suggested to council to relocate the hollow. Owl expert John Young further suggested relocating the entire tree. This way the height of the hollow in the crown could be maintained. Following the previous success of relocating a large hollow section into the corridor (next page), this was a new opportunity to develop the process again at a much larger scale. A large ironbark with two trunks growing side-by-side was selected within the corridor as the recipient tree. A 65 tonne crane secured the hollow tree trunk whilst the base of the tree was cut. After lowering the trunk section it was left for a few months whilst the cambium dried. During this time excavations of termite material allowed for the shaping of 4 large hollows of varying aspects and entry. The base was treated against termites and the entire external surface was sprayed with lanolin oil for protection from drying and cracking. Two franna cranes then carried the trunk section along road and fire trail access to the recipient tree and the larger crane lifted it vertically and slewed it into place. Heavy duty steel cable with turnbuckles used at the local TreeTops Adventure Park was used to secure the trees together. Powerful Owl was recorded inspecting the hollows for nesting during the follow up surveillance camera monitoring (image of Bingo provided by Central Coast Council below).





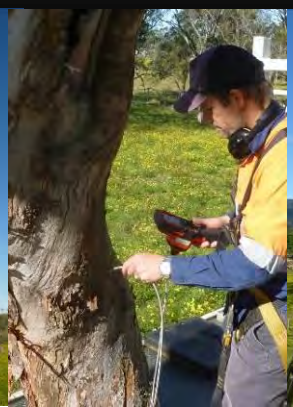
Above: During pre-clearance surveys I found Powerful Owl nesting in an approved development area at Wadalba in June 2011. Despite suitable nesting opportunities in this footprint, the previous ecologists failed to identify this potential and allocate appropriate seasonal survey. Adjacent conservation areas were also established prior to knowing owl nesting locations and were themselves deficient in such quality large hollows. I recommended and co-ordinated the relocation of this 3m hollow section. Whilst working at *Travers bushfire & ecology* this was my first attempt to co-ordinate cranes and tree climbers and design a strong attachment method to support the heavy weight of a large hollow in a recipient tree without compromising its health or public safety. Metal strapping is held off the cambium of the living tree by pine blocks and permits ongoing natural growth. Following this success, as well as the relocation of an entire 9 tonne trunk section (previous page), Central Coast Council requested I prepare the *Guideline for the Relocation of Large Tree Hollows (2016).*

Middle: In early 2020 I was requested by *Central Coast Council* to provide advice on hollows located within the approved trunk water main route linking the Mardi Water Treatment Plant to the Hunter Water Corporations trunk line at Warnervale. A 40m tall Spotted Gum was identified as an expected Masked Owl tree given the presence of a known local breeding pair.




An inspection hole was cut in the side wall of the 5m+ deep hollow section during pre-clearing climbing inspections. Termite mud was inspected and found deep traces of terrestrial mammal bones, confirming it as a historic *Tyto* owl tree and expected periodic Masked Owl roost. Given the quality deep mid hollow as well as additional large hollows at the crown, the 9 tonne tree was recommended for relocation. The tree is currently being prepared for placement in the adjacent reserve.

Below: Whilst undertaking surveys for a Stage 2 development at Kembla Grange in February 2017 I recorded a Greater Broad-nosed Bat roosting colony within a large hollow located within the already approved Stage 1 development area. Based on the threatened status of this species and also supported by the Conditions of Consent the hollow section was relocated into the adjacent reserve. A high powered cordless drill and long auger bit was used in an elevated work platform to prepare inspection holes for a videoscope probe with rotational camera head. When bats were absent the tree was secured with a Hiab (truck-mounted crane) for the cut and then lowering / transport / lifting. The section was fitted onto a pre-cut limb to take the weight, then strapped to mimic the previous height angle and aspect.



## OWL HOLLOW INSPECTIONS / SURVEILLANCE

Rosenberg's Goanna | Eastern Pygmy Possum | Large Bent-winged Bat | Monocled Cobra | New Holland Mouse | Squirrel Glider tracking | Large-footed Myotis | Little Bent-winged Bat | Green and Golden Bell Frog

TREEHOUSE nestboxes

## SUPPLY / INSTALLATION / MONITORING

# COREY MEAD

## FAUNA ECOLOGIST

THREATENED FAUNA SPECIES RECORDED

*Presumed Extinct (NSW)*

- Night Parrot n/a

*Critically Endangered Species (NSW)*

- Regent Honeyeater **
- Beach Stone-curlew **

*Endangered Species (NSW)*

- Green and Golden Bell Frog *
- Giant Barred Frog *
- Mahony's Toadlet *
- Stuttering Frog *
- Loggerhead Turtle *
- Leatherback Turtle *
- Dugong n/a
- Grey Falcon
- Southern Giant Petrel n/a
- Black-necked Stork
- Pied Oystercatcher *
- Plains Wanderer **
- Bush Stone-curlew *
- Swift Parrot **
- Black-striped Wallaby
- Cumberland Plain Land Snail *
- Maroubra Woodland Snail *

*Vulnerable Species (NSW)*

- Wallum Froglet *
- Red-crowned Toadlet *
- Giant Burrowing Frog *
- Green Turtle *
- Flatback Turtle
- Hawksbill Turtle n/a
- Stimson's Python *
- Western Blue-tongue Lizard
- Rosenberg's Goanna
- Osprey **
- Little Eagle **
- White-bellied Sea Eagle **
- Black-breasted Buzzard **
- Spotted Harrier
- Square-tailed Kite **
- Magpie Goose
- Black Bittern
- Sooty Oystercatcher *
- Greater Sand Plover **
- Lesser Sand Plover **
- Bar-tailed Godwit **
- Red-tailed Black-Cockatoo **
- Glossy Black-Cockatoo **
- Gang-gang Cockatoo **
- Major Mitchell's Cockatoo **
- Swift Parrot **
- Little Lorikeet
- Wompoo Fruit-dove
- Superb Fruit-dove
- Rose-crowned Fruit-dove
- Painted Honeyeater
- Black-chinned Honeyeater
- Grey-crowned Babbler
- Hall's Babbler
- Powerful Owl **
- Barking Owl **
- Masked Owl **
- Sooty Owl **
- Marbled Frogmouth
- Speckled Warbler
- Brown Treecreeper
- White-fronted Chat
- Varied Sittella
- Hooded Robin
- Scarlet Robin
- Flame Robin
- White-eared Monarch *
- Diamond Firetail
- Spotted-tailed Quoll
- Long-nosed Potoroo *
- Brush-tailed Phascogale *
- Eastern Pygmy Possum *
- Koala **
- Squirrel Glider *
- Yellow-bellied Glider
- Grey-headed Flying-fox **
- Yellow-bellied Sheathtail-bat
- Large-footed Myotis *
- Little Bent-winged Bat **
- Large Bent-winged Bat **
- Greater Broad-nosed Bat
- Eastern Cave Bat *
- Eastern Coastal Free-tailed Bat
- Eastern False Pipistrelle
- Eastern Long-eared Bat
- Large-eared Pied Bat *
- Hoary Wattled Bat
- Golden-tipped Bat

*EPBC Listed & Migratory Protected Species* (not otherwise listed above)

- New Holland Mouse
- Greater Glider
- White-throated Needletail
- Fork-tailed Swift
- Rainbow Bee-eater
- Black-faced Monarch
- Spectacled Monarch
- Satin Flycatcher
- Rufous Fantail

* species credit species
** dual credit species

# APPENDIX D BAM-C FINALISED CREDIT REPORTS

# BAM Biodiversity Credit Report (Like for like)

## Proposal Details

Assessment Id
00030662/BAAS18156/22/00030663

Proposal Name
Bakali Road Forresters Beach

BAM data last updated *
24/11/2021

Assessor Name
Alex FRASER

Assessor Number
BAAS18156

BAM Data version *
50

Proponent Names
John Klumper

Report Created
12/03/2022

BAM Case Status
Finalised

Assessment Revision
12

Assessment Type
Biocertification

Date Finalised
12/03/2022

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

## 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

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 |
|---|---|---|---|---|---|
| 1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast | Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions | 0.6 | 0 | 12 | 12 |
| 1722-Swamp Mahogany - Paperbarks - Harsh Ground Fern swamp forest of the Central Coast | Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions | 0.6 | 11 | 0 | 11 |

# BAM Biodiversity Credit Report (Like for like)

**1722-Swamp Mahogany - Paperbarks - Harsh Ground Fern swamp forest of the Central Coast**

**Like-for-like credit retirement options**

| Name of offset trading group | Trading group | Zone | HBT | Credits | IBRA region |
|---|---|---|---|---|---|
| Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions<br>This includes PCT's: 837, 839, 926, 971, 1064, 1092, 1227, 1230, 1231, 1232, 1235, 1649, 1715, 1716, 1717, 1718, 1719, 1721, 1722, 1723, 1724, 1725, 1730, 1795, 1798 | - | 1722_Mod | Yes | 11 | Wyong, Hunter, Pittwater and Yengo.<br>or<br>Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site. |

**1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast**

**Like-for-like credit retirement options**

| Name of offset trading group | Trading group | Zone | HBT | Credits | IBRA region |
|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| | Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 915, 916, 917, 918, 919, 1125, 1230, 1232, 1234, 1235, 1236, 1726, 1727, 1728, 1729, 1731, 1800, 1808 | - | 1728_mod | No | 12 | Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site. |

## Species Credit Summary

| Species | Vegetation Zone/s | Area / Count | Credits |
|---|---|---|---|
| **Myotis macropus** / Southern Myotis | **1728_mod, 1722_Mod** | 1.2 | 23.00 |

## Credit Retirement Options

Like-for-like credit retirement options

| | Spp | IBRA subregion |
|---|---|---|
| **Myotis macropus** / Southern Myotis | **Myotis macropus /** Southern Myotis | Any in NSW |

# BAM Biodiversity Credit Report (Variations)

## Proposal Details

**Assessment Id**
00030662/BAAS18156/22/00030663

Proposal Name
Bakali Road Forresters Beach

BAM data last updated *
24/11/2021

Assessor Name
Alex FRASER

Assessor Number
BAAS18156

BAM Data version *
50

Proponent Name(s)
John Klumper

Report Created
12/03/2022

BAM Case Status
Finalised

Assessment Revision
12

Assessment Type
Biocertification

Date Finalised
12/03/2022

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

## 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

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 |
| --- | --- | --- | --- | --- | --- |
| 1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast | Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions | 0.6 | 0 | 12 | 12.00 |
| 1722-Swamp Mahogany - Paperbarks - Harsh Ground Fern swamp forest of the Central Coast | Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions | 0.6 | 11 | 0 | 11.00 |

**1722-Swamp Mahogany - Paperbarks - Harsh Ground Fern swamp forest of the Central Coast**

**Like-for-like credit retirement options**

| Class | Trading group | Zone | HBT | Credits | IBRA region |
| --- | --- | --- | --- | --- | --- |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions<br>This includes PCT's: 837, 839, 926, 971, 1064, 1092, 1227, 1230, 1231, 1232, 1235, 1649, 1715, 1716, 1717, 1718, 1719, 1721, 1722, 1723, 1724, 1725, 1730, 1795, 1798 | - | 1722_Mod | Yes | 11 | Wyong,Hunter, Pittwater and Yengo.<br>or<br>Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site. |
| | **Variation options** | | | | | |
| | Formation | Trading group | Zone | HBT | Credits | IBRA region |
| | Forested Wetlands | Tier 3 or higher threat status | 1722_Mod | Yes (including artificial) | 11 | IBRA Region: Sydney Basin,<br>or<br>Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site. |
| **1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast** | **Like-for-like credit retirement options** | | | | | |
| | Class | Trading group | Zone | HBT | Credits | IBRA region |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 915, 916, 917, 918, 919, 1125, 1230, 1232, 1234, 1235, 1236, 1726, 1727, 1728, 1729, 1731, 1800, 1808 | - | 1728_mod | No | 12 | Wyong,Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site. |
| | **Variation options** | | | | | |
| | Formation | Trading group | Zone | HBT | Credits | IBRA region |
| | Forested Wetlands | Tier 3 or higher threat status | 1728_mod | No | 12 | IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site. |

## Species Credit Summary

| Species | Vegetation Zone/s | Area / Count | Credits |
|---|---|---|---|
| **Myotis macropus** / Southern Myotis | **1728_mod, 1722_Mod** | 1.2 | 23.00 |

## Credit Retirement Options

**Like-for-like options**

| | | | |
|---|---|---|---|
| **Myotis macropus**/ Southern Myotis | Spp | | IBRA region |
| | **Myotis macropus**/Southern Myotis | | Any in NSW |
| | **Variation options** | | |
| | Kingdom | Any species with same or higher category of listing under Part 4 of the BC Act shown below | IBRA region |
| | Fauna | Vulnerable | Wyong, Hunter, Pittwater and Yengo.<br>or<br>Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site. |

# BAM Candidate Species Report

## Proposal Details

| | | |
|---|---|---|
| Assessment Id<br>00030662/BAAS18156/22/00030663 | Proposal Name<br>Bakali Road Forresters Beach | BAM data last updated *<br>24/11/2021 |
| Assessor Name<br>Alex FRASER | Report Created<br>12/03/2022 | BAM Data version *<br>50 |
| Assessor Number<br>BAAS18156 | Assessment Type<br>Biocertification | BAM Case Status<br>Finalised |
| Assessment Revision<br>12 | Date Finalised<br>12/03/2022 | |

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

## List of Species Requiring Survey

| Name | Presence | Survey Months |
|---|---|---|
| ***Crinia tinnula***<br>Wallum Froglet | No (surveyed) | ☐ Jan ☐ Feb ☑ Mar ☐ Apr<br>☐ May ☐ Jun ☐ Jul ☐ Aug<br>☐ Sep ☐ Oct ☐ Nov ☐ Dec<br>☐ Survey month outside the specified months? |
| ***Lathamus discolor***<br>Swift Parrot | No (surveyed) | ☐ Jan ☐ Feb ☐ Mar ☐ Apr<br>☐ May ☐ Jun ☐ Jul ☐ Aug<br>☐ Sep ☐ Oct ☐ Nov ☐ Dec<br>☐ Survey month outside the specified months? |
| ***Litoria aurea***<br>Green and Golden Bell Frog | No (surveyed) | ☐ Jan ☐ Feb ☑ Mar ☐ Apr<br>☐ May ☐ Jun ☐ Jul ☐ Aug<br>☐ Sep ☐ Oct ☐ Nov ☐ Dec<br>☐ Survey month outside the specified months? |

| | | |
|---|---|---|
| ***Litoria brevipalmata***<br>Green-thighed Frog | No (surveyed) | ☐ Jan ☐ Feb ☑ Mar ☐ Apr<br>☐ May ☐ Jun ☐ Jul ☐ Aug<br>☐ Sep ☐ Oct ☐ Nov ☐ Dec<br>☐ Survey month outside the specified months? |
| ***Myotis macropus***<br>Southern Myotis | Yes (surveyed) | ☑ Jan ☐ Feb ☐ Mar ☐ Apr<br>☐ May ☐ Jun ☐ Jul ☐ Aug<br>☐ Sep ☐ Oct ☐ Nov ☐ Dec<br>☐ Survey month outside the specified months? |
| ***Petalura gigantea***<br>Giant Dragonfly | No (surveyed) | ☑ Jan ☐ Feb ☐ Mar ☐ Apr<br>☐ May ☐ Jun ☐ Jul ☐ Aug<br>☐ Sep ☐ Oct ☐ Nov ☐ Dec<br>☐ Survey month outside the specified months? |
| ***Petaurus norfolcensis***<br>Squirrel Glider | No (surveyed) | ☑ Jan ☐ Feb ☐ Mar ☐ Apr<br>☐ May ☐ Jun ☐ Jul ☐ Aug<br>☐ Sep ☐ Oct ☐ Nov ☐ Dec<br>☐ Survey month outside the specified months? |
| ***Uperoleia mahonyi***<br>Mahony's Toadlet | No (surveyed) | ☐ Jan ☐ Feb ☑ Mar ☐ Apr<br>☐ May ☐ Jun ☐ Jul ☐ Aug<br>☐ Sep ☐ Oct ☐ Nov ☑ Dec<br>☐ Survey month outside the specified months? |
| ***Wilsonia backhousei***<br>Narrow-leafed Wilsonia | No (surveyed) | ☑ Jan ☑ Feb ☑ Mar ☐ Apr<br>☐ May ☐ Jun ☐ Jul ☐ Aug<br>☐ Sep ☐ Oct ☐ Nov ☐ Dec<br>☐ Survey month outside the specified months? |

# BAM Candidate Species Report

## Threatened species Manually Added

| Common Name | Scientific Name |
|---|---|
| Large-eared Pied Bat | Chalinolobus dwyeri |
| Swift Parrot | Lathamus discolor |
| Grey-headed Flying-fox | Pteropus poliocephalus |
| Squirrel Glider | Petaurus norfolcensis |
| Red-crowned Toadlet | Pseudophryne australis |
| Stephens' Banded Snake | Hoplocephalus stephensii |
| Square-tailed Kite | Lophoictinia isura |
| Bush Stone-curlew | Burhinus grallarius |
| Glossy Black-Cockatoo | Calyptorhynchus lathami |
| Powerful Owl | Ninox strenua |
| Masked Owl | Tyto novaehollandiae |
| Sooty Owl | Tyto tenebricosa |
| Koala | Phascolarctos cinereus |
| Eastern Pygmy-possum | Cercartetus nanus |
| Eastern Cave Bat | Vespadelus troughtoni |
| Large Bent-winged Bat | Miniopterus orianae oceanensis |
| Southern Myotis | Myotis macropus |
| Sand Spurge | Chamaesyce psammogeton |
| Rough Doubletail | Diuris praecox |
| Camfield's Stringybark | Eucalyptus camfieldii |
| Biconvex Paperbark | Melaleuca biconvexa |
| Coast Headland Pea | Pultenaea maritima |
| Coast Groundsel | Senecio spathulatus |
| Magenta Lilly Pilly | Syzygium paniculatum |
| Narrow-leafed Wilsonia | Wilsonia backhousei |
| Tranquility Mintbush | Prostanthera askania |
| Eucalyptus oblonga population at Bateau Bay, Forresters Beach and Tumbi Umbi in the Wyong local government area | Eucalyptus oblonga - endangered population |
| Scrub Turpentine | Rhodamnia rubescens |
| Native Guava | Rhodomyrtus psidioides |

## Threatened species assessed as not on site

Refer to BAR for detailed justification

| Common name | Scientific name | Justification in the BAM-C |
|---|---|---|
| Barking Owl | Ninox connivens | Refer to BAR |
| Biconvex Paperbark | Melaleuca biconvexa | Refer to BAR |
| Brush-tailed Phascogale | Phascogale tapoatafa | Refer to BAR |
| Bush Stone-curlew | Burhinus grallarius | Refer to BAR |
| Camfield's Stringybark | Eucalyptus camfieldii | Refer to BAR |
| Coast Groundsel | Senecio spathulatus | Refer to BAR |
| Coast Headland Pea | Pultenaea maritima | Refer to BAR |
| Eastern Cave Bat | Vespadelus troughtoni | Refer to BAR |
| Eastern Osprey | Pandion cristatus | Refer to BAR |
| Eastern Pygmy-possum | Cercartetus nanus | Refer to BAR |
| Eucalyptus oblonga population at Bateau Bay, Forresters Beach and Tumbi Umbi in the Wyong local government area | Eucalyptus oblonga - endangered population | Refer to BAR |
| Gang-gang Cockatoo | Callocephalon fimbriatum | Refer to BAR |
| Glossy Black-Cockatoo | Calyptorhynchus lathami | Refer to BAR |
| Grey-headed Flying-fox | Pteropus poliocephalus | Refer to BAR |
| Koala | Phascolarctos cinereus | Refer to BAR |
| Large Bent-winged Bat | Miniopterus orianae oceanensis | Refer to BAR |
| Large-eared Pied Bat | Chalinolobus dwyeri | Refer to BAR |
| Little Eagle | Hieraaetus morphnoides | Refer to BAR |
| Magenta Lilly Pilly | Syzygium paniculatum | Refer to BAR |
| Masked Owl | Tyto novaehollandiae | Refer to BAR |
| Native Guava | Rhodomyrtus psidioides | Refer to BAR |
| Powerful Owl | Ninox strenua | Refer to BAR |
| Red-crowned Toadlet | Pseudophryne australis | Refer to BAR |
| Regent Honeyeater | Anthochaera phrygia | Refer to BAR |
| Rough Doubletail | Diuris praecox | Refer to BAR |

| | | |
|---|---|---|
| Sand Spurge | Chamaesyce psammogeton | Refer to BAR |
| Scrub Turpentine | Rhodamnia rubescens | Refer to BAR |
| Sooty Owl | Tyto tenebricosa | Refer to BAR |
| Square-tailed Kite | Lophoictinia isura | Refer to BAR |
| Stephens' Banded Snake | Hoplocephalus stephensii | Refer to BAR |
| Tall Knotweed | Persicaria elatior | Refer to BAR |
| Tranquility Mintbush | Prostanthera askania | Refer to BAR |
| White-bellied Sea-Eagle | Haliaeetus leucogaster | Refer to BAR |

# BAM Credit Summary Report

## Proposal Details

Assessment Id
00030662/BAAS18156/22/00030663

Proposal Name
Bakali Road Forresters Beach

BAM data last updated *
24/11/2021

Assessor Name
Alex FRASER

Report Created
12/03/2022

BAM Data version *
50

Assessor Number
BAAS18156

BAM Case Status
Finalised

Date Finalised
12/03/2022

Assessment Revision
12

Assessment Type
Biocertification

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

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

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

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Swamp Mahogany - Paperbarks - Harsh Ground Fern swamp forest of the Central Coast** | | | | | | | | | | | | |
| 2 | 1722_Mod | Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions | 36.7 | 36.7 | 0.6 | PCT Cleared - 26% | High Sensitivity to Potential Gain | Endangered Ecological Community | Not Listed | 2.00 | | 11 |
| | | | | | | | | | | | **Subtotal** | **11** |
| **Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast** | | | | | | | | | | | | |
| 1 | 1728_mod | Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions | 38.8 | 38.8 | 0.6 | PCT Cleared - 81% | High Sensitivity to Potential Gain | Endangered Ecological Community | Endangered | 2.00 | | 12 |
| | | | | | | | | | | | **Subtotal** | **12** |
| | | | | | | | | | | | **Total** | **23** |

## Species credits for threatened species

| Vegetation zone name | Habitat condition (Vegetation Integrity) | Change in habitat condition | Area (ha)/Count (no. individuals) | Sensitivity to loss (Justification) | Sensitivity to gain (Justification) | BC Act Listing status | EPBC Act listing status | Potential SAII | Species credits |
|---|---|---|---|---|---|---|---|---|---|
| ***Myotis macropus / Southern Myotis ( Fauna )*** | | | | | | | | | |
| 1728_mod | 38.0 | 38.0 | 0.6 | | | Vulnerable | Not Listed | False | 11 |
| 1722_Mod | 38.5 | 38.5 | 0.6 | | | Vulnerable | Not Listed | False | 12 |
| | | | | | | | | **Subtotal** | **23** |

# BAM Predicted Species Report

## Proposal Details

| Assessment Id | Proposal Name | BAM data last updated * |
|---|---|---|
| 00030662/BAAS18156/22/00030663 | Bakali Road Forresters Beach | 24/11/2021 |
| **Assessor Name** | **Report Created** | **BAM Data version *** |
| Alex FRASER | 12/03/2022 | 50 |
| **Assessor Number** | **Assessment Type** | **BAM Case Status** |
| BAAS18156 | Biocertification | Finalised |
| **Assessment Revision** | | **Date Finalised** |
| 12 | | 12/03/2022 |

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

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

| Common Name | Scientific Name | Vegetation Types(s) |
|---|---|---|
| Australasian Bittern | Botaurus poiciloptilus | 1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast |
| Barking Owl | Ninox connivens | 1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast |
| Black Bittern | Ixobrychus flavicollis | 1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast |
| | | 1722-Swamp Mahogany - Paperbarks - Harsh Ground Fern swamp forest of the Central Coast |
| Eastern Osprey | Pandion cristatus | 1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast |
| | | 1722-Swamp Mahogany - Paperbarks - Harsh Ground Fern swamp forest of the Central Coast |
| Gang-gang Cockatoo | Callocephalon fimbriatum | 1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast |
| Little Eagle | Hieraaetus morphnoides | 1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast |

| | | |
|---|---|---|
| Little Lorikeet | Glossopsitta pusilla | 1722-Swamp Mahogany - Paperbarks - Harsh Ground Fern swamp forest of the Central Coast |
| Regent Honeyeater | Anthochaera phrygia | 1722-Swamp Mahogany - Paperbarks - Harsh Ground Fern swamp forest of the Central Coast |
| Spotted Harrier | Circus assimilis | 1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast |
| Spotted-tailed Quoll | Dasyurus maculatus | 1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast |
| | | 1722-Swamp Mahogany - Paperbarks - Harsh Ground Fern swamp forest of the Central Coast |
| Varied Sittella | Daphoenositta chrysoptera | 1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast |
| | | 1722-Swamp Mahogany - Paperbarks - Harsh Ground Fern swamp forest of the Central Coast |
| White-bellied Sea-Eagle | Haliaeetus leucogaster | 1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast |
| | | 1722-Swamp Mahogany - Paperbarks - Harsh Ground Fern swamp forest of the Central Coast |
| White-throated Needletail | Hirundapus caudacutus | 1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast |
| | | 1722-Swamp Mahogany - Paperbarks - Harsh Ground Fern swamp forest of the Central Coast |

## Threatened species Manually Added

None added

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

Refer to BAR for detailed justification

| Common Name | Scientific Name | Justification in the BAM-C |
|---|---|---|

# BAM Vegetation Zones Report

## Proposal Details

Assessment Id
00030662/BAAS18156/22/00030663

Assessment name
Bakali Road Forresters Beach

BAM data last updated *
24/11/2021

Assessor Name
Alex FRASER

Report Created
12/03/2022

BAM Data version *
50

Assessor Number
BAAS18156

Assessment Type
Biocertification

BAM Case Status
Finalised

Assessment Revision
12

Date Finalised
12/03/2022

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

## Vegetation Zones

| # | Name | PCT | Condition | Area | Minimum number of plots | Management zones |
|---|---|---|---|---|---|---|
| 1 | 1728_mod | 1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast | mod | 0.6 | 1 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2 | 1722_Mod | 1722-Swamp Mahogany - Paperbarks - Harsh Ground Fern swamp forest of the Central Coast | Mod | 0.6 | 1 | |

# BAM Vegetation Zones Report

## Proposal Details

Assessment Id
00030662/BAAS18156/22/00030663

Assessment name
Bakali Road Forresters Beach

BAM data last updated *
24/11/2021

Assessor Name
Alex FRASER

Report Created
12/03/2022

BAM Data version *
50

Assessor Number
BAAS18156

Assessment Type
Biocertification

BAM Case Status
Finalised

Assessment Revision
12

Date Finalised
12/03/2022

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

## Vegetation Zones

| # | Name | PCT | Condition | Area | Minimum number of plots | Management zones |
|---|---|---|---|---|---|---|
| 1 | 1728_mod | 1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast | mod | 0.6 | 1 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2 | 1722_Mod | 1722-Swamp Mahogany - Paperbarks - Harsh Ground Fern swamp forest of the Central Coast | Mod | 0.6 | 1 | |

# Biodiversity payment summary report

| Assessment Id | Payment data version | Assessment Revision | Report created |
|---|---|---|---|
| 00030662/BAAS18156/22/00030663 | | 12 | 12/03/2022 |

| Assessor Name | Assessor Number | Proposal Name | BAM Case Status |
|---|---|---|---|
| Alex FRASER | BAAS18156 | Bakali Road Forresters Beach | Finalised |

| Assessment Type | Date Finalised |
|---|---|
| Biocertification | 12/03/2022 |

## PCT list

| Price calculated | PCT common name | Credits |
|---|---|---|
| Yes | **1728 -** Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast | 12 |
| Yes | **1722 -** Swamp Mahogany - Paperbarks - Harsh Ground Fern swamp forest of the Central Coast | 11 |

## Species list

| Price calculated | Species | Credits |
|---|---|---|
| Yes | ***Myotis macropus*** (Southern Myotis) | 23 |

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

# Biodiversity payment summary report

| IBRA sub region | PCT common name | Threat status | Offset trading group | Risk premium | Administrative cost | Methodology adjustment factor | Price per credit | No. of ecosystem credits | Final credits price |
|---|---|---|---|---|---|---|---|---|---|
| Wyong | **1728 -** Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast | Yes | Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions | 15.97% | $691.91 | 3.6333 | $ 20,752.23 | 12 | $249,026.77 |
| Wyong | **1722 -** Swamp Mahogany - Paperbarks - Harsh Ground Fern swamp forest of the Central Coast | Yes | Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions | 18.83% | $130.43 | 2.7038 | $4,005.11 | 11 | $44,056.17 |

| | |
|---|---|
| Subtotal (excl. GST) | **$293,082.94** |
| GST | **$29,308.29** |

# Biodiversity payment summary report

| | |
|---|---|
| **Total ecosystem credits (incl. GST)** | **$322,391.23** |

## Species credits for threatened species

| Species profile ID | Species | Threat status | Price per credit | Risk premium | Administrative cost | No. of species credits | Final credits price |
|---|---|---|---|---|---|---|---|
| 10549 | ***Myotis macropus*** (Southern Myotis) | Vulnerable | $741.31 | 20.6900% | $80.00 | 23 | $22,417.80 |

| | |
|---|---|
| Subtotal (excl. GST) | **$22,417.80** |
| GST | **$2,241.78** |
| **Total species credits (incl. GST)** | **$24,659.58** |

| | |
|---|---|
| **Grand total** | **$347,050.81** |