# **Highland Views Estate - Stages 7 to 9** Residential Subdivision

## Biodiversity Development Assessment Report

| | |
|---|---|
| Client | : CCL Developments |
| Prepared by | : Australian Wetlands Consulting Pty Ltd |
| Project # | : 3-211373 |
| Date | : April 2021 |

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# **Highland Views Estate - Stages 7 to 9**
## Residential Subdivision

## Biodiversity Development Assessment Report

# Project control

Project name: **Residential Subdivision – 2183 The Northern Road, Mulgoa**
Biodiversity Development Assessment Report

Job number: 3-201276
Client: CCL Developments
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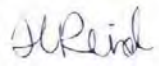
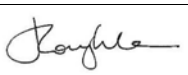
| 11.03.2021 | A | Hannah Reid | Jacqui Coughlan | Natalie Adamou |
| 19.04.2021 | B | Hannah Reid | Jacqui Coughlan | Natalie Adamou |

## Accredited Assessor Authorisation

| Assessor Name | Accreditation Number | Role | Signed | Date |
|---|---|---|---|---|
| Hannah Reid | BAAS18114 | Reporting, BAMC |  | 25.02.21 |
| Jacqui Coughlan | BAAS18139 | Field Work, Report Review, Project Manager |  | 11.03.21 |

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# 1 Introduction and Background

## 1.1 Background

This Biodiversity Development Assessment Report (BDAR) has been undertaken to accompany a Development Application (DA) relating to the Highland Views Estate - Stages 7 to 9 Residential Subdivision. The study area is located wholly within the City of Penrith Local Government Area (LGA) comprises the northern section of 2183 The Northern Road Mulgoa.

This BDAR has been prepared by Hannah Reid, Accredited Assessor (BAAS18114) and reviewed by Jacqui Coughlan Accredited Assessor (BAAS18139) under the Biodiversity Conservation Regulation 2017 and is consistent with the BAM (DPIE 2020a).

## 1.2 Location and site identification

The land to which this application relates comprises the northern section of 2183 The Northern Road Mulgoa (Lot 4 DP 1240361). The site is located 2.8km south of Western Motorway and ~7km south of Penrith Town Centre. The Nepean River runs south to north ~6km west and Mulgoa Nature Reserve is ~1.7km west of the site (Figure 1.2).

- The **Site** comprises the entirety of the development footprint, which is 8.4 ha in total. The development footprint comprises all lots with building envelopes, infrastructure (including roads and stormwater infrastructure), buffers and APZs.
- The **Study Area** comprises the whole of the Site and land within 50m of the Site.
- The **Locality** includes an area within a 1500 m buffer of the Site (as required by the BAM).

## 1.3 Proposed Development

This application seeks development consent for a proposed residential subdivision and associated recreation area (Pinnacle Park).

The proposed development is shown in Figure 1.3. The proposal includes creation of a total of 104 lots as shown in Table 1-1 below. Two screening mounds will also be constructed and landscaped along The Northern Road (to the east of the development) to provide screening from the newly constructed highway across to the residential development. The proposed location of these mounds is shown in Figure 1.1.

It is assumed that at least 70% of the trees within Pinnacle Park will be retained. It is likely that this patch will experience 50% loss of understory and ground covers. As per the Preliminary Tree Assessment Report (Truth About Trees, 2021) there are 36 trees (7 of high values, 27 of mention values and 6 of low value) within the development area. Of these all of the high value trees are to be retained, 80% of medium value trees and 50% of low value trees. This is reflected in the Management Zone (Park) in the BAMC.

Table 1-1. Make up of 104 Lots

| Lot Type | Total Lots |
|---|---|
| >10m <12.5m | 5 |
| >12.5m <15m | 48 |
| >15m | 51 |
| **Total Lots** | **104** |

| | |
|---|---|
| Figure: | 1.1: Site |
| File: | 3-211373-HighlandViews-Stage7-9-BDAR |
| Source: | Aerial Image - Goolge<br>Layout - CCL |

0 50 100 150 200 m

**Legend**

- Site
- Study Area
- Proposed Layout - HV7-9

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A3 Scale 1:4000
Coordinate System: MGA 56 Projection: Transverse Mercator

## LEGEND

- Subject Site
- Stage Boundary
- Zone Boundary

**LOT YIELD**

| Size | No. Lots | % Total Lots |
|---|---|---|
| ≥10m < 12.5m | 5 | 4.81% |
| ≥12.5m < 15m | 48 | 46.15% |
| ≥15m | 51 | 49.04% |
| **Total Number of Lots** | **104** | |

STAGE 6

STAGE 7a

STAGE 7b

STAGE 8a

STAGE 8b

STAGE 9

Open Space
732
4254m²

Riparian Corridor

822
1590m²

832
1463m²

911
1369m²

12.8m (3.8 / 8.0 / 1.0)

15.6m (3.8 / 8.0 / 3.8)

16.8m (1.0 / 12 / 3.8)

22m(3.8 / 12.3 / 5.9)

# Stage 7-9 Lot Frontage Plan
# HIGHLAND VIEWS

NORTH

5 0 10 20 30 40 50 60 70 metres

Ref:CCLGP-3-009-2 | Date: 12/11/2020 | Revision: D | Scale: 1:1,000@A2

Note: All areas and dimensions subject to detailed survey

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# 2 Landscape Context

## 2.1 Landscape Features

In accordance with the BAM, a number of features are assessed within and surrounding the subject site.

### 2.1.1 IBRA bioregions and IBRA subregions

Interim Biogeographic Regionalisation of Australia (IBRA) regions represent a landscape-based approach to classifying the land surface, including attributes of climate, geomorphology, landform, lithology, and characteristic flora and fauna species present. The subject land is located entirely within the Cumberland IBRA Subregion and within the Sydney Basin IBRA region.

### 2.1.2 NSW landscape regions (Mitchell Landscapes)

The subject site occurs entirely within the Cumberland Plain NSW Mitchell Landscape, shown in Figure 2.1.

### 2.1.3 Landforms

**Rivers, Streams and Estuaries**

- A first order stream runs from north to south adjoining the site at Pinnacle Park. Only the very southern extent of the stream falls within the site boundary. The stream provides minimal habitat and does not have well defined top of bank.
- A small dam/wetland of 195m$^2$ supporting native aquatic vegetation occurs on the northern boundary of the site.

**Caves/Rocky Escarpment**

- There are no caves or rocky escarpments on the site.

### 2.1.4 Soils and Geology

Soils at the site have been mapped by Morand (1994) as belonging to the Luddenham Erosional (ERlu) soil landscapes as follows:

Luddenham (ERlu)

- **Landscape—**undulating to rolling low hills on Wianamatta Group shales, often associated with Minchinbury Sandstone. Local relief 50–80 m, slopes 5–20%. Narrow ridges, hillcrests and valleys. Extensively cleared tall open forest (wet sclerophyll forest).
- **Soils—**shallow (<100 cm) dark podzolic soils (Dd3.51) or massive earthy clays (Uf6.71) on crests; moderately deep (70–150 cm) red podzolic soils (Dr2.11, Dr2.41, Dr3.11) on upper slopes; moderately deep (<150 cm) yellow podzolic soils (Dy4.22) and prairie soils (Gn3.26) on lower slopes and drainage lines.
- **Limitations—**water erosion hazard, localised steep slopes, localised mass movement hazard, localised shallow soils, localised surface movement potential; localised impermeable highly plastic subsoil, moderately reactive.

### 2.1.5 Disturbance

Pre-European vegetation at the site would most likely have comprised a combination of dry sclerophyll forest (Cumberland Plain Woodland), dominated by a canopy of *Eucalyptus tereticornis*, *Eucalyptus moluccana* and

*Eucalyptus crebra*.

The site has experienced high levels of disturbance through clearing for agricultural purposes. Elevated portions of the site have been changed historically by drain and dam construction.

| | |
|---|---|
| Figure: | 2.1: Location Map (Mitchell Landscape with buffer) |
| File: | 3-211373-HighlandViews-Stage7-9-BDAR |
| Source: | Aerial Image - Goolge<br>Layout - CCL |

0 200 400 600 800 m

**Legend**

- Site
- 1500m buffer
- Native Vegetation

MitchellLandscapes_v31

- Cumberland Plain

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A3 Scale 1:15000
Coordinate System: MGA 56 Projection: Transverse Mercator

## 2.2 Site Context

### 2.2.1 Native Vegetation Cover

A layer of native vegetation cover is required for a 1,500 m buffer around the study area to determine the context of the site. The extent of native vegetation on the subject site and immediate surrounds was mapped using the Penrith VIS 2352 with edits made to the layer where obvious changes to vegetation extent had occurred.

The total area of the 1,500m buffer around the study area is 893ha, with the area of vegetation mapped within the buffer being 149ha (Figure 2.1). This is a native vegetation cover of 17%, falling in the 10-30% class, which was entered into the BAM calculator.

### 2.2.2 Patch Size

Patch size was calculated for the vegetation on the development site using the field validated map of vegetation types identified and the updated native vegetation extent data layer prepared for the 1,500m buffer (based on OEH 2015). Patch size is required to be assessed as one of four classes per vegetation zone mapped, being <5 ha, 5-24 ha, 25-100 ha or >100 ha.

One patch was identified for vegetation within the subject land. Based upon vegetation mapping and air photo interpretation beyond the subject land, the total area of this patch of native vegetation was calculated as <5ha.

# 3 Native Vegetation

## 3.1 Method

Assessment and mapping of Plant Community Types (PCTs) were undertaken on the 19th February 2021. The study area was traversed to identify the vegetation structure and dominant species within patches of native vegetation. The extent of each patch of vegetation was traversed to sample any spatial variation within each polygon, identify boundaries between vegetation communities and to identify and map vegetation zones in accordance with the BAM (variation in the broad condition state of vegetation polygons).

Based upon the initial survey of the entire study area, vegetation communities present were identified, and their boundaries were mapped. The floristics of each of these vegetation communities were then sampled within vegetation plot surveys, consistent with Section 5.2.1.9 of the BAM. These are also the location of vegetation integrity plots in accordance with Section 5.3 of the BAM. The location of floristic vegetation plots were based upon randomly sampled areas of each vegetation community, whilst ensuring that the plot-based surveys included representative areas within each community and avoided, where possible, edge effects (i.e. located close to edges of vegetation extent) or ecotones with adjacent vegetation zones.

The identification of PCTs was in accordance with the NSW PCT classification as described in the BioNet Vegetation Classification. Determination of the most appropriate PCTs for vegetation communities within the study area used the BioNet Vegetation Classification database to identify PCT types which matched the geographic distribution (based upon IBRA subregions), vegetation formation and floristics of vegetation within the subject land.

## 3.2 Plant Community Types (PCTs)

Numerous studies have been conducted on the site, as such existing vegetation mapping was used to determine PCTs on the site.

Vegetation mapping by EcoLogical (2015) identified two vegetation types within the study area: Shale Plains Woodland and Cleared land. SPW corresponds to the Threatened Ecological Community (TEC) Cumberland Plain Woodland in the Sydney Basin Bioregion (CPW), listed as a critically endangered ecological community (CEEC) under the TSC Act and EPBC Act.

A site visit and desktop assessment confirmed that these vegetation are consistent with the following PCT; 849 - Cumberland shale plains woodland (Figure 3.1).

A summary of the PCTs within the subject land including areas of vegetation zones, the percent cleared for the PCT and Serious and Irreversible Impacts (SAII) candidate entities is included in Table 3.1.

Table 3-1. PCTs present on the Site and number of associated Vegetation Zones

| Types (PCTs) | Vegetation Formation & class | Vegetation zones (footprint and buffer) | Area (Total) | Threatened Ecological Communities | SAII candidate entity |
|---|---|---|---|---|---|
| PCT 849 - Cumberland shale plains woodland | Formation- Grassy Woodlands<br>Class- Coastal Valley Grassy Woodlands | 2 (plus scattered tree) | 0.18 | Yes | Yes |

### 3.2.1 PCT 849 - Cumberland shale plains woodland

Table 3-2. PCT 849

| Feature | Benchmark | Zone | |
|---|---|---|---|
| | | 1 | 2 |
| | | CPW_Moderate | Derived_Grassland |
| Canopy (Tree) | Richness: 5<br>Cover: 53%<br>Species: *Eucalyptus moluccana, Eucalyptus tereticornis* | *E. tereticornis, E. crebra, E. moluccana,* | N/A |
| Middle Stratum (Shrub) | Richness: 8<br>Cover: 16%<br>Species: *Bursaria spinosa subsp. spinosa* | *Bursaria spinosa subsp. spinosa* | N/A |
| Ground Stratum (Grass, forb, fern) | Richness: 28<br>Cover: 68%<br>Species: *Dichondra repens, Cheilanthes sieberi subsp. sieberi, Aristida vagans, Microlaena stipoides var. stipoides, Themeda australis, Brunoniella australis, Desmodium gunnii, Opercularia diphylla, Wahlenbergia gracilis, Paspalidium distans, Eragrostis leptostachya, Lomandra filiformis, Dianella longifolia, Oxalis perennans, Goodenia hederacea, Euchiton sphaericus, Aristida ramose, Arthropodium milleflorum, Cymbopogon refractus, Echinopogon caespitosus* | *Chloris gayana, Oplismenus aemulus, Bidens subalternans, Microlaena stipoides* | *Bothriochloa macra, Cynodon dactylon, Enteropogon acicularis, Plantago lanceolata,* |
| Condition | - | Moderate Condition | Absent canopy, low condition, high abundance of native grasses. Weed presence is high. Experiences cattle grazing and slashing. |


| | |
|---|---|
| Source: | NearMap |
| Disclaimer: | Care was taken in the creation of this map. AWC should be consulted as to the suitability of the information shown here in prior to the commencement of any works based on the information provided. AWC cannot accept any responsibility for errors, omissions or positional accuracy. There are no warranties expressed or implied as to the suitability of this map for a particular purpose. However, notification of any errors will be appreciated. |
| Date | 19/04/2021 |

0 50 100 150 m

A3 Scale 1:2,000
Coordinate System: MGA 56 Projection: Transverse Mercator

***Figure 3-1***

**PCTs**

**PCT Justification**

**Definition:** "The gentle topography associated with the shale plains of western Sydney carries an open grassy woodland dominated by grey box (*Eucalyptus moluccana*), forest red gum (*Eucalyptus tereticornis*) and ironbark (*Eucalyptus crebra/Eucalyptus fibrosa*). Localised patches of spotted gum (*Corymbia maculata*) may occur in the Fairfield LGA. Cumberland Shale Plains Woodland is the second of the grassy woodlands that comprise the Cumberland Plain Woodland in the Sydney Basin Bioregion Critically Endangered Ecological Community listed under the NSW TSC Act. Like the related community Cumberland Shale Hills Woodland (S_GW02) it is typified by a sparse to moderate cover of shrubs and a high cover of grasses and forbs. Tozer *et al.* (2010) define the primary habitat for the community as occurring at elevations less than 150 metres above sea level with some sites occurring at higher elevations where the landscape remains gently inclined. Rainfall is restricted to a narrow band between 750 and 950 millimetres per annum. The community occupies the north-west and west zones of the study area but is widespread elsewhere across the Cumberland Plain."

**Justification:** The site comprises shale plains of western Sydney. Dominant canopy species comprise *Eucalyptus tereticornis*, *E. molluccana* and *E. crebra*. The undertsorey is sparse and dominated by *Bursaria spinosa, Breynia oblongifolia* and *Chelianthes sieberi.* The dense ground cover comprises a mixture of grasses and forbs including: *Aristida ramosa, Arthropodium minus, Asperula conferta, Bothroochloa marcra, Chloris truncate, Chloris ventricosa.*

## 3.3 Vegetation Zones

### 3.3.1 Condition classes, subcategories and areas

The PCTs identified within the development footprint and buffer were classified into vegetation zones for credit calculation purposes. The vegetation zones are based on the condition descriptions above with the area of each vegetation zones shown in Table 3.3.

### 3.3.2 Vegetation integrity survey plots

Three vegetation integrity survey plots were completed on site (see Appendix B for data captured and Appendix I for photos). See Figure 3.1 for the vegetation zones and Figure 3.2 for location of vegetation integrity survey plots. The number of plots surveyed within each vegetation zone is consistent with the requirements as outlined within Table 4 of the BAM.

### 3.3.3 Current and future integrity scores

Vegetation integrity scores were calculated based on the vegetation integrity survey plots collected for each vegetation zone assigned to a native PCT.

The vegetation integrity scores for the vegetation zones onsite is provided in Table 3.3. All vegetation zones within the immediate development footprint will involve complete clearing of all vegetation and the default future vegetation integrity score of 0 was retained. A 20m wide buffer area has been allowed between the development footprint and the mapped vegetation in the vicinity of Pinnacle Park to account for indirect impacts arising from the construction and operation phases of the development (e.g. road edge effects, batters, edge effects, batters, weed invasion, tramping, machinery etc). Although no trees are proposed to be removed within this buffer a 50% loss in integrity (precautionary principle) has been assumed within the 20m buffer

Table 3-3. Vegetation Integrity Score

| Zone | PCT | Condition class | Management Zone | Area impacted (ha) | Plots | Veg integrity score – before | Veg integrity score – after development | Total change in integrity Score |
|---|---|---|---|---|---|---|---|---|
| 1 | 849 | CPW_Moderate | Park – no trees, shrubs, understorey or ground cover to be removed. 50% loss in 20m buffer assumed for indirect impacts. | 0.08 | 1 | 56.1 | 25.2 | 30.9 |
| 2 | 849 | Derived_Grassland | Lot Footprint – all vegetation to be lost | 1.5 | 2 | 12.1 | 0 | 12.1 |

## 3.4 Scattered Tree Assessment

One scattered paddock tree was located within the exotic grassland. The location of this tree is shown in Figure 3.1. Data collected on the tree is included in Table 3.4 below.

Due to its isolated nature, in the centre of cleared exotic grassland, habitat values associated with this tree would be restricted to highly mobile species. The tree would not provide habitat for many bird species and other species that rely on dense understorey, complex ground layers or connectivity between habitat trees. The tree supports to medium sized spout hollows. However, given the isolation of the tree it is unlikely to provide nesting or denning habitat for arboreal mammals such as gliders given its isolation from any other trees (and limitations of glide distance of arboreal mammals).

Table 3-4. Scattered Tree Assessment

| | | |
|---|---|---|
| Species | | *Eucalyptus crebra* |
| PCT | | 849 |
| TEC? | | Yes |
| Height | | 24m |
| DBH | | 102 cm |
| Habitat Features | | Two medium sized spout hollows, some small hollows, nectar source, nesting habitat, refuge. |
| Species for which tree would provide habitat | Ecosystem Credit Species | Spotted harrier, Square tailed kite, Eastern False Pipistrelle, Little Lorikeet, Little Eagle, Swift Parrot, Eastern Coastal Free-tailed Bat, Yellow-bellied Sheathtail-bat |
| | Species Credit Species | Swift Parrot – winter flowering foraging resource |

**Legend**

Plots

Plots

Vegetation Zones

CPW

Derived Grassland

Exotic Grassland

Scattered Tree

20m Buffer

20m buffer from development

Site Boundary

| | |
|---|---|
| Source: | NearMap |
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| Date | 19/04/2021 |

0 50 100 150 m

A3 Scale 1:1800
Coordinate System: MGA 56 Projection: Transverse Mercator

***Figure 3-2***

## Vegetation Zones and Plot Locations

# 4 Threatened Species

Section 6 of the BAM details the process for determining the habitat suitability for threatened species.

Under the BAM, threatened species are separated into two classes, 'ecosystem' and 'species' credit species. Those threatened species where the likelihood of occurrence of a species or elements of the species' habitat can be predicted by vegetation surrogates and landscape features, or for which a targeted survey has a low probability of detection, are identified as 'ecosystem' credit species. Targeted surveys are not required for ecosystem species and potential impacts to these species are assessed in conjunction with impacts to PCTs.

Previous studies of the site as well as a preliminary site assessment conducted in February 2021 were used to form justifications prior to detailed field assessments.

## 4.1 Ecosystem credit species

Table 4.1 lists threatened species reliably predicted to utilise the site by the BAMC. No surveys are required for these species because they are associated with the occurrence of a particular PCT, and ecosystem credits apply to these species.

Table 4-1. Ecosystem credit species

| Common Name | Scientific Name | Plant Community Types (PCT) | Maintained as Ecosystem Credit Species | Justification (if no) |
|---|---|---|---|---|
| Brown Treecreeper (eastern subspecies) | *Climacteris picumnus victoriae* | 849-Cumberland shale plains woodland | Y | |
| Diamond Firetail | *Stagonopleura guttata* | 849-Cumberland shale plains woodland | Y | |
| Dusky Woodswallow | *Artamus cyanopterus cyanopterus* | 849-Cumberland shale plains woodland | N | Insufficient suitable habitat, small patch of woodland with degraded understorey |
| Eastern Coastal Free-tailed Bat | *Micronomus norfolkensis* | 849-Cumberland shale plains woodland | Y | |
| Flame Robin | *Petroica phoenicea* | 849-Cumberland shale plains woodland | N | Insufficient suitable habitat, small patch of woodland with degraded understorey |
| Gang-gang Cockatoo | *Callocephalon fimbriatum* | 849-Cumberland shale plains woodland | N | Insufficient suitable habitat, small patch of woodland with degraded understorey |
| Greater Broad-nosed Bat | *Scoteanax rueppellii* | 849-Cumberland shale plains woodland | Y | |
| Grey-headed Flying- fox | *Pteropus poliocephalus* | 849-Cumberland shale plains woodland | Y | |
| Hooded Robin (south-eastern form) | *Melanodryas cucullata cucullata* | 849-Cumberland shale plains woodland | N | Insufficient suitable habitat, small patch of woodland with degraded understorey |
| Koala | *Phascolarctos cinereus* | 849-Cumberland | N | Very small isolated patch |

| | | | | |
|---|---|---|---|---|
| | | shale plains woodland | | of woodland surrounded by urban environment and open paddocks. Not sufficient to sustain a koala. |
| Large Bent-winged Bat | *Miniopterus orianae oceanensis* | 849-Cumberland shale plains woodland | Y | |
| Little Bent-winged Bat | *Miniopterus australis* | 849-Cumberland shale plains woodland | Y | |
| Little Eagle | *Hieraaetus morphnoides* | 849-Cumberland shale plains woodland | Y | |
| Little Lorikeet | *Glossopsitta pusilla* | 849-Cumberland shale plains woodland | Y | |
| Masked Owl | *Tyto novaehollandiae* | 849-Cumberland shale plains woodland | Y | |
| Painted Honeyeater | *Grantiella picta* | 849-Cumberland shale plains woodland | N | Not recorded in the locality since 1989. No mistletoe. |
| Powerful Owl | *Ninox strenua* | 849-Cumberland shale plains woodland | N | Site does not support prey habitat. Insufficient sheltered foraging habitat. |
| Regent Honeyeater | *Anthochaera phrygia* | 849-Cumberland shale plains woodland | N | No dry woodland or riparian River She-oak woodland |
| Scarlet Robin | *Petroica boodang* | 849-Cumberland shale plains woodland | N | Very small patch of woodland on site lacks open and grassy understorey. |
| Speckled Warbler | *Chthonicola sagittata* | 849-Cumberland shale plains woodland | N | Preferred habitat not present, insufficient ground layer complexity |
| Spotted Harrier | *Circus assimilis* | 849-Cumberland shale plains woodland | Y | Habitat on site would not support preferred prey species. No prey habitat and no suitable foraging habitat. |
| Spotted-tailed Quoll | *Dasyurus maculatus* | 849-Cumberland shale plains woodland | N | No denning and limited foraging habitat. Site surrounded by residential development and major roads. |
| Square-tailed Kite | *Lophoictinia isura* | 849-Cumberland shale plains woodland | N | Site is insufficiently timbered |
| Swift Parrot | *Lathamus discolor* | 849-Cumberland shale plains woodland | Y | |
| Turquoise Parrot | *Neophema pulchella* | 849-Cumberland shale plains woodland | N | No native grassy woodland on site |
| Varied Sittella | *Daphoenositta chrysoptera* | 849-Cumberland shale plains woodland | Y | |
| White-bellied Sea-Eagle | *Haliaeetus leucogaster* | 849-Cumberland shale plains woodland | N | No large areas of open water, prey habitat or suitable perches. |
| Yellow-bellied Sheathtail-bat | *Saccolaimus flaviventris* | 849-Cumberland shale plains woodland | Y | |

## 4.2 Species credit species (Candidate Species)

Species credit species are predicted in the BAM Calculator from assessment of geographic and habitat features in the credit calculator. Some species require further assessment of habitat constraints and/or geographic limitations before being confirmed as candidate species for assessment. Table 4.2 outlines species confirmed as a candidate species.

A candidate species that is not considered to have suitable habitat on the subject site (or specific vegetation zones) does not require further assessment on the subject site (or specific vegetation zones). The reasons for determining that a predicted species credit species is unlikely to have suitable habitat on the subject land (or specific vegetation zones) must be documented.

The potential for each threatened species, population and/or migratory species to occur was considered following review of location and date of records of threatened species, available habitat within the subject land, and the condition of such habitat. **Table 4.2** outlines the predicted candidate species which were deemed to not have suitable habitat within the study area, including justification for this decision.

Table 4-2. Species credit species – assessment of habitat constraints

| Species | Survey Timing | Maintained as Candidate Species | Justification if not | SAII Candidate |
|---|---|---|---|---|
| *Thesium australe Austral Toadflax* | Nov - Feb | Y | | |
| *Persoonia bargoensis Bargo Geebung* | All months | Y | | |
| *Cynanchum elegans White-flowered Wax Plant* | All months | Y | | |
| *Eucalyptus benthamii* Camden White Gum | All months | Y | | |
| *Acacia bynoeana Bynoe's Wattle* | All months | Y | | |
| *Caladenia tessellata Thick Lip Spider Orchid* | Sept-Oct | N | Unlikely to occur due to weed occurrence, sparseness of understory, past disturbance and isolated nature of the vegetation onsite. | Y |
| *Persicaria elatior Tall Knotweed* | Dec - May | Y | | |
| *Dillwynia tenuifolia Dillwynia tenuifolia* | Aug-Oct | Y | | |
| *Acacia pubescens Downy Wattle* | All months | Y | | |
| *Dillwynia tenuifolia - endangered population Dillwynia tenuifolia, Kemps Creek* | Aug-Oct | N | The endangered population occurs in the area bounded by Western Road, Elizabeth Drive, Devonshire Road and Cross Street, Kemps Creek in the Liverpool Local Government Area. The site supports a transition from Castlereagh Ironbark Forest to Castlereagh Scribbly Gum Woodland. Portions of the site contain a form of Shale Gravel Transition Forest. Location and vegetation of the subject site do not fall within this description. | |
| *Grevillea juniperina* subsp. *juniperina Juniper-leaved Grevillea* | All months | Y | | |
| *Marsdenia viridiflora subsp. viridiflora - endangered* | Nov - Feb | Y | | |

| | | | | |
|---|---|---|---|---|
| *population* | | | | |
| *Pultenaea pedunculata Matted Bush-pea* | Sept - Nov | Y | | |
| *Pimelea curviflora* var. *curviflora* | Oct - Mar | Y | | |
| *Pommerhelix duralensis Dural Land Snail* | All months | Y | | |
| *Pimelea spicata Spiked Rice-flower* | All months | Y | | |
| *Pterostylis saxicola Sydney Plains Greenhood* | Oct | Y | | |
| *Meridolum corneovirens* Cumberland Plain Land Snail | All months | Y | | |
| *Cercartetus nanus* Eastern Pygmy-possum | Oct - Mar | N | No Habitat on site | |
| *Callocephalon fimbriatum* Gang-gang Cockatoo (Breeding) | Oct - Jan | N | No suitable hollows on site | |
| *Litoria aurea* Green and Golden Bell Frog | Nov - Mar | Y | Small amount of potential breeding habitat on site | |
| *Pteropus poliocephalus* Grey-headed Flying-fox (Breeding) | Oct - Dec | N | No breeding camps/breeding habitat present onsite. | |
| *Phascolarctos cinereus* Koala (breeding) | All months | N | Very small, isolated patch of woodland surrounded by urban environment and open paddocks. Not sufficient to sustain a koala. | |
| *Miniopterus orianae oceanensis* Large Bent-winged Bat (Breeding) | Dec - Feb | N | No breeding habitat onsite | |
| *Chalinolobus dwyeri* Large-eared Pied Bat | Nov - Jan | N | Found in well-timbered areas containing gullies. Roosts in caves (near their entrances), crevices in cliffs, old mine workings. No caves, cliffs or other suitable roosting habitat on the site. The landscape on the site is dominated by cleared exotic pasture with one very small patch of woodland. | Y |
| *Miniopterus australis* Little Bent-winged Bat (Breeding) | Dec - Feb | N | No breeding habitat onsite | |
| *Hieraaetus morphnoides* Little Eagle (breeding) | Aug - Oct | Y | | |
| *Tyto novaehollandiae Masked Owl (breeding)* | May - Aug | N | No large hollows | |
| *Ninox strenua Powerful Owl (breeding)* | May - Aug | N | No hollows of a suitable size and no suitable roosting habitat. | |
| *Anthochaera phrygia Regent Honeyeater (breeding)* | - | N | The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. There are three known key breeding areas, two of them in NSW - Capertee Valley and Bundarra-Barraba regions. The site is not a known breeding site, and no suitable breeding habitat exists onsite. | |
| *Myotis macropus Southern Myotis* | Oct - Mar | Y | Potential foraging habitat present onsite. | |

| | | | | |
|---|---|---|---|---|
| *Lophoictinia isura* *Square-tailed Kite (breeding)* | Sept - Jan | Y | | |
| *Petaurus norfolcensis* *Squirrel Glider* | All months | N | No suitable nest hollows or foraging habitat. Site lacks Acacia and Banksia understorey | |
| *Lathamus discolor* *Swift Parrot (breeding)* | - | y | | |
| *Haliaeetus leucogaster* *White-bellied Sea-Eagle (breeding)* | Jul - Dec | N | No large areas of open water, prey habitat or suitable perches. | |
| *Burhinus grallarius* Bush Stone-curlew | All months | N | Habitat is highly degraded surrounded by residential development posing high risk of predation by domestic animals. Has not been recorded in the locality since | |

## 4.3 Presence/absence of candidate species

Targeted surveys for species credit species were undertaken in accordance within section 6.5 of the BAM, including undertaking surveys during the nominated survey period specified for each candidate species and in accordance with OEH threatened species survey guidelines. The survey effort, timing and locations for threatened flora and fauna are outlined in the following sections.

The following flora and fauna surveys were undertaken during February 2021 by Jacqui Coughlan and James Schlunke (CVs in Appendix A).

### 4.3.1 Targeted field Survey – Flora

A targeted flora survey was conducted over one day (Table 4.3). The site was traversed in transects throughout the entire development footprint (with a focus on the Cumberland Plain Woodland in the north of the site). Searches were focused on areas of native vegetation; however, grassland and landscaped areas were also searched. Refer to flora survey effort figure for location of BAMC plots in each vegetation zone.

Table 4-3. Flora Survey Times

| Date | PCT | Method |
|---|---|---|
| 19 February 2021 | 849 – Cumberland Plain Woodland | BAMC plots (1) |
| 19 February 2021 | 849 –CPW derived grassland | BAMC plots (2) |
| 19 February 2021 | Exotic Grassland | BAMC plots (2) |
| 19 February 2021 | 849 – Cumberland Plain Woodland | Targeted Flora transect x1 |
| 19 February 2021 | 849 – CPW derived grassland | Targeted Flora Transect x1 |
| 26 February 2021 | 849 – CPW derived grassland | Targeted Flora Transect x1 |


AWC

| | |
|---|---|
| Source: | NearMap 2020 and Google Satellite Points, Lines and Polygons - AWC |
| Disclaimer: | Care was taken in the creation of this map. AWC should be consulted as to the suitability of the information shown here in prior to the commencement of any works based on the information provided. AWC cannot accept any responsibility for errors, omissions or positional accuracy. There are no warranties expressed or implied as to the suitability of this map for a particular purpose. However, notification of any errors will be appreciated. |
| Date | 11/03/2021 |

0 50 100 150 200 250 m

A3 Scale 1:2000
Coordinate System: MGA 56 Projection: Transverse Mercator

***Figure 4-1***

**Flora Survey Effort**

### 4.3.2 Targeted Field Survey – Fauna

Targeted surveys for candidate threatened fauna species are outlined for each of the candidate threatened fauna species in Table 4.5 below. Location of the fauna survey effort is demonstrated in Figure 4.3 and Bionet Atlas records are shown in Figure 4.4. The full fauna species list is included in Table 4.5.

Table 4-4. Fauna Survey Effort and Threatened Species Results

| Survey | Target Species | Person hours | Effort | Total Effort | Threatened Species Detected |
|---|---|---|---|---|---|
| Nocturnal Survey (Spotlight) | Grey-headed Flying Fox | 2 Nights x 1 person | 1 hour | 2 hours | nil |
| Frog Survey | Green and Golden Bell Frog | 2 Nights x 1 person | 1 hour each survey | 2 hours | nil |
| Microbat (Anabat Survey) | Southern Myotis | 5 nights x 1 device | All night | 5 nights | Large Bent wing bat<br>Little bent wing bat<br>Eastern Coastal Freetail-bat<br>Greater Broad-nosed Bat |
| Bird Survey | White-bellied Sea-eagle<br>Swift Parrot | | | 4 transects | nil |
| Raking of litter and logs | Cumberland Plain Land Snail<br>Dural Land Snail | | | 2 hours | Nil |
| Opportunistic survey | All threatened fauna | All times while on site | All times while onsite | 3 days | None recorded |

Table 4-5. Fauna Observed on site

| Scientific Name | Common Name | Survey |
|---|---|---|
| ***Birds*** | | |
| *Acridotheres tristis* | Indian Mynah* | Bird Survey |
| *Cacatua galerita* | Sulphur-crested cockatoo | Bird Survey |
| *Cacatua sanguinea* | Corella | Bird Survey |
| *Cracticus torquatus* | Butcherbird | Bird Survey |
| *Grallina cyanoleuca* | Magpie Lark | Bird Survey |
| *Gymnorhina tibicen* | Australian Magpie | Bird Survey |
| *Hirundo neoxena* | Welcome Swallow | Bird Survey |
| *Manorina melanocephala* | Noisy Miner | Bird Survey |
| *Psephotus haematonotus* | Red-rumped Parrot | Bird Survey |
| *Rhipidura leucophrys* | Willie Wagtail | Bird Survey |
| *Ocyphaps lophotes* | Crested Pigeon | Bird Survey |
| *Anas superciliosa* | Black Duck | Opportunistic at Dam |
| *Sturnus vulgaris* | Common Starling* | Opportunistic |
| ***Mammals*** | | |
| *Miniopterus australis* | #Little Bent-winged Bat | Anabat Detection |
| *Miniopterus orianae oceanensis* | #Large Bent-wing Bat | Anabat Detection |
| *Mormopterus/Micronomus norfolkensis* | #Eastern Coastal Freetail-bat | Anabat Detection |
| *Scoteanax rueppellii* | #Greater Broad-nosed Bat | Anabat Detection |
| *Austronomus australis* | White striped Freetail Bat | Anabat Detection |
| *Chalinolbus goudlii* | Gould's Wattled Bat | Anabat Detection |
| *Chalinolobus morio* | Chocolate Wattled Bat | Anabat Detection |
| *Mormopterus ridei* | Eastern Freetail Bat (sp. 2) | Anabat Detection |
| *Nyctophilis spp.* | Long-eared bats not identifiable to species. | Anabat Detection |
| *Scotorepens orion* | Eastern Broad-nosed Bat | Anabat Detection |
| *Vespadelus vulturnus* | Little Forest Bat | Anabat Detection |
| *Lepus europaeus occidentalis* | Hare* | Opportunistic |
| *Bos taurus* | Cow* | Opportunistic |

| Scientific Name | Common Name | Survey |
|---|---|---|
| ***Amphibians*** | | |
| *Litoria fallax* | Eastern Dwarf Tree Frog | Frog Survey at Dam |
| *Limnodynastes peronii* | Striped Marsh Frog | Frog Survey at Dam |
| ***Reptiles*** | | |
| *Amphibolurus muricatus* | Jacky Lizard | Opportunistic |

** Introduced Species* *#Threatened Species*

**Legend**

- Site Boundary
- Anabat Detector
- Frog search
- Cumberland Plain Land Snail Survey
- Bird survey transect
- Cumberland Plain Woodland
- Derived Grassland
- Exotic Grassland

AWC

| | |
|---|---|
| Source: | NearMap 2020 and Google Satellite Points and POlygons - AWC |
| Disclaimer: | Care was taken in the creation of this map. AWC should be consulted as to the suitability of the information shown here in prior to the commencement of any works based on the information provided. AWC cannot accept any responsibility for errors, omissions or positional accuracy. There are no warranties expressed or implied as to the suitability of this map for a particular purpose. However, notification of any errors will be appreciated. |
| Date | 11/03/2021 |

0 15 30 45 60 m

A3 Scale 1:750
Coordinate System: MGA 56 Projection: Transverse Mercator

***Figure 4-2***

## Fauna Survey Effort

**Legend**

- Site
- Study Area

Atlas_records

- Cumberland Plain Land Snail
- Grey-headed Flying-fox
- Masked Owl
- Southern Myotis
- Swift Parrot
- Varied Sittella

AWC

| | |
|---|---|
| Figure: | 4.3: Bionet Atlas Records |
| File: | 3-211373-HighlandViews-Stage7-9-BDAR |
| Source: | Aerial Image - Goolge<br>Records - Bionet |

0 100 200 300 400 m

Care was taken in the creation of this map. AWC should be consulted as to the suitability of the information shown herin prior to the commencement of any works based on the info rmation provided. AWC cannot accept any responsibility for errors, omissions or positional accuracy. There are no warranties expressed or implied as to the suitability of this map for a particular purpose. However. notification of any errors will be appreciated.

A3 Scale 1:7000
Coordinate System: MGA 56 Projection: Transverse Mercator

# 5 Impact Assessment

## 5.1 Impact assessment

The broad ecological impacts which may result from development of the site based on the proposal are discussed below.

### 5.1.1 Direct mortality of fauna

Direct mortality of fauna via clearing of habitat and destruction: Animals within fallen logs, as well as dense vegetation and leaf litter may be killed/injured during clearing of these structures. However, clearing of vegetation for the proposed works will be minimal, as the majority of the development footprint is within highly disturbed area that does not support diverse fauna habitat. A qualified ecologist experience in clearing supervision should be present for the removal of the large *E.crebra* scattered tree in the south west of the site.

### 5.1.2 Vegetation Clearing

**Clearing of native vegetation**, including:

- Impact on 0.18 ha of moderate quality native vegetation within the development footprint (integrity score of 56.1). 70% of canopy and 50% of understorey will be retained.
- Removal of 1.48 ha of low-quality vegetation within the development footprint (integrity score of 12.1). This vegetation has an absent/sparse canopy, is dominated by exotic pastoral grasses and obtained an integrity score lower than 20.
- Removal of 4.46 ha of exotic grassland
- Removal of one scattered tree

Refer to Table 5.1 for details of vegetation and PCT to be cleared.

Table 5-1. Areas of each PCT to be cleared

| PCTs | Vegetation zones | Area – ha (Total) |
|---|---|---|
| 849 | 1 - CPW_Moderate | 0.08 |
| 849 | 2 - Derived Grassland | 1.48 |

The majority of the native vegetation to be cleared (1.48) comprises derived grassland, with an absent canopy and mixture of exotic and native ground covers (Zone 2). This community is low condition (integrity score 12.1), is regularly slashed and provides very low habitat value for most species.

### 5.1.3 Removal of Threatened Species Habitat

Four threatened species were recorded on site during the survey and five were assumed present since surveys were undertaken outside of the prescribed survey period for the species. The proposed development will result in the clearing or impact on the habitat of nine threatened species, five Species Credit species, three Ecosystem Credit species and one other threatened species.

### 5.1.4 Spread of declared weeds

Disturbance of soil provides the opportunity for weed invasion. Weeds may also be transported to the site from vehicles, people (e.g. on clothing), etc., who visit the development area and via construction materials.

Weed invasion varies over the site. Majority of the proposed development is to occur within cleared pastoral grassland which is already exposed to high levels of weed invasion. The outer edge of native vegetation is currently exposed to weed invasion as an edge effect. The proposed works are not likely to increase weed occurrence throughout the site, however weed hygiene measures will be put in place during the works.

### 5.1.5 Fragmentation

Fragmentation and the associated landscape changes at all scales is major factor in the decline of biodiversity, the modification of ecosystems, and alteration of ecosystem processes. Its effects vary with factors such as distance of fragments from similar habitat, their position in the landscape and the type of habitat modification that occurs.

Vegetation on the site comprises a small patch which is currently completely isolated form other remnant vegetation. Restoration activities in the larger development area adjacent the site will aim to link the existing vegetation patches together to form corridors for fauna movement. It is expected that long term linkages between the vegetation communities to be retained at the site will be improved.

As such the development of the site would be unlikely to have any significant impact on most local wildlife movements, and restoration areas north-east of the site would provide additional consolidated habitat over time to facilitate the movement of more mobile fauna species. Less mobile species would be able to continue to utilise small areas of habitat.

### 5.1.6 Erosion and sedimentation

Sedimentation and erosion impacts can occur at both the construction and built phases. Erosion/sedimentation may occur via erosion of fill material and disturbed soils, scouring of exposed soil, banks and habitats adjacent to the development area via directed flow (e.g. stormwater), or where runoff is concentrated. Works may increase sedimentation levels or affect water quality both during and following the completion of construction.

Erosion and sedimentation issues arising from the proposed development are thought to be minimal. All construction works should be guided by an erosion and sediment control plan prepared by an IECA certified practitioner.

### 5.1.7 Disturbance from lighting

The development may result in an overall increase in the amount and intensity of lighting compared to the existing condition which could disturb (or attract) native fauna and pest species. Increased lighting associated with the proposed development, has the potential to increase negative effects on fauna such as disorientation and high exposure to predators. This risk will require consideration within the urban design and positioning of ecological buffers.

### 5.1.8 Noise, vibration and anthropogenic disturbances

Currently the main source of anthropogenic noise and disturbance comes from traffic along The North Road to the east, construction to the west and residential area to the north.

During the development's establishment, noise will be highest during construction, but limited to day time and so should only impact diurnal birds and mammals. Following construction, the site is will see an increase in disturbances from increased human, vehicle traffic and lighting. It is expected that the outskirts of vegetation will experience these to the greatest extent, with vegetation along the eastern extents of the site to experience the least amount of disturbance due increased size and reduced edge effects.

## 5.2 Assessing additional prescribed biodiversity impacts

The BC Regulation (clause 6.1) identifies impacts which are to be assessed under the biodiversity offsets scheme, but which are not to be taken into account in calculating the number of credits required to offset the impacts. These impacts are assessed in Table 5-2.

Table 5-2. Additional prescribed biodiversity impacts and their relevance to the Development Site

| Prescribed Biodiversity Impact | Relevance to Development Site |
|---|---|
| Impacts of development on the habitat of threatened species or ecological communities associated with: (i) karst, caves, crevices, cliffs and other geological features of significance, or (ii) rocks, or (iii) human made structures, or (iv) non-native vegetation | There are no karst, caves, crevices, cliffs and other geological features of significance, or rocks, human made structures that will be removed as a result of the proposed works.<br>Exotic grassland will be removed as part of the proposed works. This vegetation is highly disturbed, experiences slashing and cattle grazing and provides little habitat for native fauna. The conversion of exotic grassland to residential estate may impact on the movement of some of the more mobile species such as Flying foxes and birds of prey that use the site as a fly over. No important habitat for these species will be impacted. |
| Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range | Exotic grassland will be removed as part of the proposed works. This vegetation is highly disturbed, experiences slashing and cattle grazing and provides little habitat for native fauna. The conversion of exotic grassland to residential estate may impact on the movement of some of the more mobile species such as Flying foxes and birds of prey that use the site as a fly over. No important habitat for these species will be impacted.<br><br>Restoration activities associated with previous stages (outlined in the master plan) will aim to link the existing vegetation patches together to form corridors for fauna movement. It is expected that long term linkages between the vegetation communities to be retained at and adjacent the site will be improved. |
| Impacts of development on movement of threatened species that maintains their life cycle | The development should not result in restrictions of the movements of any threatened species to maintain their life cycle. A majority off habitat to be removed is in relatively poor condition. Additionally, restoration activities associated with previous stages (outline in master plan) aim to link the existing vegetation patches together to form corridors for fauna movement. |
| Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining | There is one small water body on the stie that supports native aquatic vegetation and habitat for birds and frogs as well as foraging habitat for threatened bats<br>The dam will be removed as a result of the proposed works. |
| Impacts of wind turbine strikes on protected animals | N/A |
| Impacts of vehicle strikes on threatened species or on animals that are part of a TEC | Some potential for roadkill of individuals traversing habitat areas exists, this could be largely ameliorated by appropriate design of culverts and road structures. Habitat restoration in the north eastern section would mitigate against this. |

# 6 Avoiding and minimising impacts on biodiversity values

## 6.1 Avoidance of Impacts

Majority of the works are to be conducted within the most highly disturbed areas of the site, which are classified as exotic grassland. A small amount of native vegetation will require removal. Majority of this vegetation currently experience cattle grazing, slashing, underscrubbing and exposure to edge effects.

A total of 1.68ha of native vegetation communities comprising Cumberland Plain Woodland and derived grassland would be removed as a result of the proposed works.

The impacts associated with the project, including the clearing of native vegetation, have been situated within specific areas in order to avoid impacts to better condition, more intact and more connected areas of native vegetation.

In most cases, lots are only placed within areas of low condition (majority falling within Vegetation Zone 2, scoring an integrity score less than 20).

## 6.2 Minimising and Mitigating impacts on biodiversity values

The project is situated such that the impact on native vegetation is very minimal with the majority of the subdivision over cleared and grazed exotic pasture. No direct impact on the patch of CPW will occur under this proposal. Indirect impacts are assumed on 50% of the 0.08 ha of CPW within the 20m buffer allowed between the development footprint and the vegetation.

Residual impacts on flora, fauna and fauna habitat will be minimised and mitigated as outlined below.

### 6.2.1 Restoration of Good Quality Vegetation

Areas with existing canopy will be retained to some extent. The vegetation within Pinnacle Park will have the canopy and sections of understorey maintained. A corridor of CPW vegetation to the north east of the site is the responsibility of the proponent and is subject of a detailed Vegetation Management Plan (AWC 2021) and will be rehabilitated planting and assisted regeneration techniques. Restoration of the patch of CPW will facilitate linkage to other areas of remnant vegetation adjacent the site.

### 6.2.2 Mitigation measures implemented for Threatened species recorded onsite

**Mitigation Methods Microchiropteran bats**

The impact on threatened microchiropteran bats will be offset through the acquisition of species credits as calculated in the BAMC (BAM Calculator) under the BC Act (Appendix E).

Microchiropteran bats are likely to forage for insects over the small dam in the north east of the site as well as along the edges and gaps in the in the remnant woodland vegetation. The retention and restoration of remnant vegetation to the north east of the subject site will retain and enhance foraging habitat for the bats. The size of the dam being removed is 195m$^2$ so is unlikely to represent a substantial foraging resource to bats. Additional areas of forested vegetation adjacent to the site (inclusive of restoration areas such as Surveyors creek) provide foraging habitat. Some secondary foraging habitat within the development footprint would

continue to be available post development as some species would **forage** along edges of remnant vegetation and along streetscapes, where street lighting may benefit some species. Roosting habitat for the majority of species (tree hollows, caves, and culverts) are absent from the site and so would not be impacted by future development.

## 6.3 Thresholds for the assessment and offsetting of impacts of development

### 6.3.1 Serious and Irreversible impacts

A serious and irreversible impact (SAII) is listed under the BC Act as an impact that is likely to contribute significantly to the risk of extinction of a threatened entity. 13 The BAM requires additional information be provided in the BAR for any impact that is a potential SAII (see Section 10.2 of the BAM).

**Cumberland Plain Woodland**

Cumberland Plain Woodland is considered to be a species/community at risk of a SAII as it meets Principle 1 and 2. These principles being;

- Principle 1: The community is determined to have experienced a reduction in geographic extent; and
- Principle 2: Environmental degradation or disruption of biotic processes.

A SAII assessment has been undertaken consistent with subsection 10.2.2 of BAM. The determination of SAII on biodiversity values is to be made by the approval authority.

**Determining whether impacts are serious and irreversible:**

1. **The action and measures taken to avoid the direct and indirect impact on the potential entity for an SAII**

The lots and roads will not fall within the area mapped as Cumberland Plain Woodland. 75% of the trees will be retained within the patch of Cumberland Plain Woodland. The patch is already very small and isolated and the work will not further fragment this community.

2. **The area and condition of the TEC to be impacted directly and indirectly by the proposed development. The condition of the TEC is to be represented by the vegetation integrity score for each vegetation zone**

The proposed development will remove 0.08 ha of Cumberland Plain Woodland in good/moderate condition, with a vegetation integrity score of 56.1. A further 1.48 ha of derived grassland is proposed to be removed; however, this vegetation obtained a score of 12.1 and does not require offsetting.

3. **A description of the extent to which the impact exceeds the threshold for the potential entity**

A SAII threshold has not yet been published for Cumberland Plain Woodland.

4. **The extent and overall condition of the potential TEC within an area of 1000 ha, and then 10,000 ha, surrounding the proposed development footprint**

According to the 2016 OEH vegetation mapping, the area of Cumberland Plain Woodland within 1,000 ha surrounding the development footprint is ~70 ha and within 10,000 ha is 1316 ha. It is acknowledged that

this data set has not been updated since 2016 and as such, this calculation his likely to include inaccuracies. Therefore, the Cumberland Plain Woodland present within the development footprint represents 0.11% and 0.0060% of the TEC's extent within 1,000 ha and 10,000 ha surrounding the development footprint. The condition is not known for these areas; however, it is expected to range from good to poor. On average, patch size for Cumberland Plain Woodland is >3ha with more than 50% of the remaining Cumberland Plain Woodland comprised of small patches. The patch (not including derived grassland) within the development site is smaller than the average patch size of the community.

5. **An estimate of the extant area and overall condition of the potential TEC remaining in the IBRA subregion before and after the impact of the proposed development has been taken into consideration**

There is an estimated area of 281,000 ha of Cumberland Plain Woodland remaining in the Sydney Basin IBRA region (OEH 2016). The Cumberland Plain Woodland present within the development footprint represents 0.000028% of the TEC's extent within the Sydney Basin IBRA region.

6. **An estimate of the area of the candidate TEC that is in the reserve system within the IBRA region and the IBRA subregion**

There is an estimated area of 1,291 ha of Cumberland Plain Woodland remaining in the reserve system within the Sydney Basin IBRA region (OEH 2016). Likewise, within the Cumberland Plain IBRA subregion there is an estimated 1,291 ha of Cumberland Plain Woodland remaining within the reserve system. The closest reserve containing Cumberland Plain Woodland is Mulgoa Nature Reserve. The Cumberland Plain Woodland present within the development footprint represents 0.0062% of the TEC's extent in the reserve system within the Sydney Basin IBRA region.

7. **The development, clearing or biodiversity certification proposal's impact on:**
    a. **abiotic factors critical to the long-term survival of the TEC; for example, will the impact lead to a reduction of groundwater levels or substantial alteration of surface water patterns; will it alter natural disturbance regimes that the TEC depends upon, e.g. fire, flooding etc.?**

The patch of Cumberland Plain Woodland to be removed from within the site is isolated from other patches of Cumberland Plain Woodland. The removal of Cumberland Plain Woodland is unlikely to alter the water regime within the locality, as the area is so small, the patch will be partially retained and partially converted to a greenspace/recreation area with a high level of permeable surfaces. The derived grassland to be removed will be replaced with hardstands which may have an impact on the water regime, however the value of this community is already very low (VIS Score less than 20).

    b. **characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of under-storey species or harvesting of plants**

PCT 849 within the development footprint achieved a vegetation integrity score of 56.1. The species present in each stratum are common species to PCT 849, including *Eucalyptus tereticornis, Eucalyptus crebra, Eucalyptus moluccana, Bursaria spinosa, Chloris gayana, Oplismenus aemulus, Bidens subalternans and Microlaena stipoides*. These species are likely to be well represented in other patches throughout the Cumberland IBRA subregion.

    c. **the quality and integrity of an occurrence of the TEC through threats and indirect impacts including, but not limited to, assisting invasive flora and fauna species to**

**become established or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants which may harm or inhibit growth of species in the TEC**

Zone 1 (PCT 849) within the development footprint achieved a vegetation integrity score of 56.1 and is in good/moderate condition. Zone 2 (PCT 849) within the development footprint is derived woodland and achieved a very low VI score of 12.1. The general patch size of PCT 849 in the region is less than 2ha. The patch in the development site is smaller than the average patch size throughout the IBRA subregion. The area of Cumberland Plain Woodland to be removed (0.08 ha of woodland and 1.5 ha of derived grassland) is an isolated patch in the landscape. The derived grassland would be completely removed. Only indirect impacts on 0.08 ha within the 20m development buffer have been assumed. No clearing of CPW is proposed in this application.

The proposed application would reduce the quality and integrity of this candidate SAII through its removal.

**8. Direct or indirect fragmentation and isolation of an area of the TEC**

About 0.08 ha of Cumberland Plain Woodland will be impacted on and 1.5 ha of derived grassland will be completely cleared as part of this proposal. The patch is currently isolated from other patches of the community due to the development to the north and historical agricultural practices to the south. A low-quality patch exists to the east, however a 360m stretch of exotic grassland exists between the two. As a result, it is not expected that the proposal will lead to further fragmentation or isolation of this TEC.

**9. The measures proposed to contribute to the recovery of the TEC in the IBRA subregion.**

Areas with existing canopy will be retained to some extent. The vegetation within Pinnacle Park will have the canopy maintained. A corridor of CPW vegetation to the north east of the site is the responsibility of the proponent and is subject of a detailed Vegetation Management Plan (AWC 2021) and will be rehabilitated planting and assisted regeneration techniques. Restoration of this eastern patch of CPW will facilitate linkage to other areas of remnant vegetation adjacent the site.

**The results of the assessment indicate that the impacts of the proposal to the TEC are unlikely to constitute a SAII.**

**<u>Large-eared Pied Bat</u>**

The Large-eared Pied Bat is considered to be a species at risk of a SAII as it meets Principle 4. After applying the principles according to the criteria, the species is determined unlikely to respond to management (Principle 4).

SAII threshold: potential breeding habitat and presence of breeding individuals. Potential breeding habitat is PCTs associated with the species within 100m of rocky areas containing caves, or overhangs or crevices, cliffs or escarpments, or old mines, tunnels, culverts, derelict concrete buildings. Surveys must be undertaken as per the Threatened Bat Survey Guide to confirm breeding habitat.

Breeding habitat is considered present on the subject land if there is:

1) potential breeding habitat, AND

2) breeding individuals of the target species.

Where these criteria are not met but the species is present on the subject land then the proposed impact is not a potential SAII and standard species credits will be generated.

No breeding habitat was identified during the survey. The site provides a very small amount of low-quality potential foraging habitat, however the species was not recorded during the survey. As such the proposed impact is not a potential SAII and no species credits are required.

### 6.3.2 Impacts which require an offset

Impacts associated with PCT 849 will require offset under the BAM.

The removal of habitat for the following species require offsetting under the BAM (Species Credit Species). Further details regarding offsets are included in Section 7.

- *Dilwynia tenuifolia*
- Sydney Plains Greenhood Orchid *Pterostylis saxicola*
- Matted Bush pea *Pultenaea pedunculata*
- Eastern Coastal Free-tailed Bat *Mormopterus norfolkensis*

# 7 Final Credit Calculations

## 7.1 Ecosystem Credits

The ecosystem credits required to offset the proposal are provided in Table 7.1.

Table 7-1. Ecosystem Credit Summary

| PCT | Zone | Area (ha) | Credits |
|---|---|---|---|
| 849 | 1 – CPW_Moderate | 0.08 | 1 |
| 849 | 2 – Derived_grassland | 1.5 | 0 |

## 7.2 Species Credits

Species credits are calculated for species observed onsite or assumed present and require offsetting due to the proposal – see Table 7.2.

Table 7-2. Species Credits

| Species | Area | Credits |
|---|---|---|
| *Chalinolobus dwyeri Large eared Pied Bat* | 0.1 | 2 |
| *Dilwynia tenuifolia* | 0.1 | 1 |
| *Pterostylis saxicola* Sydney Plains Greenhood | 0.1 | 1 |
| *Pultenaea pedunculata* Matted Bush-pea | 0.1 | 1 |

## 7.3 Scattered Tree Assessment

One tree will be removed from within the exotic grassland. The credits required for the loss of this tree are included in table 7.3.

Table 7-3. Scattered Tree Credit requirements

| PCT | HBT Cr | No HBT Cr | Ecosystem Credits |
|---|---|---|---|
| 849 | 1 | 0 | 1 |

## 7.4 Credit Costs

The total cost of credits are to be advised by the Biodiversity Conservation Trust (BCT should the Biodiversity Conservation Trust (BCT) be used to offset the impacts. The proponent may also wish to purchase credits available on the market or may wish to pursue other offset sites as required.

# 8 Statutory Assessment

## 8.1 Introduction

The proposal has been examined in the context of the following environmental legislation (discussed at Sections 6.2 to 6.6):

- *The Environmental Planning and Assessment (EPA) Act 1979:*
  - *Coastal Management SEPP*
  - *Koala Habitat Protection SEPP 2020*
- *The Biodiversity Conservation Act 2016,*
- *Water Management Act 2000*
- *The Fisheries Management (FM) Act 1994,*
- *The EPBC Act 1999.*

### 8.1.1 Environmental Planning and Assessment Act 1979

The proposal is designated development under Part 4 of the *Environmental Planning and Assessment Act 1979* and requires an approval under the *Protection of the Environment Operations Act 1997.*

Assessments of Significance (AoS) under Part 1, Section 1.7 of the *EP&A Act 1979* are not required for those threatened species having potential to be impacted. As the works trigger the BAM thresholds the proponent has applied the Biodiversity Offsets Scheme and a BDAR is being prepared.

### 8.1.2 Coastal Management SEPP

The site does not fall within the coastal area and a such this SEPP does not apply.

### 8.1.3 Koala Habitat Protection SEPP 2021

Does not apply to land within the Penrith LGA.

### 8.1.4 Biodiversity Conservation Act 2016

The BAM is triggered due to the following attributes: There is Biodiversity Values Mapping present on the site (within the impact area).

The Biodiversity Assessment Methodology (BAM) has been applied to determine credit requirements.

### 8.1.5 Fisheries Management Act 1994

The *FM Act 1994* lists a number of threatened species, populations and communities and lists a number of Key Threatening Processes (KTPs).

Section 220ZZ of the *FM Act 1994* lists the factors AoS requiring consideration when determining whether a proposed action (development) is likely to have a significant effect upon threatened species, populations or ecological communities, and their habitats, therefore determining if a SIS is required (as also required under Section 5C of the *EPA Act 1979*).

An AoS under the *FM Act* is not required as:

- No threatened species, populations or ecological communities and their habitats occur or would

be likely to occur at the site; and
- The proposal is not characteristic of any KTP.

The proposed works area is not within an area mapped as Key Fish Habitat.

### 8.1.6 Water Management Act 2000

Controlled activities carried out in, on or under waterfront land are regulated by the Water Management Act 2000 (WM Act). Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 metres of the highest bank of the river, lake or estuary.

The drainage lines on site constitute 1st order streams and as such riparian corridors should be maintained (Table 12.2). First order streams are self-assessable under the WM Act and buffers are not enforceable.

Table 8-1. Recommended Riparian Corridor Widths

| Watercourse Type | VRZ width (each side of watercource) | Total corridor width |
|---|---|---|
| 1st Order | 10m | 20 m + channel width |

## 8.2 Commonwealth

### 8.2.1 Environment Protection and Biodiversity Conservation Act 1999

Under the EPBC Act an 'action' requires approval from the Minister if the action has, will have, or is likely to have a significant impact on a Matter of National Environmental Significance (MNES).

Search Tool within a 5km radius of the site and assesses the potential impacts of the proposal on MNES. Based on the potential impacts to MNES shown at Table 6.1, the development of the site based on the proposal would not result in any impacts to MNES.

Table 8-2 Assessment of MNES and other matters in the EPBC Act

| MNES | Impact |
|---|---|
| *Any Environmental Impact on a World Heritage Property?* | |
| One World Heritage Properties (Greater Blue Mountains Area) occurs within a 5km radius of the site. This site would not be impacted on by proposed works. | Nil |
| *Any Environmental Impact on National Heritage Places?* | |
| One National Heritage Place (The Greater Blue Mountains Area) occurs within a 5km radius of the site. This site would not be impacted on by proposed works. | Nil |
| *Any Environmental Impact on Wetlands of International Significance?* | |
| No Wetlands of International Significance occur within a 5km radius of the site. | Nil |
| *Any Environmental Impact on the Great Barrier Reef Marine Park?* | |
| The site does not occur within or adjacent to the Great Barrier Reef Marine Park. | Nil |
| *Any Environmental Impact on a Commonwealth Marine Area?* | |
| No Commonwealth Marine Areas occur within a 5km radius of the site. | Nil |
| *Any Environmental Impact on Threatened Ecological Communities?* | |

| MNES | Impact |
|---|---|
| Eight listed Threatened Ecological Communities (TEC) occur in the locality:<br><br>• Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion<br>• Coastal Swamp Oak Forest of the NWS and SEQ<br>• Cooks River/Castlereagh Ironbark Forest of the Sydney Bioregion<br>• Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest<br>• River-flat eucalypt forest on coastal floodplains of southern NSW and eastern Vic<br>• Shale Sandstone Transition Forest of the Sydney Basin Bioregion<br>• Upland Basalt Eucalypt Forest of the Sydney Basin Bioregion<br>• Western Sydney Dry Rainforest and Moist Woodland on Shale<br><br>One of these TECs (Cumberland Plain Woodland) occurs within the development footprint. This patch is small (0.18 ha) and isolated. The understory is highly degraded with many exotic species and tracks trampled by cattle. As many of the mature trees in the patch as possible will be retained, with a minimum of 50% of the canopy trees to be retained. The removal of the understory will not constitute a significant impact on the community. A referral is not required. | Nil |
| *Any Environmental Impact on Threatened Species?* | |
| The EPBC database records potential habitat for 42 threatened species within a 5km radius of the site. The following species were recorded on site or have the potential to occur on site:<br><br>• Grey-headed Flying Fox (records)<br>• Swift Parrot (records)<br>• Large-eared Pied Bat (recorded)<br><br>The proposed works will not have a significant impact on these species. | Negligible |
| *Any Environmental Impact on Migratory Species?* | |
| The EPBC database records potential habitat for 15 migratory species within a 5km radius of the site. One listed migratory species (Rufous Fantail), was recorded, and there are several other species with the potential for several other migratory species to occur on an opportunistic and seasonal basis.<br><br>Habitat loss arising from the proposal would not affect any migratory species based on the extent of habitat in the locality and the small nature of the proposal. | Negligible |
| *Any Environmental Impact on Commonwealth Land?* | |
| Six known parcels of Commonwealth Land occur within a 5km radius of the site (Aust. Telecommunications Commission, Defence housing authority, defence service homes corporation, Defence 1CAD ORCHARD HILLS KINGSWOOD, RANMME). This land would not be affected by the proposal. | Nil |
| *Any Environmental Impact on Commonwealth Heritage Places?* | |
| One Commonwealth Heritage Places (Orchard Hills Cumberland Plain Woodland) occur within a 5km radius of the site. This land would not be affected by the proposal. | Nil |
| *Any Environmental Impact on Marine Species?* | |
| The EPBC database records potential habitat for 21 marine species within a 5km radius of the site of which several are also listed as migratory species | Nil |

| MNES | Impact |
|---|---|
| (refer above). Several species such as Rainbow Bee-eater and several egret species have the potential to utilize the site as part of a larger foraging range, however these species will not be affected by the proposed works. | |
| *Any Environmental Impact on Whales and Other Cetaceans?* | |
| No Whale and cetacean species have records within the vicinity. The site does not constitute habitat for these species. | Nil |
| *Any Environmental Impact on Critical Habitats?* | |
| No Critical Habitat occurs within a 5km radius of the site. | Nil |
| *Any Environmental Impact on Commonwealth Reserves?* | |
| No Commonwealth Reserves occur within a 5km radius of the site. | Nil |
| *Any Environmental Impact on Marine Parks?* | |
| No Marine Parks occur within a 5km radius of the site. | Nil |
| *Any Environmental Impact on State and Territory Reserves?* | |
| Two listed state reserves occur within 5km of the site (Blue Mountains, Mulgoa). The proposal would have no impacts on these reserves. | Nil |
| *Any Environmental Impact on Regional Forest Agreements?* | |
| No Regional Forest Agreement (RFA) operate in the area. | Nil |
| *Any Environmental Impact on Invasive Species?* | |
| 49 invasive species are recorded as occurring within a 5km radius of the site, of which a number are known to occur within the locality (Common Myna, Cat, Domestic Dog, Domestic Cat, House Mouse, Rabbit, Black Rat, Red Fox, Lantana and Fireweed). The proposal would not enhance conditions to enable the further spread of any pest species. | Nil |
| *Any Environmental Impact on Nationally Important Wetlands* | |
| No Nationally Important Wetlands occur within 5km of the site. | Nil |
| *Any Environmental Impact on Key Ecological Features (Marine)* | |
| No Key (Marine) Ecological Features occur within a 5km radius of the site. | Nil |

**Conclusion:** As the proposed works would be unlikely to result in significant impacts to any MNES, referral to the Minister for the Environment would not be required.

# 9 References

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Department of Planning Environment (DPIE) (2021a). *NSW BioNet*. Online database available at: http://www.bionet.nsw.gov.au/ (accessed February 2021).

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Office of Environment and Heritage (OEH) (2017a). *Biodiversity Assessment Method*. Office of Environment and Heritage for the NSW Government, Sydney.

Office of Environment and Heritage (OEH) (2017b). *Guidance to assist a decision-maker to determine a serious and irreversible impact*. Office of Environment and Heritage for the NSW Government, Sydney.

Office of Environment and Heritage (OEH) (2019). *NSW Guide to Surveying Threatened Plants.* Office of Environment and Heritage for the NSW Government, Sydney.

Truth About Trees (2021). Preliminary Tree Assessment Report - Pinnacle Park, Glenmore Park. Prepared for: CCL Development.

# Appendix A – CVs

# Jacqui Coughlan

## Principal Ecologist

### Capabilities

- Biodiversity survey and assessment
- Ecological impact assessment
- Field survey design, coordination & implementation
- Peer review of ecological assessments
- Preparation of Management Plans
- Monitoring and Research
- Provision of expert advice in the Land and Environment Court

### Qualifications / Training

- Bachelor of Science (Hons Freshwater Ecology) (James Cook University, 1989)
- PhD Bird Ecology (James Cook University, 2000)
- Graduate Diploma Environmental Law (Sydney University, 2009)

### Professional Experience

Jacqui's practical ecological skills in terrestrial and freshwater ecology have been developed over 30 years in several states. She has conducted and managed numerous fauna and flora surveys and impact assessments (EIS, SIS, SEE, REF) in New South Wales, ACT, Queensland and Western Australia and has a thorough working knowledge of State and Commonwealth environmental legislation.

She has a broad knowledge base of ecological issues and is able to provide clients with sound and practical advice regarding environmental legislation and assessment protocols. She is a committed environmental professional with 25+ years' experience in the industry. Her depth and breadth of knowledge is extensive, covering both terrestrial and aquatic flora and fauna. Jacqui has worked in a broad range of sectors including residential development, energy (coal, LNG, wind, solar, transmission lines), extractive industry, water and sewerage, transport (roads, rail), Defence and Local Government.

Jacqui provides high level technical advice and peer review for ecological projects. In her various roles as ecology team manager, Jacqui has been responsible for recruitment, resourcing, workload management, coordinating tenders, performance reviews and training, mentoring, coordination of interstate resources and staff.

From 1992 to 2000 Jacqui worked as an ecological consultant for the Australian Centre for Tropical Freshwater Research (ACTFR) and Sinclair Knight Merz (SKM) in north Queensland working on projects from Townsville north to Cape York and west to Mt Isa as well as offshore islands and Western Australia. This included dozens of REFs for Queensland Department of Main Roads and flora and fauna assessments for optic fibre cables, power lines, sand extraction, marinas and boat ramps. Jacqui has conducted ecological surveys and reporting on Curtis Island (off Gladstone) and Keswick Island (off Mackay).

## Key Projects - Renewable Energies - Wind / Solar Farms

› Jacqui is the Department of Planning Approved Expert for implementation of bird and bat monitoring for the Gullen Range and Boco Rock Wind Farms in NSW. She has prepared and implemented several Bird and Bat monitoring programs including threatened species monitoring and agency liaison.

› UPC Renewables. Central Highlands Energy Zone and Stubbo solar farm. Design BAM biodiversity assessments for 5000 ha solar hub and wind farm. Client liaison to inform layout as results emerged.

› Wind Prospects. Boco Rock Wind Farm – Department of Planning approved expert for implementation of post construction monitoring program. Preparation of adaptive Bird and Bat Management Plans and monitoring program, liaison with OEH, establishment of baseline monitoring sites and bird surveys with OEH personnel. Expert peer review of monthly reports and annual report.

› Goldwind. Gullen Range Wind Farm. Preparation of Bird and Bat Adaptive Management Plan. Expert technical advice – birds and bats. preparation of Powerful Owl Management plan and implementation of Powerful Owl monitoring and management plans, liaison with OEH, large scale surveys to determine Powerful Owl population, regular monitoring of onsite powerful owl breeding pair to assess risk.

› Epuron. Liverpool Windfarm Biodiversity Assessment. Project Director, field work, reporting, client liaison. Options assessment of 4 transmission line route options and placement of 270 turbines. Jacqui managed large field team and undertook field work and reporting.

› Epuron. Silverton Wind Farm. Targeted surveys for threatened Tawny Rock Dragon on the Barrier Range, western NSW as part of impact assessment studies for large wind farm.

› Bird Surveys and Impact Assessment for proposed wind farm in Xilinhot, Inner Mongolia, China. Jacqui designed and conducted bird and habitat surveys for an approved wind farm in Inner Mongolia according to AUSWEA standards. She led a team in the field including local experts and interpreters and driver and was responsible for all analyses and reporting. International client required assessment for financial investment decision.

› Origin Energy. Cullerin Range Wind Farm – Design and implementation of Bird and Bat Monitoring program to meet conditions of approval. Jacqui was responsible for conducting and managing bird and bat surveys, carcass searches and reporting in order to assess impacts of operational wind farm on birds and bats.

› Ratch Australia Corporation (RAC). Collector Wind Farm. Strategic advice and liaison with OEH regarding offsets.

› AGL. Nyngan Solar Farm (102MW). Biodiversity assessment including assessment of potential impacts to threatened bird species Grey-crowned Babbler.

## Key Projects - Roads & Linear Infrastructure

› Transport for NSW – review and update of Vegetation Offset Guidelines (2016).

› RTA/RMS. Biodiversity Guidelines. Jacqui was the lead author of the RMS (2011) Best Practice Guidelines - Protection of Biodiversity During Construction and Maintenance on RTA projects.

› Lend Lease /Bilfiinger Berger/ Conneq – Long term monitoring of Squirrel Glider population (2008 to 2013) to determine impacts of Hume Highway Albury. Landscape scale assessment of population impacts.

› RTA. Camden Valley Way Ecological Assessment (REF) for widening of 10 km stretch of road. Bird and bat surveys, hollow bearing tree assessment, clearing supervision. Surveys, assessment and reporting of potential impacts for EPBC referral.

› RTA/Blake Dawson Waldron – Land and Environment Court expert witness – fauna ecology. Preparation of Statement of Evidence, joint conferencing and court appearance.

› NSW Roads and Traffic Authority. An investigation of the movements of Koalas in relation to major roads in north-east New South Wales (Buladelah to Coolongolook, Yelgun to Chinderah, Raleigh, Brunswick Heads). - Project Management, field work, koala capture, radio tracking, client liaison, meetings, presentations, monitoring reports.

› Queensland Hunter Gas Pipeline Biodiversity Survey and constraints analysis of proposed pipeline corridor (>600km). Coordination of large field team, vertebrate fauna survey, analyses reporting and impact assessment.

## Key Projects - Residential Development

› Wakefield Ashurst Developments – Ecological impact assessment for 100 ha Mawsons Ridge site. Threatened species issues included Tetratheca juncea, Callistemon linearifolius, Rhodamnia rubescens, powerful owl, squirrel glider and microbats. All field surveys and reporting, engagement of specialist subconsultants, liaison with Lake Macquarie City Council and OEH.

› Wakefield Ashurst Developments – Ecological impact assessment for 40 ha Swansea Valley site. Threatened species issues included Diuris praecox, Cryptostylis hunteriana, masked owl, squirrel glider. All field work and reporting, engagement of specialist subconsultants, liaison with Lake Macquarie City Council and OEH.

› Stockland Developments. Breeding season surveys for Masked, Powerful and Sooty Owls over two years to document and map all breeding habitat and resident owls. Annual Reporting. Preparation of expert advice in relation to presence of Masked Owl on Wallarah Peninsula. Liaison with national owl experts.

› Stockland Developments. Preparation and implementation of 10 year Masked Owl Management Plan and monitoring program. Responsible for all monitoring and reporting.

› Stockland Developments. Preparation of multiple Section 96 amendments under Environmental Planning and Assessment Act 1979 for proposed residential developments on Wallarah Peninsula.

› Stockland Developments. Preparation of Species Impact Statement for a proposed residential and commercial development on a 120 hectare site in Jervis Bay, NSW (Vincentia/Bayswood). Threatened species included Eastern Bristlebird, Ground Parrot, Yellow-bellied Glider, Glossy Black Cockatoo, Prasophyllum affine, Cryptostylis hunteriana

## Key Projects - Defence

› Department of Defence. Kangaroo Management Plans – Defence Establishment Orchard Hills and HMAS Creswell (strategic advice, field work, review and client liaison).

› Department of Defence. Garden Island Western Australia (Fleet Base West). Jacqui undertook field and desktop surveys of the flora and fauna of Garden Island for input to Defence Heritage Management Plan as required to fulfil Defence's obligations under the EPBC Act 1999. The site is listed on the Register of the National Estate and the Commonwealth Heritage Register.

› Department of Defence. Baseline fauna assessment for a 220 hectare site within the Holsworthy Military area. Fauna survey for all terrestrial vertebrate fauna groups. Liaison with botanists at Wollongong University who were concurrently mapping vegetation of the area.

## Affiliations / Memberships

› Birdlife Australia (formerly Birds Australia and RAOU) since 1991

› Australasian Network for Ecology and Transportation (ANET) since 2013

› Environment Institute of Australia and New Zealand (EIANZ)

› Royal Zoological Society of New South Wales (RZS)

# Hannah Reid

Senior Ecologist

## Capabilities

› Flora and fauna field surveys

› Targeted threatened species surveys

› Statutory ecological assessments and reports

› Scientific and environmental research and writing

› Natural resource analysis and management

› Statutory ecological assessments

› GIS desktop analysis, mapping and data management

› Water quality and soil sampling

› Project management

## Qualifications / Training

› B Sci (Double Major - Biology & Marine Science) – University of Sydney 2012

› M EnvSci (University of Sydney, 2014)

› Accredited Assessor under the *Biodiversity Conservation Act 2016*

## Professional Experience

Hannah has over 7 years experience in ecology and environmental consulting working extensively throughout New South Wales and Queensland. During this time Hannah has developed a broad range of professional skills including broad scale ecological assessments, targeted flora and fauna surveys, threatened species management and environmental monitoring.

Hannah has also been involved in preparing numerous reports for development approval submissions. These projects have required collaborative partnerships with council staff, heritage consultants, bushfire specialists, environmental scientists, engineers, developers and town planners.

Combining her experience working with and managing project teams, Hannah brings a strong suite of skills to best enable clients and project partners to deliver sustainable environmental solutions.

## Key Projects

› Burnum Burnum Review of Environmental Factors (REF) - Environmental assessment for proposed boat ramp, car park and wetland upgrade

› South Golden Beach Review of Environmental Factors (REF) - Environmental assessment for proposed urban drainage and vegetation removal

› Port Macquarie Rural Subdivision - Threatened flora and fauna surveys, vegetation community mapping, Assessments of Significance, GIS mapping and report preparation

› Koala Plan of Management (KPoM) - SAT surveys, field assessments and spotlighting, mitigation measure development, Assessment of Significance and report preparation

› Proposed Quarry Development - Intensive field surveys including targeted frog surveys, Elliot and pitfall trapping, PIR camera trapping, visual and acoustic bird surveys, and call playbacks

› Carbon Farming Initiative - Detailed threatened species surveys, vegetation biomass and weed mapping surveys throughout western and northern NSW

› Aviation Wildlife Hazard Management Plans - Various Population Management Reports and associated trapping, baiting and pest dispersal field work

**DR JAMES SCHLUNKE**

4 Bedford Street Earlwood NSW 2206 | 0429198660 | james.schlunke@axisecological.com.au | ABN: 27720918015

I am a botanist and ecologist with over ten years of experience flora and fauna surveys throughout NSW, for both consulting and ecological research. My primary area of expertise is in botany, and I have extensive experience in plant and community identification, vegetation mapping, threatened species survey and analysis of plant community data using multivariate statistical techniques. I have experience throughout NSW, primarily in the Sydney, Hunter, Southern Highlands, South-west Slopes and Nandewar Range regions, with experience also in the Southern Tablelands and ACT, Central-western Plains and Murray. I have experience in a range of fauna survey techniques and field identification of vertebrate fauna, particularly birds and frogs. I have a background in bush regeneration and have a working knowledge of practical restoration ecology techniques and approaches. I am proficient in a range of statistical analysis techniques, including using the R statistical package. I have a working knowledge of invertebrate fauna and have a solid background in sampling, identification, and field experimentation with ants through my BSc (Hons) and PhD research. I am a BAM Accredited Assessor and a member of the NSW Ecological Consultants Association.

## WORK EXPERIENCE

Axis Ecological Services (formerly James Schlunke Ecological Surveys)

**Principal botanist/ecologist (sole trader)** **2016-ongoing**

Since January 2016 I have operated as a sole trader botanist and ecologist. I have worked on a broad range of ecological projects across NSW, including:

- Extensive vegetation surveys (166 full-floristic vegetation plots) within the Wollondilly local government area for a Saving Our Species Koala monitoring and vegetation mapping project, for the Wollondilly Shire Council and NSW Office of Environment and Heritage;
- Extensive vegetation surveys (over 300 rapid and full-floristic plots) within the Wingecarribee local government area for a Saving Our Species Koala monitoring and habitat mapping project for the NSW Office of Environment and Heritage, Wingecarribee Shire Council and USyd;
- Population assessment surveys, production and implementation of of monitoring plans for several threatened plant species under the Saving Our Species program for Office of Environment and Heritage
- Landholder liaison, conducting site surveys and producing site values reports and Voluntary Conservation Agreements for the NSW Biodiversity Conservation Trust.
- Ecological monitoring (both flora and fauna) of numerous offset properties in the Northern Tablelands and North-west Slopes bioregions for AMBS Ecology and Heritage;
- Targeted threatened flora and fauna, due diligence, vegetation mapping and BioBanking assessment/BAM surveys for a range of projects across NSW for AMBS Ecology and Heritage;
- Baseline data collection for an ecological thinning trial within River Red Gum forests for the NSW Office of Environment and Heritage;
- Impact assessment surveys and report preparation, BioBanking and BAM impact and offset site surveys, and pre-clearance surveys for NGH Environmental;

- Flora and fauna assessment surveys, targeted threatened flora surveys, BioBanking and BAM assessment surveys, Kangaroo population estimation surveys (DISTANCE method), and report preparation for Ecoplanning;
- Threatened species and vegetation mapping surveys for EcoFocus Environmental Consulting;
- Monitoring of mine site rehabilitation for Koru Environmental;
- BAM and threatened flora surveys as part of the Snowy Hydro 2.0 project for EMM consulting; and
- Invertebrate sampling and identification as part of biodiversity monitoring of urban bushland reserves for Ryde Shire Council.

Australian Museum Consulting (now AMBS Ecology and Heritage)

**Botanist/fauna ecologist (casual)** **2013-2015**

I worked on a range of flora and fauna projects while completing my PhD, including:

- Extensive plant community data collection for remote vegetation mapping projects for NSW Office of Environment and Heritage, in the Central Western Plains, Southern Tablelands and South-west slopes bioregions, including the Hay Plains, Matakana mallee, Lachlan River-associated communities and Murray/Murrumbidgee sub-regions.
- Ecological monitoring (flora and fauna) of Biobanking offset properties in the Northern Tablelands and North-west Slopes bioregions; and
- Preparation of impact assessment reports for projects in the Sydney region.

Biosphere Environmental

**Fauna ecologist (sub-contractor)** **2012-2015**

I worked on a multi-year monitoring project tracking impacts of coal mining activities on the state and nationally listed Great Barred Frog (*Mixophes iteratus*) near Stroud NSW. This consisted of detailed population and habitat data collection, including frog microchipping.

Cumberland Ecology

**Botanist/ecologist (casual)** **2010-2014**

I continued to work for Cumberland Ecology for around 4.5 years as a casual ecologist while completing my PhD. In this role I was lead botanist on dozens of field surveys throughout NSW, particularly in the Sydney, Hunter Valley, North-west Slopes and Northern Tablelands regions. Projects have included community description, vegetation mapping and targeting threatened species searches. Much of this work has had a focus on the nationally listed Grassy Box Woodlands CEEC and associated communities of these regions. I have also carried out a number of fauna surveys in NSW and Queensland on a variety of vertebrate fauna groups.

University of Sydney

**Lab/field Demonstrator** **2010-2014**

I demonstrated in several undergraduate courses while completing my PhD, including *Australian Flora: Ecology and Conservation, Entomology* and *Terrestrial Field Ecology*. This has included providing lab instruction in identification of plants and insects and plant communities, and field instruction in a variety of sampling techniques for flora and fauna. I have also given lectures on ecological consultancy as part of the *Masters of Environmental Science* degree.

Cumberland Ecology

**Botanist/ecologist/project manager (full-time)** **2008-2010**

In this role I further developed my botanical survey, plant identification and vegetation mapping skills, conducting many surveys primarily within the Sydney and Hunter Valley regions of NSW, working in a range of vegetation communities. I also managed a range of projects, including production of impact assessment reports (7-part tests, EPBC referrals and Species Impact Statements) and Bushland Management Plans. I also produced numerous

Kangaroo Management Plans for Department of Defence, incorporating long-term monitoring of effects of kangaroo grazing on plant community composition. I also developed a working knowledge of NSW and Commonwealth biodiversity conservation legislation.

National Trust of Australia
**Bush regenerator** **2007, 2010**
As a bush regenerator I developed plant identification skills and an understanding of plant communities in the Sydney region, working within a number of plant communities. I also developed a competency in the conceptual and practical process of bushland rehabilitation, including a variety of weed management techniques.

Bush Habitat Co-operative
**Bush regenerator** **2009**
Further bush regeneration, primarily in the East and Inner-west of Sydney.

## EDUCATION

University of Sydney
**Doctor of Philosophy (PhD)**
**Supervisors:** Ass. Prof. Dieter Hochuli and Ass. Prof. Matthew Crowther. **2010-2015**

**Thesis title:** Disentangling the drivers of ant community composition: integrating structural, spatial and inter-specific competition at multiple scales. Submitted September 2015.
My project evaluated the strategy of using plant community surrogates (i.e. listed Threatened Ecological Communities) as a strategy for conserving cryptic fauna, using ants as a model system. This project was designed to utilize and compliment my existing skills in plant and invertebrate identification, while developing a range of new skills in multivariate analysis of community data in a range of statistical packages (including R), advanced survey techniques and analysis of spatial data using ArcGis. In this project I conducted extensive vegetation surveys in a variety of plant communities, including threatened ecological communities in the Sydney and South-west Slopes regions of NSW.

University of Sydney
**Bachelor of Science (Honours Class I)** **2004-2008**
I completed my science degree completed with a double biology major, focusing on ecology and zoology. For my Honours project I studied the impacts of natural regeneration of woodland on the process of ant-seed dispersal. This project encompassed a number of field survey and experimental procedures including ant pitfall trapping and application of burning treatments to buried seeds in the field.

## OTHER RELEVANT QUALIFICATIONS

Current Remote First Aid certificate
RIIVEH305A 4wd certificate
QLD Blue Card (Green Card equivalent - valid for NSW)
Open Water Diver (PADI)

## MEMBERSHIPS

Ecological Consultants Association of NSW
Birdlife Australia
Frog and Tadpole Study Group of NSW (FATS)

## REFEREES

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# Appendix B – Vegetation Plot Data

Bearing = 270° W



| 400 m² floristics plot: | Survey name | Plot identifier | Recorders |
|---|---|---|---|
| Date 19 2 2021 | HV7 ~~3~~ 9 ~~5~~ | CPW1 | JS + JC |

| | GF code | Species name<br>Full species name, or a unique means of identifying separate taxa within a survey is mandatory. Data from here will be used to assign growth form richness and cover. | N, HTW or non-HTW | [2] Foliage cover | Abund-ance | Voucher | |
|---|---|---|---|---|---|---|---|
| | | | | 25 | | | |
| 1 | | Eucalyptus tereticornis | N | ~~25~~ | 4 | | U |
| 2 | | Eucalyptus crebra | N | 1 | 5 | | ~~U~~ M |
| 3 | | Bursaria spinosa | N | 10 | 500 | | M |
| 4 | | Olea europea cuspidata | E | 2 | 50 | | M |
| 5 | | Lantana camara | E | 0.2 | 3 | | M |
| 6 | | Breynia oblongifolia | N | 0.3 | 20 | | M |
| 7 | | Hardenbergia violacea | N | 0.1 | 3 | | M |
| 8 | | Eucalyptus melucana | N | 0.3 | 2 | | ~~M~~ G |
| 9 | | Oplismenus ~~undul~~ aemulus | N | ~~1000~~ | ~~1000~~ | 2, 1000G | |
| 10 | | Enchiton sphaericus | N | 0.1 | 20 | | G |
| 11 | | Eragrostis curvula | N | 0.4 | 500 | | G |
| 12 | | Oxalis perrenans | N | 0.1 | 50 | | G |
| 13 | | Eragrostis leptostachya | N | 0.1 | 20 | | G |
| 14 | | Carex inversa | N | 0.1 | 50 | | G |
| 15 | | Desmodium varians | N | 0.1 | 2 | | G |
| 16 | | Vernonia cinerea | N | 0.1 | 20 | | G |
| 17 | | Brunoniella australis | N | 0.1 | 20 | | G |
| 18 | | Senecio madagascariensis | E | 0.1 | 50 | | G |
| 19 | | Bidens subalternans | E | 4 | >1000 | | G |
| 20 | | Cheilanthes sieb. sieb. | N | 0.1 | 20 | | G |
| 21 | | Sida ~~cord~~ rhombifolia | E | 0.1 | 50 | | G |
| 22 | | Sigesbeckia orientalis orientalis | N | 0.2 | 100 | | G |
| 23 | | Setaria parviflora | E | 6.2 | 100 | | G |
| 24 | | Glycine tabacina | N | 0.1 | 28 | | G |
| 25 | | Commelina cyanea | N | 0.1 | 20 | | G |
| 26 | | Cyperus gracilis | N | 0.1 | 50 | | G |
| 27 | | Dichondra repens | N | 0.1 | 50 | | G |
| 28 | | Plantago lanceolata | E | 0.1 | 20 | | G |
| 29 | | Bidens pilosa | E | 3 | >1000 | | G |
| 30 | | Paspalum dilatatum | E | 1 | 500 | | G |
| 31 | | Conyza sp. | E | 0.1 | 6 | | G |
| 32 | | Microlaena stip. stip. | N | 2~~0~~ | 1000 | | G |
| 33 | | Cirsium vulgare | E | 0.1 | 1 | | G |
| 34 | | Gomphocarpus fruticosus | E | 0.1 | 1 | | M |
| 35 | | Cynodon dactylon | N | 0.2 | 50 | | G |

Print more copies of this page to allow for higher species counts at a plot. All vascular plant species in a plot need to be recorded.

**GF Code:** see growth form definitions in BAM 2020 Appendix F. **N:** native, **HTW:** high threat weed.

[2] **Foliage cover:** 0.1, 0.2, 0.3, ..., 1, 2, 3, 4, 5, 10, 15, 20, 25, ...100%; Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately *1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m.* Note the top 3 dominant native species within each GF group.

* Plot running along fence - dissecting 20x20 into two halves. Grazed, shrubby section w/ surprisingly high native diversity, + ungrazed with high cover of Rhodes Grass + other weeds.

| 400 m² floristics plot: | Survey name | Plot identifier | Recorders |
|---|---|---|---|
| Date 19 2 2021 | HV7-9 | CP1 | JS + JC |

| GF code | Species name<br>Full species name, or a unique means of identifying separate taxa within a survey is mandatory. Data from here will be used to assign growth form richness and cover. | N, HTW or non-HTW | [2] Foliage cover | Abund-ance | Voucher |
|---|---|---|---|---|---|
| | Lotus angustissimus | E | 0.1 | 1 | |
| | Medicla carolinicma | E | 0.1 | 2 | |
| | Euphorbia drummondii | N | 0.1 | 3 | |
| | Bothriochloa macra | N | 0.1 | 20 | |
| | Solanum sisymbriifolium | E | 0.1 | 4 | |
| | Urochloa panicoides | E | 0.1 | 3 | |
| | Enteropogon acicularis | N | 0.1 | 20 | |
| | Eriochloa pseudoatricha | N | 0.1 | 20 | |
| | Lomandra filiformis filiformis | N | 0.1 | 2 | |
| | Sporobolus creber | N | 0.1 | 10 | |
| | Chloris truncata | N | 0.1 | 5 | |
| | Wahlenbergia communis | N | 0.1 | 20 | |
| | Rumex brownii | N | 0.1 | 4 | |
| | Digitaria sanguinalis | E | 0.1 | 3 | |
| | Tricoryne elatior | N | 0.1 | 5 | |
| | Cymbonotus lawsonianus | N | 0.1 | 2 | |
| | Cyclospermum leptophyllum | E | 0.1 | 1 | |
| | Hydrocotyle sibthorpioides | N | 0.1 | 1 | |
| | Chloris gayana | E | 5 | 500 | |
| | Themeda triandra | N | 0.2 | 20 | |
| | Centella asiatica | N | 0.1 | 6 | |
| | Hypoxis hygrometrica | N | 0.1 | 2 | |
| | Hypochaeris albiflorus | E | 0.1 | 2 | |
| | Cenchrus clandestinum | E | 0.3 | 20 | |
| | Sonchus oleraceus | E | 0.1 | 5 | |
| | Aristida ramosa | N | 0.1 | 2 | |
| | Paspalidium distans | N | 0.1 | 3 | |
| | Desmodium (Oxytes) brachypodum | N | 0.1 | 20 | |
| | Hypochaeris radicata | E | 0.1 | 1 | |
| | Briza subaristata | E | 0.1 | 2 | |
| | Cyperus brevifolius | E | 0.1 | 1 | |
| | Taraxacum officionale | E | 0.1 | 3 | |
| | Arthropodium minus | N | 0.1 | 6 | |
| | Wahlenbergia gracilis | N | 0.1 | 1 | |
| | Sclevia macbarlenois | N | 0.1 | 5 | |

Print more copies of this page to allow for higher species counts at a plot. All vascular plant species in a plot need to be recorded.

**GF Code:** see growth form definitions in BAM 2020 Appendix F. **N:** native, **HTW:** high threat weed.

[2] **Foliage cover:** 0.1, 0.2, 0.3, ..., 1, 2, 3, 4, 5, 10, 15, 20, 25, ...100%; Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately *1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m.* Note the top 3 dominant native species within each GF group.

| 400 m² floristics plot: | Survey name | Plot identifier | Recorders |
|---|---|---|---|
| Date 19 2 2021 | HV 7-9 | CPW1 | JS + JC |

| | GF code | Species name<br>Full species name, or a unique means of identifying separate taxa within a survey is mandatory. Data from here will be used to assign growth form richness and cover. | N, HTW or non-HTW | [2] Foliage cover | Abund-ance | Voucher |
|---|---|---|---|---|---|---|
| 1 | | Aspevula conferta | N | 0.1 | 10 | |
| 2 | | Hypericum gramineum | N | 0.1 | 2 | |
| 3 | | Fimbristylis dichotoma | N | 0.1 | 1 | |
| 4 | | Phyllanthus virgatus | N | 0.1 | 2 | |
| 5 | | Verbonica plebia | N | 0.1 | 2 | |
| 6 | | Chloris ventricosa | N | 0.1 | 5 | |
| 7 | | Glycine microphylla | N | 0.1 | 20 | |
| 8 | | Echinopogon ovatus | N | 0.1 | 1 | |
| 9 | | Gomphrena celasioides | E | 0.1 | 2 | |
| 10 | | Rytidosperma racemosum subsp. racemosum | N | 0.1 | 2 | |
| 11 | | Bromus cathariticus | E | 0.1 | 1 | |
| 12 | | Verbena bonariensis | E | 0.3 | 20 | |
| 13 | | Cymbopogon refractus | N | 0.1 | 3 | |
| 14 | | Arauja sericifera | E | 0.1 | 1 | |
| 15 | | Ehrharta erecta | E | 0.1 | 20 | |
| 16 | | Solanum pseudocapsicum | E | 0.2 | 10 | |
| 17 | | Geranium solanderi solanderi | N | 0.1 | 4 | |
| 18 | | Indigofera australis | N | 0.2 | 2 | M |
| 19 | | Cyperus eragrostis | E | 0.1 | 4 | |
| 20 | | | | | | |
| 21 | | | | | | |
| 22 | | | | | | |
| 23 | | | | | | |
| 24 | | | | | | |
| 25 | | | | | | |
| 26 | | | | | | |
| 27 | | | | | | |
| 28 | | | | | | |
| 29 | | | | | | |
| 30 | | | | | | |
| 31 | | | | | | |
| 32 | | | | | | |
| 33 | | | | | | |
| 34 | | | | | | |
| 35 | | | | | | |

Print more copies of this page to allow for higher species counts at a plot. All vascular plant species in a plot need to be recorded.

**GF Code:** see growth form definitions in BAM 2020 Appendix F. **N:** native, **HTW:** high threat weed.

[2] **Foliage cover:** 0.1, 0.2, 0.3, …, 1, 2, 3, 4, 5, 10, 15, 20, 25, ...100%; Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately *1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m.* Note the top 3 dominant native species within each GF group.

Numbers [1-8] on this page correlate with the numbers and explanatory notes on page 3

**Site sheet #** 1 of **Date** 9/22/ **Survey name** HIGHLAND VIEWS HV7-9 **Plot identifier** GRASSLAND GR(1).

**Recorders** Jacqui C James Schlunke. **IBRA region** SYD BASIN. **Veg zone ID**

**[1]Datum** **Coordinate system** ☐ Projected ☐ Geographic **MGA zone** **[1]X coordinate** **[1]Y coordinate**

**Location description**

**[1] Plot dimensions** **[1] Orientation of midline from 0 m point** 105°E 105°E **Photo #** JC iphone

Datum: AGD66, WGS84, GDA94, GDA2020 or Other (specify). **MGA Zone** (for Projected coordinate. system only): 56 (Coastal NSW), 55 (Central NSW or 54 (Western NSW). **X/Y coordinate**: Long/Lat (for Projected coordinate. system), Easting/Northing (for geographic coordinate. system)

**Vegetation Integrity**

Composition and structure sum values may be completed after entering data into available tools. It is not required while in the field

| **Composition** (400 m² plot) | | Sum values | **Structure** (400 m² plot) | | Sum values (%) (may sum to >100%) | **Function** (1000 m² plot) **[3]Tree stem size class (DBH)** | If data are to be used as more appropriate local data i.e. to generate local benchmarks, stems must be counted |
|---|---|---|---|---|---|---|---|
| Total count of native plant species **(richness)** in each growth form group (not individual plants within each growth form) | Trees (TG) | | Sum of **[2] foliage cover** of native plant species by growth form group | Trees (TG) | | 80 + cm | 0 |
| | Shrubs (SG) | | | Shrubs (SG) | | 50 – 79 cm | 0 |
| | Grasses etc. (GG) | | | Grasses etc. (GG) | | 30 – 49 cm | 0 |
| | Forbs (FG) | | | Forbs (FG) | | 20 – 29 cm | 0 |
| | Ferns (EG) | | | Ferns (EG) | | 10 – 19 cm | 0 |
| | Other (OG) | | | Other (OG) | | 5 – 9 cm | 0 |
| | | | | | | [4]Tree regeneration <5 cm | |
| | | | Total high threat weed cover | | | [5] Length of fallen logs | |
| | | | | | | [6] Hollow bearing trees | |

| **Vegetation integrity - function** cont. (five 1 m²) **plots)** | [7] Litter cover (%) | Bare ground cover (%) | Cryptogam cover (%) | Rock cover (%) |
|---|---|---|---|---|
| Subplot score (% in each) | 0 0 0 0 0 | | | |
| Average of the 5 subplots | | | | |

These attributes require consideration of site observations and may be completed after field work:

**Vegetation class** **[8] Large tree benchmark size** 20/ 30/ 50/ 80 DBH Confidence H/ M/ L

**Plant community type (PCT)** **EEC** Tick Confidence H/ M/ L

Physiography and site features that may help in determining PCT and management zone (optional) or for BioNet systematic flora survey purposes:

| | | | |
|---|---|---|---|
| Morphological type | Landform element | Landform pattern | Microrelief |
| Lithology | Soil surface texture | Soil colour | Soil depth |
| Slope | Aspect | Site drainage | Distance to nearest water and type |

| Disturbance | Severity code | Age code |
|---|---|---|
| Clearing (inc. logging) | | |
| Cultivation (inc. pasture) | | |
| Soil erosion | | |
| Firewood, CWD removal | | |
| Grazing (id. native/stock) | | |
| Fire damage | | |
| Storm damage | | |
| Weediness | | |

Brief site description or other notes

| Emergents heights | | | Upper stratum heights | | | Middle stratum heights | | | Lower stratum heights | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top | Mid | Bottom | Top | Mid | Bottom | Top | Mid | Bottom | Top | Mid | Bottom |
| | | | | | | | | | | | |

Numbers [1-8] on this page correlate with the numbers and explanatory notes on page 3

**Site sheet #** 1 of 2 **Date** 19/2/21 **Survey name** GR2 **Plot identifier** GR2

**Recorders** Jacqui C James Schumacher **IBRA region** SYD BASIN **Veg zone ID** grassland

[1]**Datum** **Coordinate system** ☐ Projected ☐ Geographic **MGA zone** **[1]X coordinate** 464WP **[1]Y coordinate**

**Location description**

**[1] Plot dimensions** **[1] Orientation of midline from 0 m point** 340°N **Photo #** JC 1pm

Datum: AGD66, WGS84, GDA94, GDA2020 or Other (specify). **MGA Zone** (for Projected coordinate system only): 56 (Coastal NSW), 55 (Central NSW) or 54 (Western NSW). **X/Y coordinate**: Long,Lat (for Projected coordinate system), Easting,Northing (for geographic coordinate system)

## Vegetation integrity

Composition and structure data values may be completed after entry data into available tools. It is not required while in the field

| **Composition** (400 m² plot) | | Sum values | **Structure** (400 m² plot) | | Sum values (%) (may sum to >100%) | **Function** (1000 m² plot) [3]Tree stem size class (DBH) | If data are to be used as more appropriate local data i.e. to generate local benchmarks, stems must be counted |
|---|---|---|---|---|---|---|---|
| Total count of native plant species **(richness)** in each growth form group (not individual plants within each growth form) | Trees (TG) | | Sum of [2] **foliage cover** of native plant species by growth form group | Trees (TG) | | 80 + cm | |
| | Shrubs (SG) | | | Shrubs (SG) | | 50 – 79 cm | |
| | Grasses etc. (GG) | | | Grasses etc. (GG) | | 30 – 49 cm | |
| | Forbs (FG) | | | Forbs (FG) | | 20 – 29 cm | |
| | Ferns (EG) | | | Ferns (EG) | | 10 – 19 cm | |
| | Other (OG) | | | Other (OG) | | 5 – 9 cm | |
| | | | | | | [4]Tree regeneration <5 cm | |
| | | | Total high threat weed cover | | | [5]Length of fallen logs | |
| | | | | | | [6]Hollow bearing trees | |

**Vegetation integrity - function** cont. (five 1 m²) **plots)**

| | [7]Litter cover (%) | Bare ground cover (%) | Cryptogam cover (%) | Rock cover (%) |
|---|---|---|---|---|
| Subplot score (% in each) | 0 0 0 0 0 | | | |
| Average of the 5 subplots | | | | |

These attributes require considered on-site observations and may be completed after field work

**Vegetation class** **[8]Large tree benchmark size** 20/ 30/ 50/ 80 DBH Confidence H/ M/ L

**Plant community type (PCT)** exotic dom. grassland/pasture. **EEC** Tick Confidence H/ M/ L

Physiography and site features that may help in determining PCT and management zone (optional) or for BioNet system etc flora survey purposes.

| | | | |
|---|---|---|---|
| Morphological type | Landform element | Landform pattern | Microrelief |
| Lithology | Soil surface texture | Soil colour | Soil depth |
| Slope | Aspect | Site drainage | Distance to nearest water and type |

| Disturbance | Severity code | Age code |
|---|---|---|
| Clearing (incl. logging) | | |
| Cutting of trees (not pasture) | | |
| Soil erosion | | |
| Fire (wild, CWD removal) | | |
| Grazing (at native/stock) | | |
| Fire damage | | |
| Storm damage | | |
| Weed inva | | |

Brief site description or other notes

| Emergents heights | | | Upper stratum heights | | | Middle stratum heights | | | Lower stratum heights | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top | Mid | Bottom | Top | Mid | Bottom | Top | Mid | Bottom | Top | Mid | Bottom |
| | | | | | | | | | | | |

340° N - Bearing

| 400 m² floristics plot: | Survey name | Plot identifier | Recorders |
|---|---|---|---|
| Date 19 2 2021 | ~~BV~~ 7-9 | CR2 | JS + JC |

| GF code | Species name<br>Full species name, or a unique means of identifying separate taxa within a survey is mandatory. Data from here will be used to assign growth form richness and cover. | N, HTW or non-HTW | [2] Foliage cover | Abund-ance | Voucher |
|---|---|---|---|---|---|
| | Paspalum dilatatum | E | 50 | 71000 | |
| | Cynodon dactylon | N | 30 | 71000 | |
| | Schkuhria pinnata abrotanoides | E | 0.1 | 7 | |
| | Setaria parviflora | E | 4 | 1000 | |
| | Sporobolus creber | N | 2 | 500 | |
| | Senecio madagascariensis | E | 0.1 | 20 | |
| | Urochloa panicoides | E | 0.1 | 7 | |
| | Chloris gayana | E | 0.1 | 20 | |
| | Conyza sp. | E | 0.1 | 50 | |
| | Elensine tristachya | E | 0.2 | 100 | |
| | Gamochaeta americana | E | 0.1 | 20 | |
| | Oxalis exilis | N | 0.1 | 10 | |
| | Eragrostis curvula | E | 0.3 | 100 | |
| | Fimbristylis dichotoma | N | 0.2 | 500 | |
| | Cyperus gracilis | N | 0.1 | 50 | |
| | ~~Cyp~~ Cyperus brevifolius | E | 0.2 | 500 | |
| | Axonopus fissifolius | E | 0.1 | 10 | |
| | Enteropogon acicularis | N | 0.1 | 20 | |
| | Eragrostis ~~leptostachya~~ parviflora | N | 0.1 | 20 | |
| | Hypochaeris albiflorus | E | 0.1 | 2 | |
| | Lepidium africanum | E | 0.1 | 1 | |
| | Solanum sisymbrifolium | E | 0.1 | 3 | |
| | Bothriochloa macra | N | 0.2 | 100 | |
| | Gomphrena celosioides | E | 0.1 | 4 | |
| | Sida rhombifolia | E | 0.1 | 2 | |
| | Paspalidium distans | N | 0.1 | 5 | |
| | Plantago lanceolata | E | 0.1 | 10 | |
| | Lysimachia arvensis | E | 0.1 | 5 | |
| | Cenchrus clandestina | E | 0.1 | 3 | |
| | Carex inversa | N | 0.2 | 100 | |
| | Briza subaristata | E | 0.1 | 1 | |
| | Portulaca oleracea | N | 0.1 | 1 | |
| | Centaurium tenuiflorum | E | 0.1 | 1 | |
| | Wahlenbergia gracilis | N | 0.1 | 2 | |

Print more copies of this page to allow for higher species counts at a plot. All vascular plant species in a plot need to be recorded.

**GF Code:** see growth form definitions in BAM 2020 Appendix F. **N:** native, **HTW:** high threat weed.

[2] **Foliage cover:** 0.1, 0.2, 0.3, …, 1, 2, 3, 4, 5, 10, 15, 20, 25, ...100%; Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately *1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m.* Note the top 3 dominant native species within each GF group.

30 cm = 10 dbh

125° SE

Scanned JC 22.2.21

Numbers [1-8] on this page correlate with the numbers and explanatory notes on page 3

**Site sheet #** 1 of **Date** 9/2/21 **Survey name** HV 7-9 **Plot identifier** CPW1

**Recorders** LS+JC **IBRA region** **Veg zone ID** CPW

[1]**Datum** **Coordinate system** □ Projected □ Geographic **MGA zone** [1]**X coordinate** [1]**Y coordinate**

**Location description** along fenceline Pinnacle park

[1] **Plot dimensions** [1] **Orientation of midline from 0 m point** 125° SE **Photo #**

Datum: AGD66, WGS84, GDA94, GDA2020 or Other (specify). **MGA Zone** (for Projected coordinate. system only): 56 (Coastal NSW), 55 (Central NSW or 54 (Western NSW). **X/Y coordinate**: Long/Lat (for Projected coordinate. system), Easting/Northing (for geographic coordinate. system)

**Vegetation integrity**

Composition and structure sum values may be completed after entering data into available tools. It is not required while in the field

| **Composition** (400 m² plot) | | Sum values | **Structure** (400 m² plot) | | Sum values (%) (may sum to >100%) | **Function** (1000 m² plot) [3]Tree stem size class (DBH) | If data are to be used as more appropriate local data i.e. to generate local benchmarks, stems must be counted |
|---|---|---|---|---|---|---|---|
| Total count of native plant species **(richness)** in each growth form group (not individual plants within each growth form) | Trees (TG) | | Sum of [2] **foliage cover** of native plant species by growth form group | Trees (TG) | | 80 + cm | |
| | Shrubs (SG) | | | Shrubs (SG) | | 50 – 79 cm | 61, 57 |
| | Grasses etc. (GG) | | | Grasses etc. (GG) | | 30 – 49 cm | 38, 46, 34, 42 |
| | Forbs (FG) | | | Forbs (FG) | | 20 – 29 cm | |
| | Ferns (EG) | | | Ferns (EG) | | 10 – 19 cm | |
| | Other (OG) | | | Other (OG) | | 5 – 9 cm | |
| | | | | | | [4]Tree regeneration <5 cm EUCS | |
| | | | Total high threat weed cover | | | [5]Length of fallen logs | 5m+1+50 |
| 5, 15, 25, 35, 45 | | | | | | [6]Hollow bearing trees | |

**Vegetation integrity - function** cont. (five 1 m²) **plots)**

| [7]Litter cover (%) | Bare ground cover (%) | Cryptogam cover (%) | Rock cover (%) |
|---|---|---|---|
| Subplot score (% in each) | 0 0 0 0 0 | | |
| ~~Average of the 5 subplots~~ | | | |

These attributes require consideration of site observations and may be completed after field work.

**Vegetation class** [8]**Large tree benchmark size** 20/ 30/ 50/ 80 DBH Confidence H/ M/ L

**Plant community type (PCT)** CPW. **EEC** Tick Confidence H/ M/ L

Physiography and site features that may help in determining PCT and management zone (optional) or for BioNet systematic flora survey purposes.

| | | | |
|---|---|---|---|
| Morphological type | Landform element | Landform pattern | Microrelief |
| Lithology | Soil surface texture | Soil colour | Soil depth |
| Slope | Aspect | Site drainage | Distance to nearest water and type |

| Disturbance | Severity code | Age code |
|---|---|---|
| Clearing (inc. logging) | | |
| Cultivation (inc. pasture) | | |
| Soil erosion | | |
| Firewood / CWD removal | | |
| Grazing (id. native/stock) | | |
| Fire damage | | |
| Storm damage | | |
| Weediness | | |

Brief site description or other notes

| Emergents heights | | | Upper stratum heights | | | Middle stratum heights | | | Lower stratum heights | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top | Mid | Bottom | Top | Mid | Bottom | Top | Mid | Bottom | Top | Mid | Bottom |
| | | | | | | | | | | | |

**400 m² floristics plot:** | **Survey name** | **Plot identifier** | **Recorders**

**Date** 19 2 21 | HV7-9 | GR1 | JS + JC

| GF code | Species name<br>Full species name, or a unique means of identifying separate taxa within a survey is mandatory. Data from here will be used to assign growth form richness and cover. | N, HTW or non-HTW | [2] Foliage cover | Abund-ance | Voucher |
|---|---|---|---|---|---|
| | Bothriochloa macra | N | 5 | >1000 | |
| | Aristida ramosa | N | 0.3 | 500 | |
| | Plantago lanceolata | E | 10 | >1000 | |
| | Senecio madagascariensis | E | 0.2 | 500 | |
| | Aster subulata | E | 0.1 | 2 | |
| | Centaurium tenuiflorum | E | 0.2 | 500 | |
| | Enteropogon acicularis | N | 30 | >1000 | |
| | Conyza sp. | E | 0.2 | 500 | |
| | Sporobolus creber | N | 0.6 | 500 | |
| | Dichanthium sericeum sericeum | N | 0.1 | 5 | |
| | Paspalum dilatatum | E | 3 | 500 | |
| | Glycine tabacina | N | 0.1 | 100 | |
| | Dichondra repens | N | 0.1 | 50 | |
| | Eragrostis curvula | E | 2 | 500 | |
| | Setaria parviflora | E | 0.4 | 500 | |
| | Chloris gayana | E | 1 | 500 | |
| | Phyllanthus virgatus | N | 0.1 | 4 | |
| | Oxalis ~~perennans~~ exilis | N | 0.1 | 50 | |
| | Cynodon dactylon | N | 20 | >1000 | |
| | Solanum sisymbriifolium | E | 0.1 | 3 | |
| | Hypochaeris glabra | E | 0.1 | 4 | |
| | Lysimachia arvensis | E | 0.1 | 20 | |
| | Richardia stellaris | E | 0.1 | 1 | |
| | Cirsium vulgare | E | 0.1 | 10 | |
| | Chloris truncata | N | 0.1 | 10 | |
| | Euphorbia drummondii | N | 0.1 | 50 | |
| | Rytidosperma sp. | N | 0.1 | 1 | 2-1 |
| | Wahlenbergia ~~gracilis~~ communis | N | 0.1 | 4 | |
| | Cyperus gracilis | N | 0.1 | 10 | |
| | Chloris ventricosa | N | 0.1 | 1 | |
| | Wahlenbergia gracilis | N | 0.1 | 7 | |
| | Euchiton sphaericus | N | 0.1 | 1 | |
| | Leontodon saxatilis | E | 0.1 | 2 | |
| | Lotus angustissimus | E | 0.1 | 2 | |
| | Linum trigynum | E | 0.1 | 2 | |
| | Sida rhombifolia | E | 0.1 | 1 | |
| | Carex inversa | N | 0.1 | 2 | |
| | Gamochaeta americana | E | 0.1 | 1 | |
| | Paronychia brasiliana | E | 0.1 | 20 | |
| | Hypochaeris albiflora | E | 0.1 | 2 | |
| | Verbena bonariensis | E | 0.1 | 1 | |

Print more copies of this page to allow for higher species counts at a plot. All vascular plant species in a plot need to be recorded.

**GF Code:** see growth form definitions in BAM 2020 Appendix F. **N:** native, **HTW:** high threat weed.

[2] **Foliage cover:** 0.1, 0.2, 0.3, ..., 1, 2, 3, 4, 5, 10, 15, 20, 25, ...100%; Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately *1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m.* ~~Note the top 3 dominant native species within each GF group.~~

Numbers [1-8] on this page correlate with the numbers and explanatory notes on page 3

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Site sheet #** | 1 of | **Date** | 19/2/21 | **Survey name** | [redacted] HV7-9 | **Plot identifier** | GR3. |
| **Recorders** | K + JS. | | | **IBRA region** | | **Veg zone ID** | |
| **[1]Datum** | | **Coordinate system** | □ Projected □ Geographic | **MGA zone** | | **[1]X coordinate** | **[1]Y coordinate** |
| **Location description** | descriptive notes to locate site without grid reference | | | | | | |
| **[1] Plot dimensions** | For composition & structure (400m²): 20 m x 20 m<br>For function (1000m²): 20 m x 50 m | | | **[1] Orientation of midline from 0 m point** | 140°SE | **Photo #** | |

Datum: AGD66, WGS84, GDA94, GDA2020 or Other (specify). **MGA Zone** (for Projected coordinate. system only): 56 (Coastal NSW), 55 (Central NSW or 54 (Western NSW). **X/Y coordinate**: Long/Lat (for Projected coordinate. system), Easting/Northing (for geographic coordinate. system)

## Vegetation integrity

Composition and structure sum values may be completed after entering data into available tools. It is not required while in the field

| **Composition** (400 m² plot) | | Sum values | **Structure** (400 m² plot) | | Sum values (%) (may sum to >100%) | **Function** (1000 m² plot) [3] Tree stem size class (DBH) | If data are to be used as more appropriate local data i.e. to generate local benchmarks, stems must be counted |
|---|---|---|---|---|---|---|---|
| Total count of native plant species **(richness)** in each growth form group (not individual plants within each growth form) | Trees (TG) | | Sum of [2] **foliage cover** of native plant species by growth form group | Trees (TG) | | 80 + cm | Count |
| | Shrubs (SG) | | | Shrubs (SG) | | 50 – 79 cm | Count (best practice)/tick. If [8] large tree benchmark size ≥50 cm, count |
| | Grasses etc. (GG) | | | Grasses etc. (GG) | | 30 – 49 cm | Count (best practice)/tick. If [8] large tree benchmark size ≥ 30 cm, count |
| | Forbs (FG) | | | Forbs (FG) | | 20 – 29 cm | Count (best practice)/tick. If [8] large tree benchmark size ≥ 20 cm, count |
| | Ferns (EG) | | | Ferns (EG) | | 10 – 19 cm | Count (best practice)/tick |
| | Other (OG) | | | Other (OG) | | 5 – 9 cm | Count (best practice)/tick |
| | | | | | | [4]Tree regeneration <5 cm | Tick |
| | | | Total high threat weed cover | | % | [5] Length of fallen logs | Tally space / Total m |
| | | | | | | [6] Hollow bearing trees | Tick |

| **Vegetation integrity - function** cont. (five 1 m²) **plots)** | [7] Litter cover (%) | Bare ground cover (%) | Cryptogam cover (%) | Rock cover (%) |
|---|---|---|---|---|
| Subplot score (% in each) | 0 0 0 0 0 | a b c d e | a b c d e | a b c d e |
| Average of the 5 subplots | | | | |

These attributes require consideration of site observations and may be completed after field work:

| | | | | | |
|---|---|---|---|---|---|
| **Vegetation class** | | **[8] Large tree benchmark size** | 20/ 30/ 50/ 80 DBH | Confidence | H/ M/ L |
| **Plant community type (PCT)** | | | **EEC** Tick | Confidence | H/ M/ L |

Physiography and site features that may help in determining PCT and management zone (optional) or for BioNet systematic flora survey purposes:

| | | | | | |
|---|---|---|---|---|---|
| Morphological type | | Landform element | | Landform pattern | | Microrelief | |
| Lithology | | Soil surface texture | | Soil colour | | Soil depth | |
| Slope | | Aspect | | Site drainage | | Distance to nearest water and type | |

| Disturbance | Severity code | Age code |
|---|---|---|
| Clearing (inc. logging) | | |
| Cultivation (inc. pasture) | | |
| Soil erosion | | |
| Firewood / CWD removal | | |
| Grazing (id. native/stock) | | |
| Fire damage | | |
| Storm damage | | |
| Weediness | | |

Brief site description or other notes

| Emergents heights | | | Upper stratum heights | | | Middle stratum heights | | | Lower stratum heights | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top | Mid | Bottom | Top | Mid | Bottom | Top | Mid | Bottom | Top | Mid | Bottom |

PTO species list

HV7-9 GR3 19.2.21 140° NSEW

| SPECIES. | N/E/I/T/W | Foliage Cover | Abundance |
|---|---|---|---|
| Paspalum dilatatum | E | 75 | 71000 |
| Cynodon dactylon | N | 10 | 71000 |
| Sporobolus creber | N | 2 | 1000 |
| Conyza sp. | E | 0.5 | 500 |
| Senecio madagascariensis | E | 2 | 1000 |
| Hypochaeris albiflora | E | 0.1 | 20 |
| Leontodon saxatilis | E | 0.2 | 500 |
| Bothriochloa macra | N | 0.5 | 500 |
| Gamochaeta americana | E | 0.1 | 3 |
| Centaurium tenuiflorum | E | 0.1 | 7 |
| Cenchrus clandestina | E | 1 | 50 |
| Plantago lanceolata | E | 0.3 | 500 |
| Asperula conferta | N | 0.1 | 1 |
| Carex inversa | N | 0.1 | 20 |
| Malva parviflora | E | 0.1 | 1 |
| Solanum sisymbrifolium | E | 0.1 | 20 |
| Chloris gayana | E | 1 | 50 |
| Cymbonotus lawsonianus | N | 0.1 | 1 |
| Sida rhombifolia | E | 0.1 | 6 |
| Eragrostis curvula | E | 0.2 | 20 |
| Wahlenbergia gracilis | N | 0.1 | 2 |
| Setaria parviflora | E | 2 | 500 |
| Centella asiatica | N | 0.1 | 20 |
| Oxalis exilis | N | 0.1 | 8 |
| Lysimachia arvensis | E | 0.1 | 5 |
| Cirsium vulgare | E | 0.1 | 10 |
| Lepidium bonariense | E | 0.1 | 1 |
| Portulaca oleracea | N | 0.1 | 5 |
| Paronychia brasiliana | E | 0.1 | 4 |
| Solanum nigrum | E | 0.1 | 1 |
| Enteropogon acicularis | N | 0.1 | 5 |
| Verbena bonariensis | E | 0.1 | 2 |
| Trifolium repens | E | 0.1 | 1 |
| Cyperus brevifolius | E | 0.1 | 4 |
| Dichondra repens | N | 0.1 | 7 |

Numbers [1-8] on this page correlate with the numbers and explanatory notes on page 3

| | | | | | |
|---|---|---|---|---|---|
| **Site sheet #** | 1 of | **Date** | / / | **Survey name** | ~~GR4~~ HV7-9. |
| **Plot identifier** | GR4 | | | | |
| **Recorders** | James Jacqui | **IBRA region** | SYD BASIN | **Veg zone ID** | |
| [1]**Datum** | **Coordinate system** | □ Projected □ Geographic | **MGA zone** | [1]**X coordinate** | JC GPS |
| [1]**Y coordinate** | | | | | |
| **Location description** | descriptive notes to locate site without grid reference | | | | |
| [1] **Plot dimensions** | For composition & structure (400m²): 20 m x 20 m<br>For function (1000m²): 20 m x 50 m | [1] **Orientation of midline from 0 m point** | ~~Magnetic~~ 78°E | **Photo #** | JC iphone |

Datum: AGD66, WGS84, GDA94, GDA2020 or Other (specify). **MGA Zone** (for Projected coordinate. system only): 56 (Coastal NSW), 55 (Central NSW) or 54 (Western NSW). **X/Y coordinate**: Long/Lat (for Projected coordinate. system), Easting/Northing (for geographic coordinate. system)

## Vegetation integrity

Composition and structure sum values may be completed after entering data into available tools. It is not required while in the field

| **Composition** (400 m² plot) | | Sum values | **Structure** (400 m² plot) | | Sum values (%) (may sum to >100%) | **Function** (1000 m² plot) [3] Tree stem size class (DBH) | If data are to be used as more appropriate local data i.e. to generate local benchmarks, stems must be counted |
|---|---|---|---|---|---|---|---|
| Total count of native plant species **(richness)** in each growth form group (not individual plants within each growth form) | Trees (TG) | | Sum of [2] **foliage cover** of native plant species by growth form group | Trees (TG) | | 80 + cm | Count |
| | Shrubs (SG) | | | Shrubs (SG) | | 50 – 79 cm | Count (best practice)/tick. If [8] large tree benchmark size ≥50 cm, count |
| | Grasses etc. (GG) | | | Grasses etc. (GG) | | 30 – 49 cm | Count (best practice)/tick. If [8] large tree benchmark size ≥ 30 cm, count |
| | Forbs (FG) | | | Forbs (FG) | | 20 – 29 cm | Count (best practice)/tick. If [8] large tree benchmark size ≥ 20 cm, count |
| | Ferns (EG) | | | Ferns (EG) | | 10 – 19 cm | Count (best practice)/tick |
| | Other (OG) | | | Other (OG) | | 5 – 9 cm | Count (best practice)/tick |
| | | | | | | [4]Tree regeneration <5 cm | Tick |
| | | | Total high threat weed cover | | % | [5] Length of fallen logs | Tally space / Total m |
| | | | | | | [6] Hollow bearing trees | Tick |

| **Vegetation integrity - function** cont. (five 1 m²) **plots)** | [7] Litter cover (%) | Bare ground cover (%) | | | | | Cryptogam cover (%) | | | | | Rock cover (%) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Subplot score (% in each) | | a | b | c | d | e | a | b | c | d | e | a | b | c | d | e |
| Average of the 5 subplots | | | | | | | | | | | | | | | | |

These attributes require consideration of site observations and may be completed after field work:

| | | | | | |
|---|---|---|---|---|---|
| **Vegetation class** | | [8] **Large tree benchmark size** | 20/ 30/ 50/ 80 DBH | Confidence | H/ M/ L |
| **Plant community type (PCT)** | | **EEC** | Tick | Confidence | H/ M/ L |

Physiography and site features that may help in determining PCT and management zone (optional) or for BioNet systematic flora survey purposes:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Morphological type | | Landform element | | Landform pattern | | Microrelief | |
| Lithology | | Soil surface texture | | Soil colour | | Soil depth | |
| Slope | | Aspect | | Site drainage | | Distance to nearest water and type | |

| Disturbance | Severity code | Age code |
|---|---|---|
| Clearing (inc. logging) | | |
| Cultivation (inc. pasture) | | |
| Soil erosion | | |
| Firewood / CWD removal | | |
| Grazing (id. native/stock) | | |
| Fire damage | | |
| Storm damage | | |
| Weediness | | |

Brief site description or other notes

| Emergents heights | | | Upper stratum heights | | | Middle stratum heights | | | Lower stratum heights | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top | Mid | Bottom | Top | Mid | Bottom | Top | Mid | Bottom | Top | Mid | Bottom |
| | | | | | | | | | | | |

HV 7-9 19/2/2021 JS + JC

GR4 - in Native downhaded low diversity GL

| Species | E or N | Cover | Abund. |
|---|---|---|---|
| Enteropogon acicularis | N | 50 | >1000 |
| Cynodon dactylon | N | 20 | >1000 |
| Setaria parviflora | E | 3 | 1000 |
| Conyza sumatrensis | E | 0.6 | 500 |
| Bothriochloa macra | N | 3 | 500 |
| Plantago lanceolata | E | 0.2 | 100 |
| Sporobolus creber | N | 4 | 71000 |
| Paspalum dilatatum | E | 2 | 500 |
| Cenchrus clandestinus | E | 0.1 | 20 |
| Oxalis exilis | N | 0.1 | 20 |
| Wahlenbergia gracilis | N | 0.1 | 8 |
| Carex inversa | N | 0.1 | 10 |
| Senecio madagascariensis | E | 0.2 | 50 |
| Gamochaeta calviceps | E | 0.1 | 20 |
| Cyperus gracilis | N | 0.1 | 20 |
| Phyllanthus virgatus | N | 0.1 | 50 |
| Euphorbia drummondii | N | 0.1 | 50 |
| Paronychia brasiliana | E | 0.1 | 20 |
| Spergularia levis | E | 0.1 | 3 |
| Gamochaeta americana | E | 0.1 | 20 |
| Eleusine tristachya | E | 0.1 | 20 |
| Lysimachia arvensis | E | 0.1 | 10 |
| Einadia polygonoides | N | 0.1 | 20 |
| Glycine tabacina | N | 0.1 | 8 |
| Aristida ramosa | N | 0.1 | 50 |
| Leontodon saxatilis | E | 0.1 | 50 |
| Dichondra repens | N | 0.1 | 4 |
| Eragrostis curvula | E | 0.7 | 50 |
| Wahlenbergia communis | N | 0.1 | 10 |
| Cirsium vulgare | E | 0.1 | 1 |
| Portulaca oleracea | N | 0.1 | 6 |
| Cyperus brevifolius | E | 0.1 | 7 |
| Linum trigynum | E | 0.1 | 1 |
| Hypochaeris albiflorus | E | 0.1 | 1 |
| Schkuhria pinnata abrobotanoides | E | 0.1 | 1 |
| Gomphrena celosioides | E | 0.1 | 2 |
| Solanum sisymbriifolium | E | 0.1 | 4 |
| Fimbristylis dichotoma | N | 0.1 | 20 |

Fenced off "restoration area" in NE of site

Scattered remnant large Euc. tereticornis, Euc. crebra + a few smaller Euc. melliodora, with abundant Euc. tereticornis regen + a few Euc. crebra regen.
Understorey patchy, ~~some~~ most areas dominated by Chloris gayana, Paspalum dilatatum, Setaria parviflora, but some areas dominated by Themeda triandra.
Some midstorey of Bursaria spinosa in patches. ~~Abundant~~ Euc. seedlings.

Also present

Briza subaristata
Fimbristylis dichotoma
Solanum sisymbriifolium
Senecio madagascariensis
Tricoryne elatior
Conyza sumatrensis
Euchiton ~~sphaericus~~ involucratus
Sida rhombifolia
Cyperus gracilis
Verbena bonariensis
Plantago lanceolata
Glycine microphylla

# Appendix C – Site Flora Species List

| Scientific Name | Common Name | NSW Status | Comwlth Status | Native | Exotic |
|---|---|---|---|---|---|
| *Araujia sericifera* | Moth Vine | Not Listed | Not Listed | | YES |
| *Aristida ramosa* | Purple Wiregrass | Not Listed | Not Listed | YES | |
| *Arthropodium minus* | Small Vanilla Lily | Not Listed | Not Listed | YES | |
| *Asperula conferta* | Common Woodruff | Not Listed | Not Listed | YES | |
| *Axonopus fissifolius* | Narrow-leafed Carpet Grass | Not Listed | Not Listed | | YES |
| *Bidens pilosa* | Cobbler's Pegs | Not Listed | Not Listed | | YES |
| *Bidens subalternans* | Greater Beggar's Ticks | Not Listed | Not Listed | | YES |
| *Bothriochloa macra* | Red Grass | Not Listed | Not Listed | YES | |
| *Breynia oblongifolia* | Coffee Bush | Not Listed | Not Listed | YES | |
| *Briza subaristata* | | Not Listed | Not Listed | | YES |
| *Bromus catharticus* | Prairie Grass | Not Listed | Not Listed | | YES |
| *Brunoniella australis* | Blue Trumpet | Not Listed | Not Listed | YES | |
| *Bursaria spinosa* | Native Blackthorn | Not Listed | Not Listed | YES | |
| *Carex inversa* | Knob Sedge | Not Listed | Not Listed | YES | |
| *Carex inversa* | Knob Sedge | Not Listed | Not Listed | YES | |
| *Cenchrus clandestinus* | Kikuyu Grass | Not Listed | Not Listed | | YES |
| *Centaurium tenuiflorum* | Branched Centaury, Slender centaury | Not Listed | Not Listed | | YES |
| *Centella asiatica* | Indian Pennywort | Not Listed | Not Listed | YES | |
| *Cheilanthes sieberi* | Rock Fern | Not Listed | Not Listed | YES | |
| *Chloris gayana* | Rhodes Grass | Not Listed | Not Listed | | YES |
| *Chloris truncata* | Windmill Grass | Not Listed | Not Listed | YES | |
| *Chloris ventricosa* | Tall Chloris | Not Listed | Not Listed | YES | |
| *Cirsium vulgare* | Spear Thistle | Not Listed | Not Listed | | YES |
| *Commelina cyanea* | Native Wandering Jew | Not Listed | Not Listed | YES | |
| *Conyza Spp.* | | Not Listed | Not Listed | | YES |
| *Cyanthillium cinereum* | | Not Listed | Not Listed | YES | |
| *Cyclospermum leptophyllum* | Slender Celery | Not Listed | Not Listed | | YES |
| *Cymbonotus lawsonianus* | Bear's Ear | Not Listed | Not Listed | YES | |
| *Cymbopogon refractus* | Barbed Wire Grass | Not Listed | Not Listed | YES | |
| *Cynodon dactylon* | Common Couch | Not Listed | Not Listed | YES | |
| *Cyperus brevifolius* | | Not Listed | Not Listed | | YES |
| *Cyperus eragrostis* | Umbrella Sedge | Not Listed | Not Listed | | YES |
| *Cyperus gracilis* | Slender Flat-sedge | Not Listed | Not Listed | YES | |
| *Desmodium brachypodum* | Large Tick-trefoil | Not Listed | Not Listed | YES | |
| *Desmodium varians* | Slender Tick-trefoil | Not Listed | Not Listed | YES | |
| *Dichanthium sericeum* | Queensland Bluegrass | Not Listed | Not Listed | YES | |
| *Dichondra repens* | Kidney Weed | Not Listed | Not Listed | YES | |
| *Digitaria sanguinalis* | Crab Grass | Not Listed | Not Listed | | YES |
| *Echinopogon ovatus* | Forest Hedgehog Grass | Not Listed | Not Listed | YES | |
| *Ehrharta erecta* | Panic Veldtgrass | Not Listed | Not Listed | | YES |
| *Einadia polygonoides* | Knotweed Goosefoot | Not Listed | Not Listed | YES | |
| *Eleusine tristachya* | Goose Grass | Not Listed | Not Listed | | YES |
| *Enteropogon acicularis* | Curly Windmill Grass | Not Listed | Not Listed | YES | |
| *Eragrostis curvula* | African Lovegrass | Not Listed | Not Listed | | YES |
| *Eragrostis leptostachya* | Paddock Lovegrass | Not Listed | Not Listed | YES | |
| *Eragrostis parviflora* | Weeping Lovegrass | Not Listed | Not Listed | YES | |
| *Eriochloa pseudoacrotricha* | Early Spring Grass | Not Listed | Not Listed | YES | |
| *Eucalyptus crebra* | Narrow-leaved Ironbark | Not Listed | Not Listed | YES | |
| *Eucalyptus moluccana* | Grey Box | Not Listed | Not Listed | YES | |
| *Eucalyptus tereticornis* | Forest Red Gum | Not Listed | Not Listed | YES | |
| *Euchiton sphaericus* | Star Cudweed | Not Listed | Not Listed | YES | |
| *Euphorbia drummondii* | Caustic Weed | Not Listed | Not Listed | YES | |

| Scientific Name | Common Name | NSW Status | Comwlth Status | Native | Exotic |
|---|---|---|---|---|---|
| *Fimbristylis dichotoma* | Common Fringe-sedge | Not Listed | Not Listed | YES | |
| *Gamochaeta americana* | Purple Cudweed | Not Listed | Not Listed | | YES |
| *Gamochaeta calviceps* | Cudweed | Not Listed | Not Listed | | YES |
| *Geranium solanderi* | Native Geranium | Not Listed | Not Listed | YES | |
| *Glycine microphylla* | Small-leaf Glycine | Not Listed | Not Listed | YES | |
| *Glycine tabacina* | Variable Glycine | Not Listed | Not Listed | YES | |
| *Gomphocarpus fruticosus* | Narrow-leaved Cotton Bush | Not Listed | Not Listed | | YES |
| *Gomphrena celosioides* | Gomphrena Weed | Not Listed | Not Listed | | YES |
| *Hardenbergia violacea* | False Sarsaparilla | Not Listed | Not Listed | YES | |
| *Hydrocotyle sibthorpioides* | | Not Listed | Not Listed | YES | |
| *Hypericum gramineum* | Small St John's Wort | Not Listed | Not Listed | YES | |
| *Hypochaeris albiflora* | White Flatweed | Not Listed | Not Listed | | YES |
| *Hypochaeris glabra* | Smooth Catsear | Not Listed | Not Listed | | YES |
| *Hypochaeris radicata* | Catsear | Not Listed | Not Listed | | YES |
| *Hypoxis hygrometrica* | Golden Weather-grass | Not Listed | Not Listed | YES | |
| *Indigofera australis* | Australian Indigo | Not Listed | Not Listed | YES | |
| *Lantana camara* | Lantana | Not Listed | Not Listed | | YES |
| *Leontodon taraxacoides* | Lesser Hawkbit | Not Listed | Not Listed | | YES |
| *Leontodon taraxacoides* | Lesser Hawkbit | Not Listed | Not Listed | | YES |
| *Lepidium africanum* | Common Peppercress | Not Listed | Not Listed | | YES |
| *Linum trigynum* | French Flax | Not Listed | Not Listed | | YES |
| *Lomandra filiformis* | Wattle Matt-rush | Not Listed | Not Listed | YES | |
| *Lotus angustissimus* | Slender Birds-foot Trefoil | Not Listed | Not Listed | | YES |
| *Lysimachia arvensis* | Scarlet Pimpernel | Not Listed | Not Listed | | YES |
| *Microlaena stipoides* | Weeping Grass | Not Listed | Not Listed | YES | |
| *Modiola caroliniana* | Red-flowered Mallow | Not Listed | Not Listed | | YES |
| *Olea europaea subsp. cuspidata* | African Olive | Not Listed | Not Listed | | YES |
| *Oplismenus aemulus* | | Not Listed | Not Listed | YES | |
| *Oxalis exilis* | | Not Listed | Not Listed | YES | |
| *Oxalis perennans* | | Not Listed | Not Listed | YES | |
| *Paronychia brasiliana* | Chilean Whitlow Wort, Brazilian Whitlow | Not Listed | Not Listed | | YES |
| *Paspalidium distans* | | Not Listed | Not Listed | YES | |
| *Paspalum dilatatum* | Paspalum | Not Listed | Not Listed | | YES |
| *Phyllanthus virgatus* | Wiry Spurge | Not Listed | Not Listed | YES | |
| *Plantago lanceolata* | Lamb's Tongues | Not Listed | Not Listed | | YES |
| *Portulaca oleracea* | Pigweed | Not Listed | Not Listed | YES | |
| *Richardia stellaris* | | Not Listed | Not Listed | | YES |
| *Rumex brownii* | Swamp Dock | Not Listed | Not Listed | YES | |
| *Rytidosperma racemosum var. racemosum* | Wallaby Grass | Not Listed | Not Listed | YES | |
| *Rytidosperma spp.* | | Not Listed | Not Listed | YES | |
| *Schkuhria pinnata* | Dwarf Marigold | Not Listed | Not Listed | | YES |
| *Scleria mackaviensis* | | Not Listed | Not Listed | YES | |
| *Senecio madagascariensis* | Fireweed | Not Listed | Not Listed | | YES |
| *Setaria parviflora* | | Not Listed | Not Listed | | YES |
| *Sida rhombifolia* | Paddy's Lucerne | Not Listed | Not Listed | | YES |
| *Sigesbeckia orientalis* | Indian Weed | Not Listed | Not Listed | YES | |
| *Solanum pseudocapsicum* | Madeira Winter Cherry | Not Listed | Not Listed | | YES |
| *Solanum sisymbriifolium* | | Not Listed | Not Listed | | YES |
| *Sonchus oleraceus* | Common Sowthistle | Not Listed | Not Listed | | YES |
| *Spergularia levis* | | Not Listed | Not Listed | | YES |
| *Sporobolus creber* | Slender Rat's Tail Grass | Not Listed | Not Listed | YES | |
| *Aster subulatus* | Wild Aster | Not Listed | Not Listed | | YES |
| *Taraxacum officinale* | Dandelion | Not Listed | Not Listed | | YES |
| *Themeda triandra* | | Not Listed | Not Listed | YES | |
| *Tricoryne elatior* | Yellow Autumn-lily | Not Listed | Not Listed | YES | |
| *Urochloa panicoides* | Urochloa Grass | Not Listed | Not Listed | | YES |
| *Verbena bonariensis* | Purpletop | Not Listed | Not Listed | | YES |

| Scientific Name | Common Name | NSW Status | Comwlth Status | Native | Exotic |
|---|---|---|---|---|---|
| *Veronica plebeia* | Trailing Speedwell | Not Listed | Not Listed | YES | |
| *Wahlenbergia communis* | Tufted Bluebell | Not Listed | Not Listed | YES | |
| *Wahlenbergia gracilis* | Sprawling Bluebell | Not Listed | Not Listed | YES | |

# Appendix D – BAM Calculator Reports

# BAM Candidate Species Report

## Proposal Details

| | | |
|---|---|---|
| Assessment Id<br>00024108/BAAS18139/21/00024124 | Proposal Name<br>Highland Views stage 7 to 9 | BAM data last updated *<br>29/03/2021 |
| Assessor Name<br>Jacqueline Frances Coughlan | Report Created<br>19/04/2021 | BAM Data version *<br>38 |
| Assessor Number<br>BAAS18139 | Assessment Type<br>Part 4 Developments (General) | BAM Case Status<br>Open |
| Assessment Revision<br>0 | Date Finalised<br>To be finalised | BOS entry trigger<br>BOS Threshold: Biodiversity Values Map |

* 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 |
|---|---|---|
| ***Chalinolobus dwyeri***<br>Large-eared Pied Bat | Yes (assumed present) | ☐ Jan ☐ Feb ☐ Mar ☐ Apr<br>☐ May ☐ Jun ☐ Jul ☐ Aug<br>☐ Sep ☐ Oct ☐ Nov ☐ Dec<br>☐ Survey month outside the specified months? |
| ***Cynanchum elegans***<br>White-flowered Wax Plant | No (surveyed) | ☐ Jan ☑ Feb ☐ Mar ☐ Apr<br>☐ May ☐ Jun ☐ Jul ☐ Aug<br>☐ Sep ☐ Oct ☐ Nov ☐ Dec<br>☐ Survey month outside the specified months? |
| ***Dillwynia tenuifolia***<br>Dillwynia tenuifolia | Yes (assumed present) | ☐ Jan ☐ Feb ☐ Mar ☐ Apr<br>☐ May ☐ Jun ☐ Jul ☐ Aug<br>☐ Sep ☐ Oct ☐ Nov ☐ Dec<br>☐ Survey month outside the specified months? |

| | | |
|---|---|---|
| ***Dillwynia tenuifolia - endangered population***<br>Dillwynia tenuifolia, Kemps Creek | No (surveyed)<br>*Survey months are outside of the months specified in Bionet. | ☐ Jan ☑ Feb ☐ Mar ☐ Apr<br>☐ May ☐ Jun ☐ Jul ☐ Aug<br>☐ Sep ☐ Oct ☐ Nov ☐ Dec<br>☑ Survey month outside the specified months? |
| ***Eucalyptus benthamii***<br>Camden White Gum | No (surveyed) | ☐ Jan ☑ Feb ☐ Mar ☐ Apr<br>☐ May ☐ Jun ☐ Jul ☐ Aug<br>☐ Sep ☐ Oct ☐ Nov ☐ Dec<br>☐ Survey month outside the specified months? |
| ***Grevillea juniperina subsp. juniperina***<br>Juniper-leaved Grevillea | 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? |
| ***Marsdenia viridiflora subsp. viridiflora - endangered population***<br>Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas | No (surveyed) | ☐ Jan ☑ Feb ☐ Mar ☐ Apr<br>☐ May ☐ Jun ☐ Jul ☐ Aug<br>☐ Sep ☐ Oct ☐ Nov ☐ Dec<br>☐ Survey month outside the specified months? |

| | | |
|---|---|---|
| ***Meridolum corneovirens***<br>Cumberland Plain Land Snail | 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 | No (surveyed) | ☐ Jan ☑ Feb ☐ Mar ☐ Apr<br>☐ May ☐ Jun ☐ Jul ☐ Aug<br>☐ Sep ☐ Oct ☐ Nov ☐ Dec<br>☐ Survey month outside the specified months? |
| ***Persoonia bargoensis***<br>Bargo Geebung | No (surveyed) | ☐ Jan ☑ Feb ☐ Mar ☐ Apr<br>☐ May ☐ Jun ☐ Jul ☐ Aug<br>☐ Sep ☐ Oct ☐ Nov ☐ Dec<br>☐ Survey month outside the specified months? |
| ***Pimelea curviflora var. curviflora***<br>Pimelea curviflora var. curviflora | No (surveyed) | ☐ Jan ☑ Feb ☐ Mar ☐ Apr<br>☐ May ☐ Jun ☐ Jul ☐ Aug<br>☐ Sep ☐ Oct ☐ Nov ☐ Dec<br>☐ Survey month outside the specified months? |
| ***Pimelea spicata***<br>Spiked Rice-flower | No (surveyed) | ☐ Jan ☑ Feb ☐ Mar ☐ Apr<br>☐ May ☐ Jun ☐ Jul ☐ Aug<br>☐ Sep ☐ Oct ☐ Nov ☐ Dec<br>☐ Survey month outside the specified months? |
| ***Pommerhelix duralensis***<br>Dural Land Snail | No (surveyed) | ☐ Jan ☑ Feb ☐ Mar ☐ Apr<br>☐ May ☐ Jun ☐ Jul ☐ Aug<br>☐ Sep ☐ Oct ☐ Nov ☐ Dec<br>☐ Survey month outside the specified months? |

| | | |
|---|---|---|
| ***Pterostylis saxicola***<br>Sydney Plains Greenhood | Yes (assumed present) | ☐ Jan ☐ Feb ☐ Mar ☐ Apr<br>☐ May ☐ Jun ☐ Jul ☐ Aug<br>☐ Sep ☐ Oct ☐ Nov ☐ Dec<br>☐ Survey month outside the specified months? |
| ***Pultenaea pedunculata***<br>Matted Bush-pea | Yes (assumed present) | ☐ Jan ☐ Feb ☐ Mar ☐ Apr<br>☐ May ☐ Jun ☐ Jul ☐ Aug<br>☐ Sep ☐ Oct ☐ Nov ☐ Dec<br>☐ Survey month outside the specified months? |
| ***Thesium australe***<br>Austral Toadflax | No (surveyed) | ☐ Jan ☑ Feb ☐ Mar ☐ Apr<br>☐ May ☐ Jun ☐ Jul ☐ Aug<br>☐ Sep ☐ Oct ☐ Nov ☐ Dec<br>☐ Survey month outside the specified months? |

## Threatened species assessed as not on site

Refer to BAR for detailed justification

| Common name | Scientific name | Justification in the BAM-C |
|---|---|---|
| Bush Stone-curlew | Burhinus grallarius | Habitat degraded |
| Bynoe's Wattle | Acacia bynoeana | Habitat degraded |
| Downy Wattle | Acacia pubescens | Habitat degraded |
| Eastern Pygmy-possum | Cercartetus nanus | Refer to BAR |
| Gang-gang Cockatoo | Callocephalon fimbriatum | 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 |
| Little Bent-winged Bat | Miniopterus australis | Refer to BAR |
| Little Eagle | Hieraaetus morphnoides | Refer to BAR |
| Masked Owl | Tyto novaehollandiae | Refer to BAR |

| | | |
|---|---|---|
| Powerful Owl | Ninox strenua | Refer to BAR |
| Regent Honeyeater | Anthochaera phrygia | Refer to BAR |
| Square-tailed Kite | Lophoictinia isura | Refer to BAR |
| Squirrel Glider | Petaurus norfolcensis | Refer to BAR |
| Swift Parrot | Lathamus discolor | Refer to BAR |
| Thick Lip Spider Orchid | Caladenia tessellata | Refer to BAR |
| White-bellied Sea-Eagle | Haliaeetus leucogaster | Refer to BAR |

# BAM Predicted Species Report

## Proposal Details

| | | |
|---|---|---|
| Assessment Id | Proposal Name | BAM data last updated * |
| 00024108/BAAS18139/21/00024124 | Highland Views stage 7 to 9 | 29/03/2021 |
| Assessor Name | Report Created | BAM Data version * |
| Jacqueline Frances Coughlan | 19/04/2021 | 38 |
| Assessor Number | Assessment Type | BAM Case Status |
| BAAS18139 | Part 4 Developments (General) | Open |
| Assessment Revision | BOS entry trigger | Date Finalised |
| 0 | BOS Threshold: Biodiversity Values Map | To be finalised |

* 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) |
|---|---|---|
| Brown Treecreeper (eastern subspecies) | Climacteris picumnus victoriae | 849-Cumberland shale plains woodland |
| Diamond Firetail | Stagonopleura guttata | 849-Cumberland shale plains woodland |
| Dusky Woodswallow | Artamus cyanopterus cyanopterus | 849-Cumberland shale plains woodland |
| Eastern Coastal Free-tailed Bat | Micronomus norfolkensis | 849-Cumberland shale plains woodland |
| Grey-headed Flying-fox | Pteropus poliocephalus | 849-Cumberland shale plains woodland |
| Large Bent-winged Bat | Miniopterus orianae oceanensis | 849-Cumberland shale plains woodland |
| Little Bent-winged Bat | Miniopterus australis | 849-Cumberland shale plains woodland |
| Little Lorikeet | Glossopsitta pusilla | 849-Cumberland shale plains woodland |
| Masked Owl | Tyto novaehollandiae | 849-Cumberland shale plains woodland |
| Spotted Harrier | Circus assimilis | 849-Cumberland shale plains woodland |

| | | |
|---|---|---|
| Swift Parrot | Lathamus discolor | 849-Cumberland shale plains woodland |
| Varied Sittella | Daphoenositta chrysoptera | 849-Cumberland shale plains woodland |
| Yellow-bellied Sheathtail-bat | Saccolaimus flaviventris | 849-Cumberland shale plains woodland |

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

| Common Name | Scientific Name | Plant Community Type(s) |
|---|---|---|
| Flame Robin | Petroica phoenicea | 849-Cumberland shale plains woodland |
| Gang-gang Cockatoo | Callocephalon fimbriatum | 849-Cumberland shale plains woodland |
| Hooded Robin (south-eastern form) | Melanodryas cucullata cucullata | 849-Cumberland shale plains woodland |
| Koala | Phascolarctos cinereus | 849-Cumberland shale plains woodland |
| Little Eagle | Hieraaetus morphnoides | 849-Cumberland shale plains woodland |
| Painted Honeyeater | Grantiella picta | 849-Cumberland shale plains woodland |
| Powerful Owl | Ninox strenua | 849-Cumberland shale plains woodland |
| Regent Honeyeater | Anthochaera phrygia | 849-Cumberland shale plains woodland |
| Scarlet Robin | Petroica boodang | 849-Cumberland shale plains woodland |
| Speckled Warbler | Chthonicola sagittata | 849-Cumberland shale plains woodland |
| Spotted-tailed Quoll | Dasyurus maculatus | 849-Cumberland shale plains woodland |
| Square-tailed Kite | Lophoictinia isura | 849-Cumberland shale plains woodland |
| Turquoise Parrot | Neophema pulchella | 849-Cumberland shale plains woodland |
| White-bellied Sea-Eagle | Haliaeetus leucogaster | 849-Cumberland shale plains woodland |

### 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 |
|---|---|---|
| Flame Robin | Petroica phoenicea | Refer to BAR |
| Gang-gang Cockatoo | Callocephalon fimbriatum | Refer to BAR |
| Hooded Robin (south-eastern form) | Melanodryas cucullata cucullata | Refer to BAR |
| Koala | Phascolarctos cinereus | Refer to BAR |
| Little Eagle | Hieraaetus morphnoides | Refer to BAR |

| | | |
|---|---|---|
| Painted Honeyeater | Grantiella picta | Refer to BAR |
| Powerful Owl | Ninox strenua | Refer to BAR |
| Regent Honeyeater | Anthochaera phrygia | Refer to BAR |
| Scarlet Robin | Petroica boodang | Refer to BAR |
| Speckled Warbler | Chthonicola sagittata | Refer to BAR |
| Spotted-tailed Quoll | Dasyurus maculatus | Refer to BAR |
| Square-tailed Kite | Lophoictinia isura | Refer to BAR |
| Turquoise Parrot | Neophema pulchella | Refer to BAR |
| White-bellied Sea-Eagle | Haliaeetus leucogaster | Refer to BAR |

# BAM Vegetation Zones Report

## Proposal Details

| | | |
|---|---|---|
| Assessment Id | Assessment name | BAM data last updated * |
| 00024108/BAAS18139/21/00024124 | Highland Views stage 7 to 9 | 29/03/2021 |
| Assessor Name | Report Created | BAM Data version * |
| Jacqueline Frances Coughlan | 19/04/2021 | 38 |
| Assessor Number | Assessment Type | BAM Case Status |
| BAAS18139 | Part 4 Developments (General) | Open |
| Assessment Revision | Date Finalised | BOS entry trigger |
| 0 | To be finalised | BOS Threshold: Biodiversity Values Map |

* 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 | 849_CPW_Moderate | 849-Cumberland shale plains woodland | CPW_Moderate | 0.08 | 1 | Park (0.08 ha) |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2 | 849_Derived_Grassland | 849-Cumberland shale plains woodland | Derived_Grassland | 1.48 | 1 | |
| 3 | 849_Exotic_Grassland | 849-Cumberland shale plains woodland | Exotic_Grassland | 4.46 | 2 | |

# BAM Predicted Species Report

## Proposal Details

| | | |
|---|---|---|
| Assessment Id | Proposal Name | BAM data last updated * |
| 00024108/BAAS18139/21/00024109 | Highland Views Stages 7-9 | 29/03/2021 |
| Assessor Name | Report Created | BAM Data version * |
| Jacqueline Frances Coughlan | 21/04/2021 | 38 |
| Assessor Number | BAM Case Status | Date Finalised |
| BAAS18139 | Open | To be finalised |
| Assessment Revision | Assessment Type | BOS entry trigger |
| 0 | Scattered Trees | BOS Threshold: Biodiversity Values Map |

* 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 |
|---|---|
| Barking Owl | Ninox connivens |
| Eastern Coastal Free-tailed Bat | Micronomus norfolkensis |
| Eastern False Pipistrelle | Falsistrellus tasmaniensis |
| Little Eagle | Hieraaetus morphnoides |
| Masked Owl | Tyto novaehollandiae |
| Spotted Harrier | Circus assimilis |
| White-bellied Sea-Eagle | Haliaeetus leucogaster |
| Yellow-bellied Sheathtail-bat | Saccolaimus flaviventris |

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

| Common Name | Scientific Name | Plant Community Type(s) |
|---|---|---|
| Black-chinned Honeyeater (eastern subspecies) | Melithreptus gularis gularis | 849-Cumberland shale plains woodland |
| Brown Treecreeper (eastern subspecies) | Climacteris picumnus victoriae | 849-Cumberland shale plains woodland |
| Dusky Woodswallow | Artamus cyanopterus cyanopterus | 849-Cumberland shale plains woodland |
| Flame Robin | Petroica phoenicea | 849-Cumberland shale plains woodland |

| | | |
|---|---|---|
| Hooded Robin (south-eastern form) | Melanodryas cucullata cucullata | 849-Cumberland shale plains woodland |
| Koala | Phascolarctos cinereus | 849-Cumberland shale plains woodland |
| Little Lorikeet | Glossopsitta pusilla | 849-Cumberland shale plains woodland |
| Painted Honeyeater | Grantiella picta | 849-Cumberland shale plains woodland |
| Scarlet Robin | Petroica boodang | 849-Cumberland shale plains woodland |
| Speckled Warbler | Chthonicola sagittata | 849-Cumberland shale plains woodland |
| Swift Parrot | Lathamus discolor | 849-Cumberland shale plains woodland |
| Varied Sittella | Daphoenositta chrysoptera | 849-Cumberland shale plains woodland |

## 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 |
|---|---|---|
| Black-chinned Honeyeater (eastern subspecies) | Melithreptus gularis gularis | Refer to BAR |
| Brown Treecreeper (eastern subspecies) | Climacteris picumnus victoriae | Refer to BAR |
| Dusky Woodswallow | Artamus cyanopterus cyanopterus | Refer to BAR |
| Flame Robin | Petroica phoenicea | Refer to BAR |
| Hooded Robin (south-eastern form) | Melanodryas cucullata cucullata | Refer to BAR |
| Koala | Phascolarctos cinereus | Refer to BAR |
| Little Lorikeet | Glossopsitta pusilla | Refer to BAR |
| Painted Honeyeater | Grantiella picta | Refer to BAR |
| Scarlet Robin | Petroica boodang | Refer to BAR |
| Speckled Warbler | Chthonicola sagittata | Refer to BAR |
| Swift Parrot | Lathamus discolor | Refer to BAR |
| Varied Sittella | Daphoenositta chrysoptera | Refer to BAR |

# Scattered Tree Report

## Proposal Details

Assessment Id
00024108/BAAS18139/21/00024109

Assessment name
Highland Views Stages 7-9

BAM data last updated *
29/03/2021

Assessor Name
Jacqueline Frances Coughlan

Report Created
21/04/2021

BAM Data version *
38

Assessor Number
BAAS18139

BAM Case Status
Open

Date Finalised
To be finalised

Assessment Revision
0

Assessment Type
Scattered Trees

BOS entry trigger
BOS Threshold: Biodiversity Values Map

* 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.

## Scattered Trees

| PCT code | PCT name | No. of trees | Species | DBHOB Category | Contain hollows | Class | Assessment required |
|---|---|---|---|---|---|---|---|
| 849 | Cumberland shale plains woodland | 1 | Eucalyptus crebra | >= 50cm | True | 3 | Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species |

# Appendix E – Credit Requirements and Costs

# BAM Biodiversity Credit Report (Like for like)

## Proposal Details

Assessment Id
00024108/BAAS18139/21/00024124

Proposal Name
Highland Views stage 7 to 9

BAM data last updated *
29/03/2021

Assessor Name
Jacqueline Frances Coughlan

Assessor Number
BAAS18139

BAM Data version *
38

Proponent Names

Report Created
19/04/2021

BAM Case Status
Open

Assessment Revision
0

Assessment Type
Part 4 Developments (General)

Date Finalised
To be finalised

BOS entry trigger
BOS Threshold: Biodiversity Values Map

* 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 |
|---|---|---|
| Cumberland Plain Woodland in the Sydney Basin Bioregion | Critically Endangered Ecological Community | 849-Cumberland shale plains woodland |

| Species |
|---|
| **Chalinolobus dwyeri** / Large-eared Pied Bat |

## Additional Information for Approval

PCTs With Customized Benchmarks

| PCT |
| --- |
| No Changes |

Predicted Threatened Species Not On Site

| Name |
| --- |
| **Dasyurus maculatus /** Spotted-tailed Quoll |
| **Grantiella picta /** Painted Honeyeater |
| **Callocephalon fimbriatum /** Gang-gang Cockatoo |
| **Petroica phoenicea /** Flame Robin |
| **Petroica boodang /** Scarlet Robin |
| **Hieraaetus morphnoides /** Little Eagle |
| **Haliaeetus leucogaster /** White-bellied Sea-Eagle |
| **Lophoictinia isura /** Square-tailed Kite |
| **Melanodryas cucullata cucullata /** Hooded Robin (south-eastern form) |
| **Neophema pulchella /** Turquoise Parrot |
| **Ninox strenua /** Powerful Owl |
| **Phascolarctos cinereus /** Koala |
| **Chthonicola sagittata /** Speckled Warbler |
| **Anthochaera phrygia /** Regent Honeyeater |

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

# BAM Biodiversity Credit Report (Like for like)

| Name of Plant Community Type/ID | Name of threatened ecological community | Area of impact | HBT Cr | No HBT Cr | Total credits to be retired |
|---|---|---|---|---|---|
| 849-Cumberland shale plains woodland | Cumberland Plain Woodland in the Sydney Basin Bioregion | 6.0 | 0 | 1 | 1 |

**849-Cumberland shale plains woodland**

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

| Name of offset trading group | Trading group | Zone | HBT | Credits | IBRA region |
|---|---|---|---|---|---|
| Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 849, 850 | - | 849_CPW_Moderate | No | 1 | Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site. |
| Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 849, 850 | - | 849_Derived_Grassland | No | 0 | Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site. |
| Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 849, 850 | - | 849_Exotic_Grassland | No | 0 | Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site. |

# BAM Biodiversity Credit Report (Like for like)

## Species Credit Summary

| Species | Vegetation Zone/s | Area / Count | Credits |
|---|---|---|---|
| **Chalinolobus dwyeri** / Large-eared Pied Bat | **849_CPW_Moderate** | 0.1 | 2.00 |
| **Dillwynia tenuifolia** / Dillwynia tenuifolia | **849_CPW_Moderate** | 0.1 | 1.00 |
| **Pterostylis saxicola** / Sydney Plains Greenhood | **849_CPW_Moderate** | 0.1 | 1.00 |
| **Pultenaea pedunculata** / Matted Bush-pea | **849_CPW_Moderate** | 0.1 | 1.00 |

## Credit Retirement Options

Like-for-like credit retirement options

| | | |
|---|---|---|
| **Chalinolobus dwyeri** / Large-eared Pied Bat | Spp | IBRA subregion |
| | **Chalinolobus dwyeri /** Large-eared Pied Bat | Any in NSW |
| **Dillwynia tenuifolia** / Dillwynia tenuifolia | Spp | IBRA subregion |
| | **Dillwynia tenuifolia /** Dillwynia tenuifolia | Any in NSW |
| **Pterostylis saxicola** / Sydney Plains Greenhood | Spp | IBRA subregion |
| | **Pterostylis saxicola /** Sydney Plains Greenhood | Any in NSW |
| **Pultenaea pedunculata** / Matted Bush-pea | Spp | IBRA subregion |
| | **Pultenaea pedunculata /** Matted Bush-pea | Any in NSW |

# BAM Biodiversity Credit Report (Variations)

## Proposal Details

**Assessment Id**

00024108/BAAS18139/21/00024124

Proposal Name

Highland Views stage 7 to 9

BAM data last updated *

29/03/2021

Assessor Name

Jacqueline Frances Coughlan

Assessor Number

BAAS18139

BAM Data version *

38

Proponent Name(s)

Report Created

19/04/2021

BAM Case Status

Open

Assessment Revision

0

Assessment Type

Part 4 Developments (General)

Date Finalised

To be finalised

BOS entry trigger

BOS Threshold: Biodiversity Values Map

* 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 |
|---|---|---|
| Cumberland Plain Woodland in the Sydney Basin Bioregion | Critically Endangered Ecological Community | 849-Cumberland shale plains woodland |

| Species |
|---|
| **Chalinolobus dwyeri** / Large-eared Pied Bat |

## Additional Information for Approval

PCTs With Customized Benchmarks

| PCT |
|---|
| No Changes |

Predicted Threatened Species Not On Site

| Name |
|---|
| **Dasyurus maculatus /** Spotted-tailed Quoll |
| **Grantiella picta /** Painted Honeyeater |
| **Callocephalon fimbriatum /** Gang-gang Cockatoo |
| **Petroica phoenicea /** Flame Robin |
| **Petroica boodang /** Scarlet Robin |
| **Hieraaetus morphnoides /** Little Eagle |
| **Haliaeetus leucogaster /** White-bellied Sea-Eagle |
| **Lophoictinia isura /** Square-tailed Kite |
| **Melanodryas cucullata cucullata /** Hooded Robin (south-eastern form) |
| **Neophema pulchella /** Turquoise Parrot |
| **Ninox strenua /** Powerful Owl |
| **Phascolarctos cinereus /** Koala |
| **Chthonicola sagittata /** Speckled Warbler |
| **Anthochaera phrygia /** Regent Honeyeater |

## 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 |
|---|---|---|---|---|---|
| 849-Cumberland shale plains woodland | Cumberland Plain Woodland in the Sydney Basin Bioregion | 6.0 | 0 | 1 | 1.00 |

| **849-Cumberland shale plains woodland** | **Like-for-like credit retirement options** | | | | | |
|---|---|---|---|---|---|---|
| | Class | Trading group | Zone | HBT | Credits | IBRA region |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 849, 850 | - | 849_CPW_ Moderate | No | 1 | Cumberland,Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site. |
| | Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 849, 850 | - | 849_Derive d_Grasslan d | No | 0 | Cumberland,Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site. |
| | Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 849, 850 | - | 849_Exotic_ Grassland | No | 0 | Cumberland,Burragorang, Pittwater, Sydney Cataract, Wollemi 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 |
|---|---|---|---|
| **Chalinolobus dwyeri** / Large-eared Pied Bat | **849_CPW_Moderate** | 0.1 | 2.00 |
| **Dillwynia tenuifolia** / Dillwynia tenuifolia | **849_CPW_Moderate** | 0.1 | 1.00 |
| **Pterostylis saxicola** / Sydney Plains Greenhood | **849_CPW_Moderate** | 0.1 | 1.00 |
| **Pultenaea pedunculata** / Matted Bush-pea | **849_CPW_Moderate** | 0.1 | 1.00 |

## Credit Retirement Options

**Like-for-like options**

| | | | |
|---|---|---|---|
| **Chalinolobus dwyeri**/ Large-eared Pied Bat | Spp | | IBRA region |
| | **Chalinolobus dwyeri**/Large-eared Pied Bat | | 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 | Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo.<br>or<br>Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site. |
| **Dillwynia tenuifolia**/ Dillwynia tenuifolia | Spp | | IBRA region |
| | **Dillwynia tenuifolia**/Dillwynia tenuifolia | | 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 |
| | Flora | Vulnerable | Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo.<br>or<br>Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site. |

| | | | |
|---|---|---|---|
| **Pterostylis saxicola**/ Sydney Plains Greenhood | Spp | | IBRA region |
| | **Pterostylis saxicola**/Sydney Plains Greenhood | | 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 |
| | Flora | Endangered | Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo.<br>or<br>Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site. |
| **Pultenaea pedunculata**/ Matted Bush-pea | Spp | | IBRA region |
| | **Pultenaea pedunculata**/Matted Bush-pea | | 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 |
| | Flora | Endangered | Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo.<br>or<br>Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site. |

# BAM Credit Summary Report

## Proposal Details

| | | |
|---|---|---|
| Assessment Id | Proposal Name | BAM data last updated * |
| 00024108/BAAS18139/21/00024124 | Highland Views stage 7 to 9 | 29/03/2021 |
| Assessor Name | Report Created | BAM Data version * |
| Jacqueline Frances Coughlan | 19/04/2021 | 38 |
| Assessor Number | BAM Case Status | Date Finalised |
| BAAS18139 | Open | To be finalised |
| Assessment Revision | Assessment Type | BOS entry trigger |
| 0 | Part 4 Developments (General) | BOS Threshold: Biodiversity Values Map |

* 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) | BC Act Listing status | EPBC Act listing status | Species sensitivity to gain class (for BRW) | Biodiversity risk weighting | Potential SAII | Ecosystem credits |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cumberland shale plains woodland** | | | | | | | | | | | |
| 1 | 849_CPW_ Moderate | Cumberland Plain Woodland in the Sydney Basin Bioregion | 56.1 | 25.2 | 0.08 | Critically Endangered Ecological Community | Critically Endangered | High Sensitivity to Potential Gain | 2.50 | TRUE | 1 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 849_Derived_Grassland | Cumberland Plain Woodland in the Sydney Basin Bioregion | 12.1 | 12.1 | 1.5 | Critically Endangered Ecological Community | Critically Endangered | High Sensitivity to Potential Gain | 2.50 | TRUE | 0 |
| 3 | 849_Exotic_Grassland | Cumberland Plain Woodland in the Sydney Basin Bioregion | 9 | 9.0 | 4.5 | Critically Endangered Ecological Community | Critically Endangered | High Sensitivity to Potential Gain | 2.50 | TRUE | 0 |
| | | | | | | | | | | **Subtotal** | **1** |
| | | | | | | | | | | **Total** | **1** |

## Species credits for threatened species

| Vegetation zone name | Habitat condition (Vegetation Integrity) | Change in habitat condition | Area (ha)/Count (no. individuals) | BC Act Listing status | EPBC Act listing status | Biodiversity risk weighting | Potential SAII | Species credits |
|---|---|---|---|---|---|---|---|---|
| ***Chalinolobus dwyeri / Large-eared Pied Bat ( Fauna )*** | | | | | | | | |
| 849_CPW_Moderate | 25.2 | 25.2 | 0.08 | Vulnerable | Vulnerable | 3 | True | 2 |
| | | | | | | | **Subtotal** | **2** |
| ***Dillwynia tenuifolia / Dillwynia tenuifolia ( Flora )*** | | | | | | | | |
| 849_CPW_Moderate | 25.2 | 25.2 | 0.08 | Vulnerable | Not Listed | 2 | False | 1 |
| | | | | | | | **Subtotal** | **1** |
| ***Pterostylis saxicola / Sydney Plains Greenhood ( Flora )*** | | | | | | | | |
| 849_CPW_Moderate | 25.2 | 25.2 | 0.08 | Endangered | Endangered | 2 | False | 1 |
| | | | | | | | **Subtotal** | **1** |

| ***Pultenaea pedunculata / Matted Bush-pea ( Flora )*** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 849_CPW_Moderate | 25.2 | 25.2 | 0.08 | Endangered | Not Listed | 2 | False | 1 |
| | | | | | | | **Subtotal** | **1** |

# Biodiversity payment summary report

| Assessment Id | Payment data version | Assessment Revision | Report created |
|---|---|---|---|
| 00024108/BAAS18139/21/00024124 | | 0 | 19/04/2021 |

| Assessor Name | Assessor Number | Proposal Name | BAM Case Status |
|---|---|---|---|
| Jacqueline Frances Coughlan | BAAS18139 | Highland Views stage 7 to 9 | Open |

| Assessment Type | Date Finalised | BOS entry trigger |
|---|---|---|
| Part 4 Developments (General) | To be finalised | BOS Threshold: Biodiversity Values Map |

## PCT list

| Price calculated | PCT common name | Credits |
|---|---|---|
| Yes | **849 -** Cumberland shale plains woodland | 1 |

## Species list

| Price calculated | Species | Credits |
|---|---|---|
| Yes | ***Chalinolobus dwyeri*** (Large-eared Pied Bat) | 2 |
| Yes | ***Dillwynia tenuifolia*** (Dillwynia tenuifolia) | 1 |
| Yes | ***Pterostylis saxicola*** (Sydney Plains Greenhood) | 1 |
| Yes | ***Pultenaea pedunculata*** (Matted Bush-pea) | 1 |

## 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 |
|---|---|---|---|---|---|---|---|---|---|
| Cumberland | **849 -** Cumberland shale plains woodland | Yes | Cumberland Plain Woodland in the Sydney Basin Bioregion | 18.83% | $ 1,097.37 | 1.6350 | $ 33,697.42 | 1 | $33,697.42 |

| | |
|---|---|
| Subtotal (excl. GST) | **$33,697.42** |
| GST | **$3,369.74** |
| **Total ecosystem credits (incl. GST)** | **$37,067.16** |

## 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 |
|---|---|---|---|---|---|---|---|
| 10157 | ***Chalinolobus dwyeri*** (Large-eared Pied Bat) | Vulnerable | $741.31 | 20.6900% | $80.00 | 2 | $1,949.37 |
| 10226 | ***Dillwynia tenuifolia*** (Dillwynia tenuifolia) | Vulnerable | $54.59 | 20.6900% | $80.00 | 1 | $145.88 |
| 10705 | ***Pterostylis saxicola*** (Sydney Plains Greenhood) | Endangered | $865.08 | 20.6900% | $80.00 | 1 | $1,124.07 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 10716 | ***Pultenaea pedunculata*** (Matted Bush-pea) | Endangered | $1,730.17 | 20.6900% | $80.00 | 1 | $2,168.14 |

| | |
|---|---|
| Subtotal (excl. GST) | **$5,387.46** |
| GST | **$538.75** |
| **Total species credits (incl. GST)** | **$5,926.21** |
| **Grand total** | **$42,993.37** |

# BAM Biodiversity Credit Report (Like for like)

## Proposal Details

Assessment Id
00024108/BAAS18139/21/00024109

Proposal Name
Highland Views Stages 7-9

BAM data last updated *
29/03/2021

Assessor Name
Jacqueline Frances Coughlan

Assessor Number
BAAS18139

BAM Data version *
38

Proponent Names

Report Created
21/04/2021

Date Finalised
To be finalised

Assessment Revision
0

Assessment Type
Scattered Trees

BAM Case Status
Open

BOS entry trigger
BOS Threshold: Biodiversity Values Map

* 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

Nil

## Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

## Ecosystem Credit Summary

# BAM Biodiversity Credit Report (Like for like)

| PCT | TEC | HBT Cr | No HBT Cr | Credits |
|---|---|---|---|---|
| 849-Cumberland shale plains woodland | Cumberland Plain Woodland in the Sydney Basin Bioregion | 1 | 0 | 1 |

**Credit classes for 849**

**Like-for-like options**

| TEC | Trading group | HBT | Credits | IBRA region |
|---|---|---|---|---|
| Cumberland Plain Woodland in the Sydney Basin Bioregion | - | Yes | 1 | Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo.<br>or<br>Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site. |

# BAM Biodiversity Credit Report (Variations)

## Proposal Details

Assessment Id
00024108/BAAS18139/21/00024109

Proposal Name
Highland Views Stages 7-9

BAM data last updated *
29/03/2021

Assessor Name
Jacqueline Frances Coughlan

Assessor Number
BAAS18139

BAM Data version *
38

Proponent Name(s)

Report Created
21/04/2021

Assessment Type
Scattered Trees

Date Finalised
To be finalised

Assessment Revision
0

BAM Case Status
Open

BOS entry trigger
BOS Threshold: Biodiversity Values Map

* 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

Nil

## Additional Information for Approval

PCTs With Customized Benchmarks
No Changes

## Ecosystem Credit Summary

| PCT | TEC | HBT Cr | No HBT Cr | Credits |
|---|---|---|---|---|
| 849-Cumberland shale plains woodland | Cumberland Plain Woodland in the Sydney Basin Bioregion | 1 | 0 | 1 |

# BAM Biodiversity Credit Report (Variations)

| Credit classes for 849 | Like-for-like options | | | | |
|---|---|---|---|---|---|
| | TEC | Trading group | HBT | Credits | IBRA region |
| | Cumberland Plain Woodland in the Sydney Basin Bioregion | - | Yes | 1 | Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo.<br>or<br>Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site. |

# BAM Credit Summary Report

## Proposal Details

| | | |
|---|---|---|
| Assessment Id | Proposal Name | BAM data last updated * |
| 00024108/BAAS18139/21/00024109 | Highland Views Stages 7-9 | 29/03/2021 |
| Assessor Name | Report Created | BAM Data version * |
| Jacqueline Frances Coughlan | 21/04/2021 | 38 |
| Assessor Number | BAM Case Status | Date Finalised |
| BAAS18139 | Open | To be finalised |
| Assessment Revision | Assessment Type | BOS entry trigger |
| 0 | Scattered Trees | BOS Threshold: Biodiversity Values Map |

* 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.

## Scattered Trees Credit Requirement

| Class | Contains hollows | Number of trees | Ecosystem credits |
|---|---|---|---|
| **849-Cumberland shale plains woodland** | | | |
| 3 | True | 1.0 | 1 |
| | | | **1** |
| | | | **1** |

## Species credits for threatened species

Nil

# Biodiversity payment summary report

| Assessment Id | Payment data version | Assessment Revision | Report created |
|---|---|---|---|
| 00024108/BAAS18139/21/00024109 | | 0 | 21/04/2021 |

| Assessor Name | Assessor Number | Proposal Name | BAM Case Status |
|---|---|---|---|
| Jacqueline Frances Coughlan | BAAS18139 | Highland Views Stages 7-9 | Open |

| Assessment Type | Date Finalised | BOS entry trigger |
|---|---|---|
| Scattered Trees | To be finalised | BOS Threshold: Biodiversity Values Map |

## PCT list

| Include | PCT common name | Credits |
|---|---|---|
| Yes | **849 -** Cumberland shale plains woodland | 1 |

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

| IBRA sub region | PCT common name | Baseline price | Dynamic coefficient | Market coefficient | Risk premium | Administrative cost | Methodology adjustment factor | Price per credit | No. of ecosystem credits | Final credits price |
|---|---|---|---|---|---|---|---|---|---|---|
| Cumberland | **849 -** Cumberland shale plains woodland | $ 17,700.43 | 0.72141840 | 2.67146100 | 18.83% | $ 1,097.37 | 1.6350 | $ 33,697.42 | 1 | $33,697.42 |

| | |
|---|---|
| Subtotal (excl. GST) | **$33,697.42** |
| GST | **$3,369.74** |

# Biodiversity payment summary report

| | |
|---|---|
| **Total credits (incl. GST)** | **$37,067.16** |

# Appendix F – Anabat Report

Biodiversity Research Pty Ltd
trading as Biodiversity Monitoring Services
ACN 617 530 686

167 McKanes Falls Road
South Bowenfels, NSW 2790
E: andrew.lothian@biodiversitymonitoring.com.au
M: 0421 841 726

| Date | A.aus | C.gou | C.mor | Mi.aus | Mi.ori | Mo.nor | Mo.rid | Ny. spp. | Scote.ru | Scoto.or | V.vul | Total Passes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25/2/2021 | 2(1) | 4(1) | 0(0) | 0(0) | 0(0) | 0(0) | 0(0) | 1(0) | 0(0) | 0(0) | 0(0) | 7 |
| 26/2/2021 | 1(0) | 14(3) | 3(0) | 1(0) | 4(3) | 0(0) | 2(2) | 1(0) | 0(0) | 1(0) | 8(0) | 35 |
| 27/2/2021 | 0(0) | 26(3) | 2(0) | 1(0) | 1(0) | 0(0) | 8(4) | 2(1) | 0(0) | 0(0) | 3(0) | 43 |
| 28/2/2021 | 1(0) | 15(5) | 1(0) | 1(0) | 1(0) | 3(0) | 1(0) | 0(0) | 1(0) | 0(0) | 2(0) | 26 |
| 1/3/2021 | 4(2) | 21(3) | 0(0) | 0(0) | 5(2) | 0(0) | 1(0) | 0(0) | 0(0) | 0(0) | 1(0) | 32 |

The number of echolocation calls identified to a high level of confidence to a species are marked in brackets. Species codes explained below, those in bold are listed as threatened.

A.aus = *Austronomus australis* **C.dwy = *Chalinolobus dwyeri*** C.gou = *Chalinolobus gouldii* C.mor = *Chalinolobus morio* **F.ta = *Falsistrellus tasmaniensis***
**Mi.aus = Miniopterus australis** **Mi.ori = *Miniopterus orianae oceanensis*** **Mo.nor = *Mormopterus norfolkensis***
Mo.rid = *Mormopterus ridei* **My.ma = *Myotis macropus*** R.meg = *Rhinolophus megaphyllus* **Sa.fla = *Saccolaimus flaviventris***
Nyctophilus spp. = bats from the following three species which are difficult to distinguish based on call:
**N.cor = *Nyctophilus corbeni*** N.geo = *Nyctophilus geoffroyi* N.gou = *Nyctophilus gouldii*
**Scote.ru = *Scoteanax rueppellii*** Scoto.or = *Scotorepens orion* V.dar = *Vespadelus darlingtoni* V.reg = *Vespadelus regulus* V.vul = *Vespadelus vulturnus*

# Appendix G – Vegetation Plot Photos

| Plot | 1 | 2 |
|---|---|---|
| 1A CPW |  |  |

| | | |
|---|---|---|
| 2A Grassland 1 |  | |

| | | |
|---|---|---|
| 2B – Grassland 4 |  | |

# Appendix H – Protected Matters Search Tool (EPBC Act)

Australian Government

Department of Agriculture, Water and the Environment

# EPBC Act Protected Matters Report

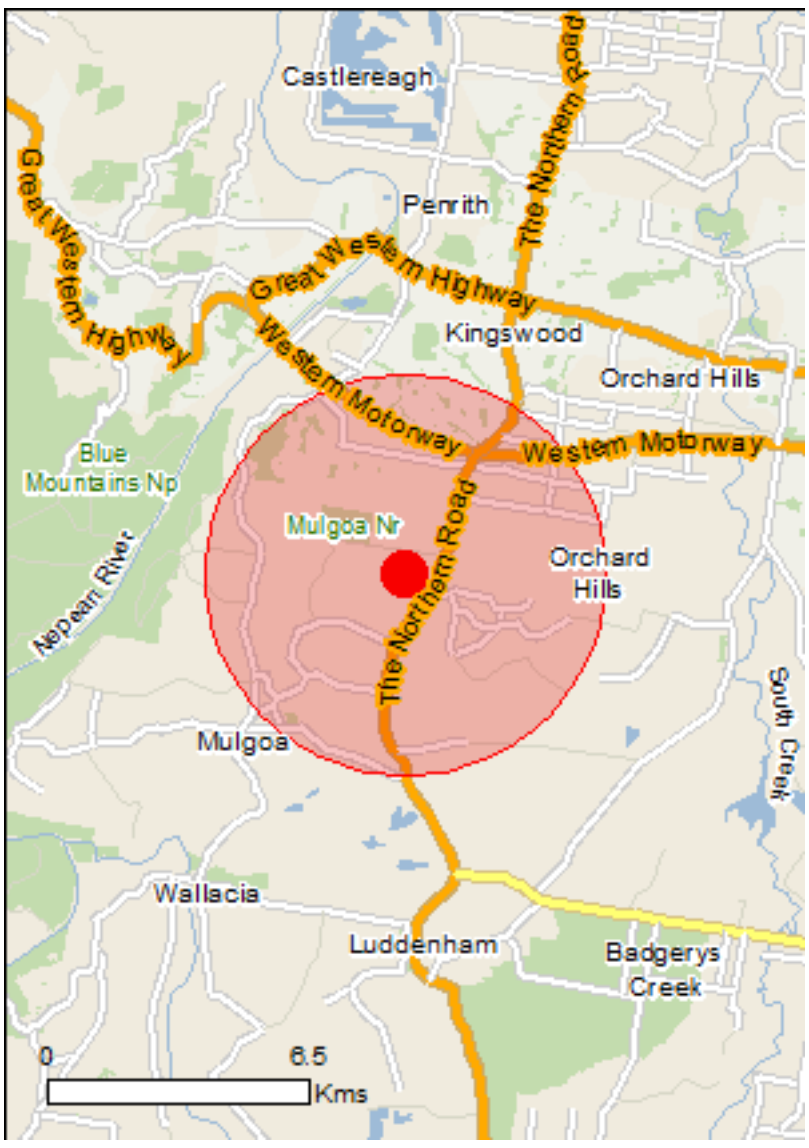
This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

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

Report created: 24/02/21 16:55:22

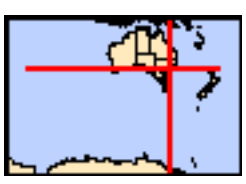





This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2015

Coordinates

Buffer: 5.0Km



# Summary

## Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

| | |
|---|---|
| World Heritage Properties: | 1 |
| National Heritage Places: | 1 |
| Wetlands of International Importance: | None |
| Great Barrier Reef Marine Park: | None |
| Commonwealth Marine Area: | None |
| Listed Threatened Ecological Communities: | 8 |
| Listed Threatened Species: | 42 |
| Listed Migratory Species: | 15 |

## Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

| | |
|---|---|
| Commonwealth Land: | 6 |
| Commonwealth Heritage Places: | 1 |
| Listed Marine Species: | 21 |
| Whales and Other Cetaceans: | None |
| Critical Habitats: | None |
| Commonwealth Reserves Terrestrial: | None |
| Australian Marine Parks: | None |

## Extra Information

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

| | |
|---|---|
| State and Territory Reserves: | 2 |
| Regional Forest Agreements: | None |
| Invasive Species: | 49 |
| Nationally Important Wetlands: | None |
| Key Ecological Features (Marine) | None |

# Details

## Matters of National Environmental Significance

| World Heritage Properties | | [ Resource Information ] |
|---|---|---|
| Name | State | Status |
| Greater Blue Mountains Area | NSW | Declared property |

| National Heritage Properties | | [ Resource Information ] |
|---|---|---|
| Name | State | Status |
| Natural | | |
| The Greater Blue Mountains Area | NSW | Listed place |

| Listed Threatened Ecological Communities | | [ Resource Information ] |
|---|---|---|

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

| Name | Status | Type of Presence |
|---|---|---|
| Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion | Endangered | Community may occur within area |
| Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community | Endangered | Community may occur within area |
| Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion | Critically Endangered | Community likely to occur within area |
| Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest | Critically Endangered | Community likely to occur within area |
| River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria | Critically Endangered | Community likely to occur within area |
| Shale Sandstone Transition Forest of the Sydney Basin Bioregion | Critically Endangered | Community likely to occur within area |
| Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion | Endangered | Community may occur within area |
| Western Sydney Dry Rainforest and Moist Woodland on Shale | Critically Endangered | Community likely to occur within area |

| Listed Threatened Species | | [ Resource Information ] |
|---|---|---|
| Name | Status | Type of Presence |
| Birds | | |
| Anthochaera phrygia<br>Regent Honeyeater [82338] | Critically Endangered | Foraging, feeding or related behaviour likely to occur within area |
| Botaurus poiciloptilus<br>Australasian Bittern [1001] | Endangered | Species or species habitat known to occur within area |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area |
| Falco hypoleucos<br>Grey Falcon [929] | Vulnerable | Species or species habitat likely to occur within area |
| Grantiella picta<br>Painted Honeyeater [470] | Vulnerable | Species or species habitat likely to occur within area |
| Hirundapus caudacutus<br>White-throated Needletail [682] | Vulnerable | Species or species habitat known to occur |

| Name | Status | Type of Presence within area |
|---|---|---|
| Lathamus discolor<br>Swift Parrot [744] | Critically Endangered | Species or species habitat known to occur within area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area |
| Rostratula australis<br>Australian Painted Snipe [77037] | Endangered | Species or species habitat likely to occur within area |
| **Fish** | | |
| Macquaria australasica<br>Macquarie Perch [66632] | Endangered | Species or species habitat may occur within area |
| Prototroctes maraena<br>Australian Grayling [26179] | Vulnerable | Species or species habitat may occur within area |
| **Frogs** | | |
| Heleioporus australiacus<br>Giant Burrowing Frog [1973] | Vulnerable | Species or species habitat likely to occur within area |
| Litoria aurea<br>Green and Golden Bell Frog [1870] | Vulnerable | Species or species habitat known to occur within area |
| **Mammals** | | |
| Chalinolobus dwyeri<br>Large-eared Pied Bat, Large Pied Bat [183] | Vulnerable | Species or species habitat known to occur within area |
| Dasyurus maculatus  maculatus (SE mainland population)<br>Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184] | Endangered | Species or species habitat likely to occur within area |
| Petauroides volans<br>Greater Glider [254] | Vulnerable | Species or species habitat likely to occur within area |
| Petrogale penicillata<br>Brush-tailed Rock-wallaby [225] | Vulnerable | Species or species habitat likely to occur within area |
| Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)<br>Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104] | Vulnerable | Species or species habitat known to occur within area |
| Pseudomys novaehollandiae<br>New Holland Mouse, Pookila [96] | Vulnerable | Species or species habitat may occur within area |
| Pteropus poliocephalus<br>Grey-headed Flying-fox [186] | Vulnerable | Foraging, feeding or related behaviour known to occur within area |
| **Other** | | |
| Pommerhelix duralensis<br>Dural Land Snail [85268] | Endangered | Species or species habitat likely to occur within area |
| **Plants** | | |
| Acacia bynoeana<br>Bynoe's Wattle, Tiny Wattle [8575] | Vulnerable | Species or species habitat may occur within area |
| Acacia pubescens<br>Downy Wattle, Hairy Stemmed Wattle [18800] | Vulnerable | Species or species |

| Name | Status | Type of Presence |
|---|---|---|
| | | habitat may occur within area |
| Allocasuarina glareicola [21932] | Endangered | Species or species habitat likely to occur within area |
| Cynanchum elegans White-flowered Wax Plant [12533] | Endangered | Species or species habitat likely to occur within area |
| Eucalyptus aggregata Black Gum [20890] | Vulnerable | Species or species habitat may occur within area |
| Eucalyptus benthamii Camden White Gum, Nepean River Gum [2821] | Vulnerable | Species or species habitat may occur within area |
| Genoplesium baueri Yellow Gnat-orchid, Bauer's Midge Orchid, Brittle Midge Orchid [7528] | Endangered | Species or species habitat may occur within area |
| Haloragis exalata subsp. exalata Wingless Raspwort, Square Raspwort [24636] | Vulnerable | Species or species habitat may occur within area |
| Melaleuca deanei Deane's Melaleuca [5818] | Vulnerable | Species or species habitat known to occur within area |
| Persicaria elatior Knotweed, Tall Knotweed [5831] | Vulnerable | Species or species habitat may occur within area |
| Persoonia hirsuta Hairy Geebung, Hairy Persoonia [19006] | Endangered | Species or species habitat likely to occur within area |
| Persoonia nutans Nodding Geebung [18119] | Endangered | Species or species habitat may occur within area |
| Pimelea spicata Spiked Rice-flower [20834] | Endangered | Species or species habitat known to occur within area |
| Pomaderris brunnea Rufous Pomaderris, Brown Pomaderris [16845] | Vulnerable | Species or species habitat likely to occur within area |
| Pterostylis saxicola Sydney Plains Greenhood [64537] | Endangered | Species or species habitat may occur within area |
| Pultenaea parviflora [19380] | Vulnerable | Species or species habitat known to occur within area |
| Rhizanthella slateri Eastern Underground Orchid [11768] | Endangered | Species or species habitat may occur within area |
| Rhodamnia rubescens Scrub Turpentine, Brown Malletwood [15763] | Critically Endangered | Species or species habitat may occur within area |
| Syzygium paniculatum Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307] | Vulnerable | Species or species habitat may occur within area |
| Thelymitra kangaloonica Kangaloon Sun Orchid [81861] | Critically Endangered | Species or species habitat may occur within |

| Name | Status | Type of Presence |
|---|---|---|
| | | area |
| Thesium australe | | |
| Austral Toadflax, Toadflax [15202] | Vulnerable | Species or species habitat may occur within area |

## Listed Migratory Species [ Resource Information ]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

| Name | Threatened | Type of Presence |
|---|---|---|
| **Migratory Marine Birds** | | |
| Apus pacificus | | |
| Fork-tailed Swift [678] | | Species or species habitat likely to occur within area |
| **Migratory Terrestrial Species** | | |
| Cuculus optatus | | |
| Oriental Cuckoo, Horsfield's Cuckoo [86651] | | Species or species habitat may occur within area |
| Hirundapus caudacutus | | |
| White-throated Needletail [682] | Vulnerable | Species or species habitat known to occur within area |
| Monarcha melanopsis | | |
| Black-faced Monarch [609] | | Species or species habitat known to occur within area |
| Motacilla flava | | |
| Yellow Wagtail [644] | | Species or species habitat may occur within area |
| Myiagra cyanoleuca | | |
| Satin Flycatcher [612] | | Species or species habitat known to occur within area |
| Rhipidura rufifrons | | |
| Rufous Fantail [592] | | Species or species habitat known to occur within area |
| **Migratory Wetlands Species** | | |
| Actitis hypoleucos | | |
| Common Sandpiper [59309] | | Species or species habitat may occur within area |
| Calidris acuminata | | |
| Sharp-tailed Sandpiper [874] | | Species or species habitat may occur within area |
| Calidris ferruginea | | |
| Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area |
| Calidris melanotos | | |
| Pectoral Sandpiper [858] | | Species or species habitat may occur within area |
| Gallinago hardwickii | | |
| Latham's Snipe, Japanese Snipe [863] | | Species or species habitat known to occur within area |
| Numenius madagascariensis | | |
| Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area |
| Pandion haliaetus | | |
| Osprey [952] | | Species or species habitat known to occur within area |
| Tringa nebularia | | |
| Common Greenshank, Greenshank [832] | | Species or species habitat likely to occur within area |

# Other Matters Protected by the EPBC Act

## Commonwealth Land [ Resource Information ]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

| Name |
|---|
| Commonwealth Land - |
| Commonwealth Land - Australian Telecommunications Commission |
| Commonwealth Land - Defence Housing Authority |
| Commonwealth Land - Defence Service Homes Corporation |
| Defence - 1CAD ORCHARD HILLS KINGSWOOD |
| Defence - RANMME (DEOH) |

## Commonwealth Heritage Places [ Resource Information ]

| Name | State | Status |
|---|---|---|
| Natural | | |
| Orchard Hills Cumberland Plain Woodland | NSW | Listed place |

## Listed Marine Species [ Resource Information ]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

| Name | Threatened | Type of Presence |
|---|---|---|
| Birds | | |
| Actitis hypoleucos<br>Common Sandpiper [59309] | | Species or species habitat may occur within area |
| Apus pacificus<br>Fork-tailed Swift [678] | | Species or species habitat likely to occur within area |
| Ardea alba<br>Great Egret, White Egret [59541] | | Species or species habitat known to occur within area |
| Ardea ibis<br>Cattle Egret [59542] | | Species or species habitat may occur within area |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | | Species or species habitat may occur within area |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area |
| Calidris melanotos<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area |
| Chrysococcyx osculans<br>Black-eared Cuckoo [705] | | Species or species habitat likely to occur within area |
| Gallinago hardwickii<br>Latham's Snipe, Japanese Snipe [863] | | Species or species habitat known to occur within area |
| Haliaeetus leucogaster<br>White-bellied Sea-Eagle [943] | | Species or species habitat known to occur within area |
| Hirundapus caudacutus<br>White-throated Needletail [682] | Vulnerable | Species or species habitat known to occur within area |
| Lathamus discolor<br>Swift Parrot [744] | Critically Endangered | Species or species habitat known to occur |

| Name | Threatened | Type of Presence |
|---|---|---|
| | | within area |
| Merops ornatus<br>Rainbow Bee-eater [670] | | Species or species habitat may occur within area |
| Monarcha melanopsis<br>Black-faced Monarch [609] | | Species or species habitat known to occur within area |
| Motacilla flava<br>Yellow Wagtail [644] | | Species or species habitat may occur within area |
| Myiagra cyanoleuca<br>Satin Flycatcher [612] | | Species or species habitat known to occur within area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area |
| Pandion haliaetus<br>Osprey [952] | | Species or species habitat known to occur within area |
| Rhipidura rufifrons<br>Rufous Fantail [592] | | Species or species habitat known to occur within area |
| Rostratula benghalensis (sensu lato)<br>Painted Snipe [889] | Endangered* | Species or species habitat likely to occur within area |
| Tringa nebularia<br>Common Greenshank, Greenshank [832] | | Species or species habitat likely to occur within area |

## Extra Information

| State and Territory Reserves | [ Resource Information ] |
|---|---|
| Name | State |
| Blue Mountains | NSW |
| Mulgoa | NSW |

| Invasive Species | [ Resource Information ] |
|---|---|

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

| Name | Status | Type of Presence |
|---|---|---|
| Birds | | |
| Acridotheres tristis<br>Common Myna, Indian Myna [387] | | Species or species habitat likely to occur within area |
| Alauda arvensis<br>Skylark [656] | | Species or species habitat likely to occur within area |

| Name | Status | Type of Presence |
|---|---|---|
| Anas platyrhynchos<br>Mallard [974] | | Species or species habitat likely to occur within area |
| Carduelis carduelis<br>European Goldfinch [403] | | Species or species habitat likely to occur within area |
| Carduelis chloris<br>European Greenfinch [404] | | Species or species habitat likely to occur within area |
| Columba livia<br>Rock Pigeon, Rock Dove, Domestic Pigeon [803] | | Species or species habitat likely to occur within area |
| Lonchura punctulata<br>Nutmeg Mannikin [399] | | Species or species habitat likely to occur within area |
| Passer domesticus<br>House Sparrow [405] | | Species or species habitat likely to occur within area |
| Passer montanus<br>Eurasian Tree Sparrow [406] | | Species or species habitat likely to occur within area |
| Pycnonotus jocosus<br>Red-whiskered Bulbul [631] | | Species or species habitat likely to occur within area |
| Streptopelia chinensis<br>Spotted Turtle-Dove [780] | | Species or species habitat likely to occur within area |
| Sturnus vulgaris<br>Common Starling [389] | | Species or species habitat likely to occur within area |
| Turdus merula<br>Common Blackbird, Eurasian Blackbird [596] | | Species or species habitat likely to occur within area |
| Frogs | | |
| Rhinella marina<br>Cane Toad [83218] | | Species or species habitat likely to occur within area |
| Mammals | | |
| Bos taurus<br>Domestic Cattle [16] | | Species or species habitat likely to occur within area |
| Canis lupus familiaris<br>Domestic Dog [82654] | | Species or species habitat likely to occur within area |
| Felis catus<br>Cat, House Cat, Domestic Cat [19] | | Species or species habitat likely to occur within area |
| Feral deer<br>Feral deer species in Australia [85733] | | Species or species habitat likely to occur within area |
| Lepus capensis<br>Brown Hare [127] | | Species or species habitat likely to occur within area |
| Mus musculus<br>House Mouse [120] | | Species or species habitat likely to occur |

| Name | Status | Type of Presence |
|---|---|---|
| | | within area |
| Oryctolagus cuniculus<br>Rabbit, European Rabbit [128] | | Species or species habitat likely to occur within area |
| Rattus norvegicus<br>Brown Rat, Norway Rat [83] | | Species or species habitat likely to occur within area |
| Rattus rattus<br>Black Rat, Ship Rat [84] | | Species or species habitat likely to occur within area |
| Vulpes vulpes<br>Red Fox, Fox [18] | | Species or species habitat likely to occur within area |
| **Plants** | | |
| Alternanthera philoxeroides<br>Alligator Weed [11620] | | Species or species habitat likely to occur within area |
| Anredera cordifolia<br>Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643] | | Species or species habitat likely to occur within area |
| Asparagus aethiopicus<br>Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425] | | Species or species habitat likely to occur within area |
| Asparagus asparagoides<br>Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473] | | Species or species habitat likely to occur within area |
| Cabomba caroliniana<br>Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171] | | Species or species habitat likely to occur within area |
| Chrysanthemoides monilifera<br>Bitou Bush, Boneseed [18983] | | Species or species habitat may occur within area |
| Chrysanthemoides monilifera subsp. monilifera<br>Boneseed [16905] | | Species or species habitat likely to occur within area |
| Cytisus scoparius<br>Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934] | | Species or species habitat likely to occur within area |
| Dolichandra unguis-cati<br>Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119] | | Species or species habitat likely to occur within area |
| Eichhornia crassipes<br>Water Hyacinth, Water Orchid, Nile Lily [13466] | | Species or species habitat likely to occur within area |
| Genista monspessulana<br>Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126] | | Species or species habitat likely to occur within area |
| Genista sp. X Genista monspessulana<br>Broom [67538] | | Species or species habitat may occur within area |
| Lantana camara<br>Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892] | | Species or species habitat likely to occur within area |
| Lycium ferocissimum<br>African Boxthorn, Boxthorn [19235] | | Species or species |

| Name | Status | Type of Presence |
|---|---|---|
| | | habitat likely to occur within area |
| Nassella neesiana<br>Chilean Needle grass [67699] | | Species or species habitat likely to occur within area |
| Nassella trichotoma<br>Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884] | | Species or species habitat likely to occur within area |
| Opuntia spp.<br>Prickly Pears [82753] | | Species or species habitat likely to occur within area |
| Pinus radiata<br>Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780] | | Species or species habitat may occur within area |
| Rubus fruticosus aggregate<br>Blackberry, European Blackberry [68406] | | Species or species habitat likely to occur within area |
| Sagittaria platyphylla<br>Delta Arrowhead, Arrowhead, Slender Arrowhead [68483] | | Species or species habitat likely to occur within area |
| Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii<br>Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497] | | Species or species habitat likely to occur within area |
| Salvinia molesta<br>Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665] | | Species or species habitat likely to occur within area |
| Senecio madagascariensis<br>Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624] | | Species or species habitat likely to occur within area |
| Ulex europaeus<br>Gorse, Furze [7693] | | Species or species habitat likely to occur within area |
| **Reptiles** | | |
| Hemidactylus frenatus<br>Asian House Gecko [1708] | | Species or species habitat likely to occur within area |

# Caveat

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

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

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

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc).  In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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

- migratory and
- marine

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

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

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

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

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

# Coordinates

-33.80859 150.68687

# Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

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-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

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Please feel free to provide feedback via the Contact Us page.


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