

# Streamline Biodiversity Development Assessment Report

For Hillsborough Indoor Stadium  
Hillsborough Road, Hillsborough, NSW



**Prepared for: Basketball Association Newcastle Ltd  
C/- Catalyst Project Consulting Pty Ltd**

**26 August 2021**

**BOAMS Ref: 00027482/BAAS18147/21/00027483**

**AEP Ref: 2078.01**

**Revision: 02**

## Document Control

<b>Document Name</b>	Streamline Biodiversity Development Assessment Report for Proposed Development at 62 & 62a Hillsborough Road, Hillsborough and 109-117 Waratah Avenue, Charlestown NSW within lands identified as Lots 11 & 12 DP 879281, Hillsborough and Lots 6, 7 & 8 DP 9594, Charlestown.
<b>Project Number</b>	2078.01
<b>Client Name</b>	Catalyst Project Consulting Pty Ltd on behalf of Basketball Association Newcastle Ltd.
<b>Certifying Accredited Assessor</b>	Natalie Black (BAAS 19076)
<b>AEP Staff</b>	Stevie Kay Joe May (BAAS 18060) Natalie Black (BAAS 19076) Tim Mouton (BAAS 19083) Frances O'Brien (BAAS 20013) Bonni Yare

## Revision

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Draft	29/01/2021	Natalie Black	AEP	Draft
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Rev 01	09/02/2021	Natalie Black	AEP	Rev 01
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## Distribution

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00	28/06/2021	Nick Whitton	Catalyst
01	09/02/2021	Nick Whitton	Catalyst
02	26/08/2021	Kris Leck	Catalyst

## EXECUTIVE SUMMARY

Anderson Environment & Planning (AEP) was commissioned by Catalyst Project Consulting on behalf of Basketball Association Newcastle Ltd. to undertake a Streamlined Biodiversity Development Assessment Report (SBDAR) for a proposed Indoor Stadium development on Lots 11 & 12 DP879281 and Lots 6,7 & 8 DP9594, Hillsborough Road, Hillsborough NSW.

This report has been prepared to meet the requirements of the Biodiversity Assessment Method 2020 (BAM) established under Section 6.7 of the NSW Biodiversity Conservation Act 2016. This assessment utilises methods detailed within the BAM Order 2017 to identify biodiversity values inherent within the site, including known and potentially occurring threatened species and ecological communities, and quantifies impacts of the proposal upon these values under a streamlined assessment (small area).

The Subject Site is located 10 km south-west of the Newcastle CBD in the Lake Macquarie City Council LGA and within the Sydney Basin Bioregion and Wyong IBRA sub-region. In addition to existing cleared lands, the Subject Site contains PCT 1568 *Blackbutt – Turpentine – Sydney Blue Gum mesic tall open forest on ranges of the Central Coast* Poor Condition and PCT 1627 *Smooth-barked Apple – Swamp Mahogany – Red Mahogany – Cabbage Palm open forest on lowlands of the Central Coast*, both in degraded condition. The Subject Site also contains a cleared grassland public reserve bordered by a fence line which covers approximately 3.1 ha and is dominated by grasses, comprising mostly introduced species and exotics.

The development would remove or modify approximately 0.33ha of disturbed vegetation commensurate with PCT 1568 *Blackbutt – Turpentine – Sydney Blue Gum mesic tall open forest on ranges of the Central Coast*.

Fauna species recorded were typical of those expected in this locality, particularly due to the degraded nature of the habitat with existing connection to larger patches of habitat offsite. One threatened species, namely a Powerful Owl (*Ninox strenua*) was recorded within the Subject Site, however no suitable hollows were identified for nesting within the Subject Site.

To offset residual impacts of the proposal upon identified biodiversity values, the proposal would require retirement of a total of 6 x PCT 1568 Ecosystem Credits (or equivalent) with no Species Credits.

Assessment of potential Serious and Irreversible Impact (SAIL) candidates was carried out against SAIL criteria. As a result, it was considered that no SAIL are likely to occur as a result of the proposal due to the small size of the area, degraded condition, and current level of vegetation community fragmentation in the locality.

Avoid and minimise has been effectively considered during this assessment, whereby the location of the proposed works is designed to occur primarily within existing cleared areas. Numerous access options have been investigated with the current access option being the only available access solution for the development. Further site specific avoid and minimise measures are provided within this report.

Assessment of the proposal under other relevant environmental policy instruments including the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and *State Environmental Planning Policy (Koala Habitat Protection) 2020* are also included.

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## Study Certification and Licensing

The fieldwork undertaken was undertaken by Tim Mouton BEnvSc MEnvSc (BAAS no. 19083), Stevie Kay BSc, Natalie Black BSc (Hons), MPL & Cert IV TAE & MSc (BAAS no. 19076), Bonni Yarre B.Sc, Frances O'Brien BEnv LLB, GDPL, MEL (BAAS: 20013) and Ian Simpson B.Sc. This report was written by Chris Wark B.Sc of Anderson Environment & Planning and reviewed and certified by Natalie Black BSc (Hons), MPL & Cert IV TAE & MSc (BAAS no. 19076).

Research was conducted under the following licences:

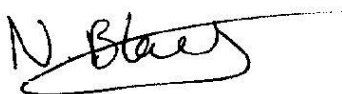
- NSW National Parks and Wildlife Service Scientific Investigation Licence SL101313;
- Animal Research Authority (Trim File No: 14/600(2)) issued by NSW Agriculture; and
- Animal Research Establishment Accreditation Number 53724.

### Certification:

As the principal author, I, Natalie Black, make the following certification:

- This report has been written to comply with the requirements of the BAM 2020 and obligations outlined within the BAM Assessor Code of Conduct and includes, in the opinion of the writer, a true and accurate account of the species recorded, or considered likely to occur within the Survey Area, and inferences of such for biodiversity credit calculations;
- BAM Assessment methodology, as well as Commonwealth, state and local government policies and guidelines formed the basis of project surveying methodology, unless specified departures from industry standard guidelines are justified for scientific and/or animal ethics reasons;
- All research workers have complied with relevant laws and codes relating to the conduct of flora and fauna research, including the *Animal Research Act 1995*, *National Parks and Wildlife Act 1974* and the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes.

Principal Author and Certifier:



**Natalie Black**

**Senior Environmental Manager**

**Anderson Environment & Planning**

**BAAS no. 19076**

**BOAMS Ref: 00027482/BAAS18147/21/00027483**

**26 August 2021**

## Glossary of Terms

<b>APZ</b>	Asset Protection Zone
<b>BAM</b>	<i>Biodiversity Assessment Method Order</i> (2020) that determines: <ul style="list-style-type: none"> <li>• Methodology applicable to quantifying biodiversity values inherent within a development site;</li> <li>• Avoid and minimise efforts required to be employed as part of any development proposal; and</li> <li>• Number and class of credits required to offset residual impacts of the proposal upon the biodiversity values therein.</li> </ul>
<b>BC Act</b>	The NSW <i>Biodiversity Conservation Act</i> 2016.
<b>Biodiversity Credit Report</b>	Specifies the number and type of biodiversity credits required to offset the impacts of a development.
<b>BAM Calculator (BAM-C)</b>	The online tool used to interpret site survey data and regional location information to quantify ecosystem and species credits required / generated at a development / stewardship site.
<b>Biodiversity credits</b>	Ecosystem or Species Credits required to offset the loss of biodiversity values on a development site.
<b>Biodiversity offsets</b>	Specific measures that are put in place to compensate for impacts on biodiversity values.
<b>Biodiversity values</b>	The composition, structure and function of ecosystems, and threatened species, populations and ecological communities, and their habitats.
<b>Council</b>	Lake Macquarie City Council.
<b>Development Lands</b>	Land upon which the development is proposed, and within which impacts upon biodiversity are required to be offset.
<b>DoEE</b>	The Commonwealth Department of the Environment and Energy.
<b>DPI</b>	The NSW Department of Primary Industries.
<b>DPIE</b>	The NSW Department of Planning, Industry and Environment.
<b>Ecosystem credit</b>	The class of biodiversity credits created or required for the impact on EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur within a vegetation type.
<b>EEC</b>	Endangered Ecological Community (under BC Act).
<b>EPBC Act</b>	The Commonwealth <i>Environment Protection and Biodiversity Conservation Act</i> 1999.
<b>OEH</b>	The former NSW Office of Environment and Heritage.
<b>PFC</b>	Percentage Foliage Cover

<b>SEWPaC</b>	The former Department of Sustainability Environment Water Populations and Communities, now the Commonwealth Department of the Environment.
<b>Subject Site</b>	As shown in <b>Figure 1</b> .
<b>Species credit</b>	Class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area based on habitat surrogates.
<b>TBDC</b>	Threatened Biodiversity Data Collection
<b>TEC</b>	Threatened Ecological Community
<b>TSPD</b>	Threatened Species Profile Database

## 1.0 Stage 1 – Biodiversity Assessment

### 1.1 Introduction

The proposed development is a new indoor facility (Hillsborough Indoor Stadium) comprising 10 full size basketball courts, including a show court with the capacity for 4000 people. There are two proposed accessways to the proposed development. Located within lands identified as Lots 11 & 12 DP 879281, Hillsborough and Lots 6, 7 & 8 DP 9594, Charlestown, the works are proposed to occur primarily within existing clearings however, approximately 0.33ha of remnant native vegetation is expected to be removed, including an area to allow access to the site.

At the request of Catalyst Project Consulting on behalf of Basketball Association Newcastle Ltd (the client), Anderson Environment & Planning (AEP) have undertaken the necessary investigations to inform the production of a Streamlined Biodiversity Development Assessment Report (SBDAR) addressing the proposed development.

#### 1.1.1 Assessment Scope

The SBDAR presented herewith aims to quantify impacts of the proposal upon biodiversity values based upon the methods described within the Biodiversity Assessment Method Order 2020 (BAM), including threatened entities listed under the NSW Biodiversity Conservation Act 2016 (BC Act).

This report includes:

- **Stage 1 – Biodiversity Assessment** – including the mapping of remnant vegetation communities including Endangered Ecological Communities (EECs) within the site, the location of previously identified threatened species and their habitats, and potential contemporary occurrence of threatened species identified within the BAM Calculator
- **Stage 2 – Impact Assessment** – identification of impact avoidance and mitigation measures, and the quantifying of offset requirements in the form of biodiversity credits based upon residual impacts of the proposal.

The area clearing threshold applicable to the Subject Site is 0.25ha. As mentioned further in this report, native vegetation covers approx. 1.28ha. The applicable threshold for the Streamlined Assessment Module for Small Areas of the BAM is 1ha. Therefore, the extent of proposed native vegetation clearing is under the 1ha, and as such, the assessment was undertaken as per the Streamlined Assessment Module for Small Areas of the BAM, and a Streamlined BDAR (SBDAR) was produced.

Under the Streamlined Assessment Module for Small Areas, only candidate threatened species defined in the related BAM Calculator as being potentially at risk of a Serious and Irreversible Impact (SAIL) are required to be surveyed. The concept of SAIL is explained further in this report.

Furthermore, should any other threatened species be noted as occurring on site incidentally or through other survey methods, then they should be added as present in the BAM Calculator, thus generating species credits if their habitat is likely to be impacted.

#### 1.1.2 The Proposal

The Study Area occurs within the Lake Macquarie City Council LGA. The proposed development is a new indoor facility, Hillsborough Indoor Stadium, comprising 10 full size basketball courts, including a show court with the capacity for 4000 people. Access to the site would be from the east off Waratah Avenue. Works are to primarily occur within existing clearings however, approximately 0.33 ha of remnant native vegetation is expected to be removed.

The majority of the Subject Site is currently zoned RE1 – ‘Public Recreation’, with a small area zoned E2 – ‘Environmental Conservation’. The Study Area is shown in the context of broader development plans in **Appendix A**.

### 1.1.3 Site Particulars

- **Address** – 62 & 62a Hillsborough Road, Hillsborough and 109-117 Waratah Avenue, Charlestown, NSW.
- **Title** – The site comprises Lots 11 & 12 DP 879281 and Lots 6,7 & 8 DP 9594.
- **LGA** – Lake Macquarie City Council LGA.
- **Subject Site** – The proposed development will cover a footprint of approximately 3.6ha, including approximately 0.33ha of remnant vegetation.
- **Zoning** – As per LMCC LEP 2014, the site is zoned RE1 – ‘Public Recreation’ and E2 – ‘Environmental Conservation’
- **Current Land Use** – The site contains existing open space managed as a public reserve, remnant native vegetation, Winding Creek and adjoining tributary and scattered trees. It is bounded by Newcastle Inner City Bypass to the west, Hillsborough Road and Hillsborough Public School to the north, Waratah Road to the east, and land zoned E2 – ‘Environmental Conservation’ to the south. A residential dwelling is located on the south eastern boundary of the site, with driveway access to Waratah Road.
- **Surrounding Land Use** – The surrounding area has a range of zonings. To the immediate west is the Newcastle Inner City Bypass and lots zoned E2, RE1, RU4 – ‘Primary Production Small Lots’, and RE2 – ‘Private Recreation’. To the north is the junction of Hillsborough Road and Newcastle Inner City Bypass followed by lots zoned RE1 and R2 – ‘Low Density Residential’ and Hillsborough Public School. To the east is the suburb of Charlestown predominantly zoned R2 with patches of E3 – ‘Environmental Management’ and RE1 zoning. To the immediate south is vegetated land zoned E2, as well as lots zoned R2 and RE2.

**Figure 1** depicts the extent of the site and defines the Subject Site.

**Figure 2** depicts the location of the site within the landscape.



### 1.1.4 Information Sources

Information and spatial data provided within this SBDAR has been compiled from various sources including:

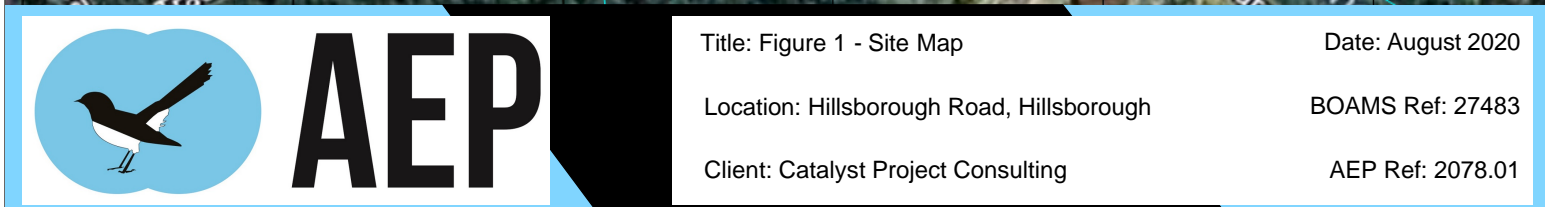
- Aerial Photograph Interpretation (API) of the site and surrounding locality (Google 2019);
- Volume 2: Vegetation Community Profiles, Lake Macquarie Community Profiles, Lake Macquarie Local Government Area. Working Draft v2. Unpublished Report to Lake Macquarie City Council. March 2016. Eastcoast Flora Survey.
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities. Working Draft, November 2004.
- Lower Hunter & Central Coast Regional Environmental Management Strategy Extant Vegetation Map (LHCCREMS 2003);
- *NSW Guide to Surveying Threatened Plants*, NSW Office of Environment and Heritage (2016);
- Survey Guidelines for Australia's Threatened Orchids: Guidelines for detecting orchids listed as threatened under the EPBC Act 1999, DoE (2014);
- OEH Threatened Biodiversity Profiles  
(<https://www.environment.nsw.gov.au/threatenedSpeciesApp/>);
- PlantNET NSW (<http://plantnet.rbgsyd.nsw.gov.au/>);
- Anecdotal records.

In addition, database searches were carried out, namely:

- Review of flora and fauna records held by the NSW Office of Environment & Heritage (OEH) Atlas of NSW Wildlife within a 10km radius of the site (April 2020); and
- Review of flora and fauna records held by the Commonwealth Department of Energy and Environment (DoEE) Protected Matters Search within a 5km radius of the site (April 2020).



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## 1.2 Landscape Features

### 1.2.1 Regional Landscapes

The Subject Site was identified as occurring within the following landscape areas:

- *IBRA Bioregion* – Sydney Basin.
- *IBRA Subregion* – Wyong.
- *NSW Landscape* – Gosford-Cooranbong Coastal Slopes. Sydney-Newcastle Coastal Alluvial Plains is located west of the Subject Site. Delineation of *NSW Landscape* areas are shown in the Location Map (**Figure 2**).

### 1.2.2 Identified Landscape Features

The Calculator identifies nine (9) landscape features that require assessment for their relevance to the site. These features include:

- **Rivers and Streams:** The southern and western extent of Study Area contains a tributary called 'Winding Creek' (**Figure 1**).
- **Wetlands:** No mapped wetlands (Coastal Management SEPP or otherwise) occur within the site.
- **Native Vegetation Extent:** Approximately 3.67ha of native vegetation occurs in the Site, of which 0.33ha is to be impacted. A breakdown of the vegetation classes is provided in **Section 1.3** (refer to **Figure 5**).
- **Connectivity Features:** The site is bounded by vegetation to the east and north-east. Development of the site will not significantly impact connectivity through the locality.
- **Karst, Caves, Crevices, Cliffs, Rock and other Geological Features of Significance:** There are no identified karst, caves, crevices, cliffs, rock and other geological features of significance within the study area.
- **NSW Landscapes: Gosford-Cooranbong Coastal Slopes.** Sydney-Newcastle Coastal Alluvial Plains is located west of the Subject Site. Delineation of *NSW Landscape* areas are shown in the Location Map (**Figure 2**).
- **Soil hazard features:** None known on site.
- **Features identified in SEARs for major projects:** Proposal is not a major project.
- **Areas of Outstanding Biodiversity Value (AOBV) under the BC Act:** No AOBV are present on the Subject Site.

### **1.2.3 Site Context Components**

#### **1.2.3.1 Method**

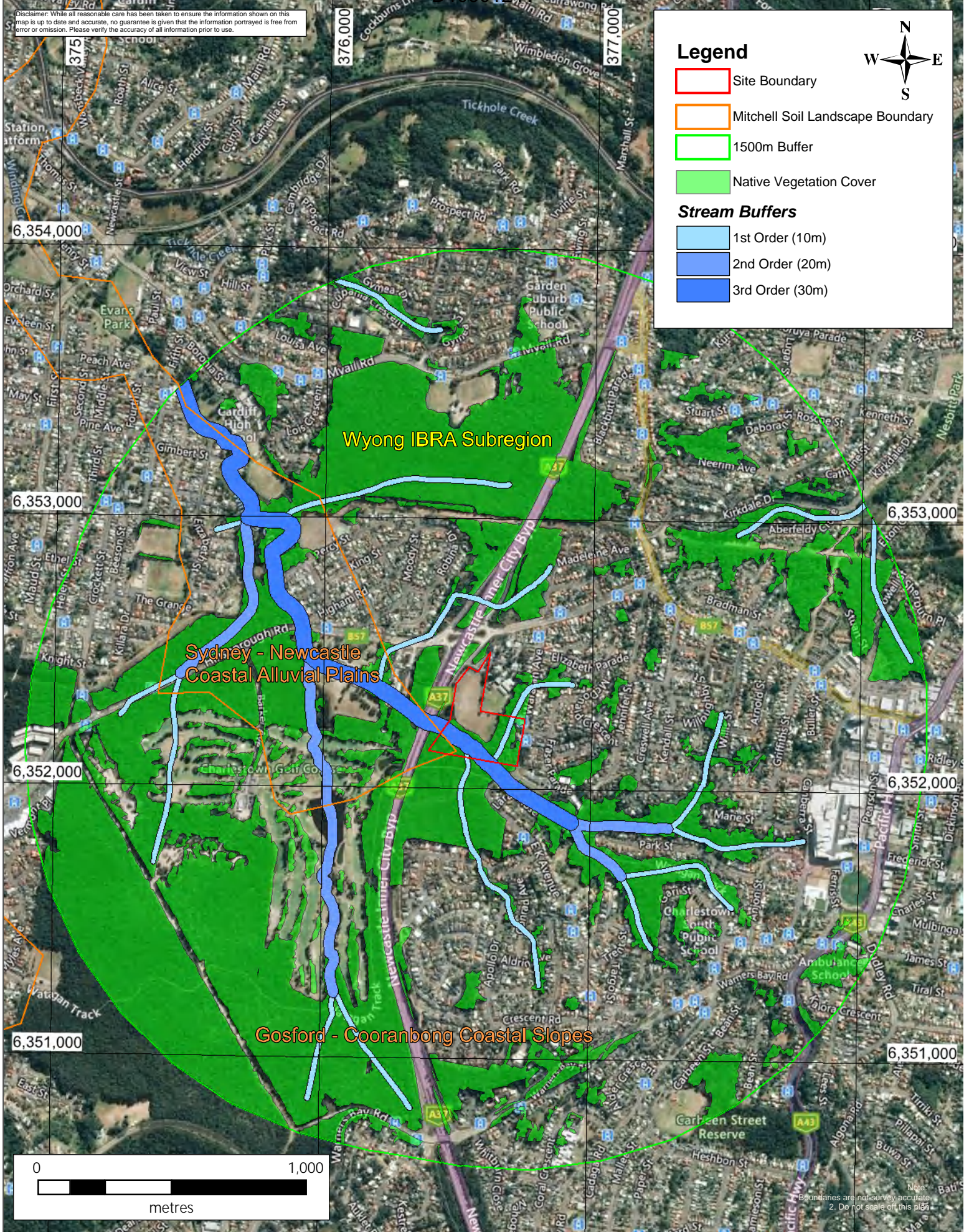
Site layout allowed for the landscape values to be determined based upon a site-based method, rather than that of a linear method.

#### **1.2.3.2 Landscape Native Vegetation Cover**

In accordance with Section 3.1.2, 3.2 and 43.2 of the BAM a 1500m was buffer placed around the site, totalling approx. 898ha. Of this, approximately 320.8 ha comprises native vegetation as per Section 4.3.2 of the BAM (**Figure 3**). This equates to approximately **35.7 %** native vegetation cover and was entered as such within the Calculator.



Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.



# AEP

Title: Figure 2 - Location Map Location:

Date: Aug 2020

Hillsborough Rd, Hillsborough Client:

BOAMs Ref: 27483

Catalyst Project Consulting

AEP Ref: 2078.01



## 1.3 Native Vegetation

### 1.3.1 Regional Mapping

Preliminary vegetation mapping has been produced for the site. This has been achieved by adoption and subsequent updating and refinement of LMCC Vegetation Community Mapping (2016) via field inspection and Aerial Photograph Interpretation (API). The communities mapped within the site for the dataset is provided in **Table 1** below and can be seen in **Figure 3**.

**Table 1- Regional Vegetation Mapping Results**

Vegetation Community	Area (ha) (Bell, 2013)
Alluvial Tall Moist Forest (MU5)	1.525
Coastal Sheltered Apple – Peppermint Forest (MU11)	1.635
Coastal Plains Stringybark – Apple Forest (MU30e)	0.514
Cleared/Highly disturbed	3.126
<b>Total</b>	<b>6.8</b>

\* Includes non-descript regenerating native vegetation, non-remnant vegetation, agricultural / cleared / unmapped areas/etc.



Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

## Legend

 Site Boundary

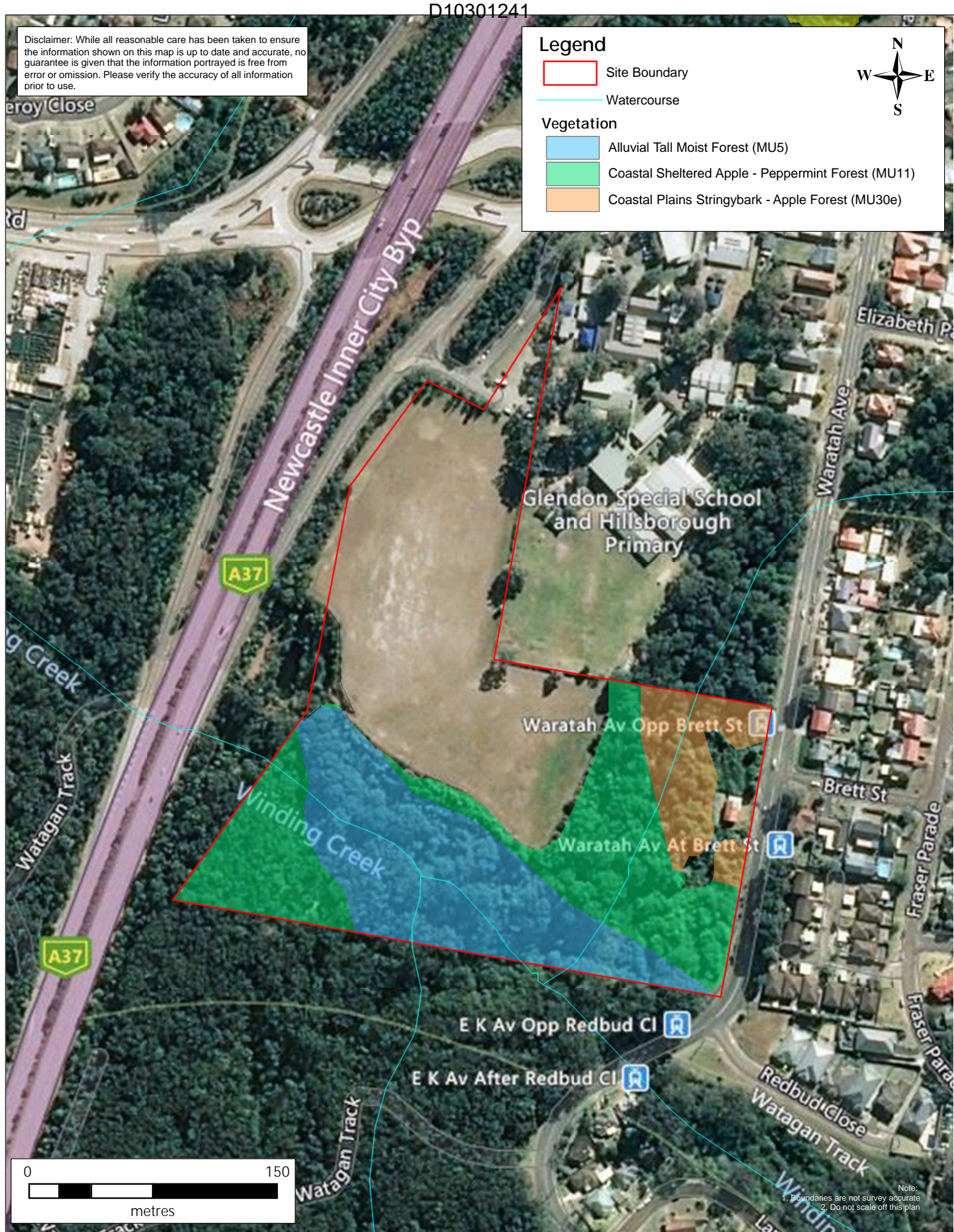
 Watercourse

## Vegetation

 Alluvial Tall Moist Forest (MU5)

 Coastal Sheltered Apple - Peppermint Forest (MU11)

 Coastal Plains Stringybark - Apple Forest (MU30e)



# AEP

Title: Figure 3 - Regional Vegetation Map

Location: Hillsborough Road, Hillsborough

Client: Catalyst Project Consulting

Date: August 2020

BOAMS Ref: 27483

AEP Ref: 2078.01



### 1.3.2 Flora Field Survey Results

Flora surveys were undertaken by AEP in February 2020, April, 2020, June 2020, August 2020 and January 2021, to produce a flora species list for the Study Area, to search specifically for threatened flora and fauna species known from the wider area, and to gather data necessary to both derive vegetation community type(s) and to meet relevant survey guidelines. Such works included:

- Identification of all vascular plant species encountered during fieldwork. Subject site coverage was both systematic to ensure all key points of the subject site were checked, and parallel transects were utilised to maximise species encountered.
- Four (4) BAM plots were undertaken within the Subject Site. This is in excess of BAM requirements (refer to **Figure 5**). A summary of plot data is provided in **Appendix D**.
- A full list of all flora species recorded by AEP within the Subject Site and surrounds is included as **Appendix B**.
- Targeted threatened species surveys were carried out in the case where a potential Serious and Irreversible Impact (SAIL) was deemed likely to occur on site, as per the specific requirements of the streamlined assessment module of the BAM (2020). If a threatened species was identified incidentally during other surveys, then such species was added to the assessment. Targeted flora survey tracks are shown in **Figure 6**.

#### 1.3.2.1 Plant Community Types (PCTs)

The native vegetation within the Subject Site contains and replanted areas in the south west with the remaining native vegetation being disturbed remnant, being predominantly canopy species with highly weed infested shrub and ground covers. with a sparse and managed shrub and ground layer. The remaining area within the Study Area contains maintain land (exotic grassland) in the form of an oval that has highly compacted soils due to previous land uses such as Pony Club. and as such it is not considered to meet the criteria of the scientific determination for PCTs identified hereafter.

Regional mapping requires ground-truthing at a Subject Site level to refine the vegetation assessment herein. As is often the case in such situations, finer ground-truthing may reveal that regional mapping is inaccurate. In the case of the Subject Site, field survey carried out by AEP from February 2020 to January 2021 identified two (2) native vegetation communities within the Subject Site, being

- PCT 1568 *Blackbutt – Turpentine – Sydney Blue Gum mesic tall open forest on ranges of the Central Coast*, within the Subject Site (development footprint). This community is not associated with a listed Threatened Ecological Community (TEC); and
- PCT 1627 *Smooth-barked Apple – Swamp Mahogany – Red Mahogany – Cabbage Palm open forest on lowlands of the Central Coast* is also present within the Study Area, though not within the development footprint. No further assessment of this PCT was undertaken.

The extent of the vegetation within the Subject Site and Study Area is shown in **Figure 5**. The flora list is included in **Appendix B** and the BAM Field Sheets are included in **Appendix D**.

The site condition is considered to be quite disturbed with tracks and a high weed load. Weeds were observed to be dominant shrub and ground layers, which densely covered the Study Area and Subject Site. Several priority weeds and environmental weeds species are present, which are typical of disturbed remnants within the Lake Macquarie region, being Lantana, small leaved privet and Bitou Bush. There is also evidence of scattered rubbish dumping, walking and bike tracks through the vegetated areas. Also, sightings of unleashed domestic dogs.

### 1.3.3 PCT Selection Justification

Analysis of the fieldwork and Vegetation Information System (VIS) classification system was undertaken to determine the PCT for the native vegetation within the Subject Site. **Table 2** show the analysis of the online VIS database for the characteristics of PCT 1568.

Diagnostic species recorded on site during fieldwork supporting the determination of PCTs are shown in **Table 2**. Additional site photographs are included in **Appendix F**.

**Table 2 - PCT Determination**

Search Item	Plot 1	Plot 2	Plot 3	Plot 4
IBRA Region	Sydney Basin	Sydney Basin	Sydney Basin	Sydney Basin
IBRA Subregion	Wyong	Wyong	Wyong	Wyong
Native Upper Stratum Species	<i>Eucalyptus saligna</i> and <i>Eucalyptus globoidea</i>	None present	<i>Eucalyptus robusta</i> , <i>Syncarpia glomulifera</i> ,	<i>Glochidion ferdinandi</i> var. <i>ferdinandi</i>
Native Mid Stratum Species	<i>Callistemon salignus</i> , <i>Glochidion ferdinandi</i> , <i>Pittosporum undulatum</i> and <i>Polyscias sambucifolia</i> .	<i>Dodonaea triquetra</i> , <i>Acacia longifolia</i> , <i>Callistemon salignus</i> , <i>Glochidion ferdinandi</i> , <i>Melaleuca nodosa</i> , <i>Leptospermum continentale</i> and <i>Acacia falcata</i> .	<i>Elaeocarpus reticulatus</i> , <i>Breynia oblongifolia</i> , <i>Acacia irrorata</i> subsp. <i>irrorate</i> , <i>Pittosporum undulatum</i> , <i>Zieria smithii</i> , <i>Dodonaea triquetra</i>	<i>Pittosporum undulatum</i>
Native Lower Stratum Species	<i>Pseuderanthemum variabile</i> , <i>Adiantum aethiopicum</i> ., <i>Pandorea pandorana</i> , <i>Pteridium esculentum</i> , <i>Lobelia purpurascens</i> , <i>Lomandra longifolia</i> , <i>Geitonoplesium cymosum</i> , <i>Oxalis perrenans</i> , <i>Dianella caerulea</i> var. <i>producta</i> , <i>Entolasia marginate</i> , <i>Entolasia stricta</i> , <i>Imperata cylindrica</i> , <i>Microlaena stipoides</i> , <i>Oplismenus imbecillis</i> , <i>Themeda triandra</i>	<i>Pandorea pandorana</i> , <i>Pteridium esculentum</i> , <i>Hardenbergia violacea</i> , <i>Juncus usitatus</i> , <i>Lobelia purpurascens</i> , <i>Lomandra longifolia</i> , <i>Oxalis perrenans</i> , <i>Dianella caerulea</i> var. <i>producta</i> , <i>Cynodon dactylon</i> , <i>Entolasia stricta</i> , <i>Imperata cylindrica</i> , <i>Oplismenus imbecillis</i> , <i>Themeda triandra</i>	<i>Pseuderanthemum variabile</i> , <i>Adiantum aethiopicum</i> , <i>Pandorea pandorana</i> subsp. <i>pandorana</i> , <i>Commelina cyaneal</i> , <i>Hibbertia scandens</i> , <i>Desmodium varians</i> , <i>Hardenbergia violacea</i> , <i>Lomandra longifolia</i> , <i>Oxalis perrenans</i> , <i>Oplismenus imbecillis</i> , <i>Xanthorrhoea</i> sp.	<i>Cyperus</i> sp., <i>Pteridium esculentum</i> , <i>Calochlaena dubia</i> , <i>Juncus</i> sp., <i>Nephrolepis exaltata</i> , <i>Cynodon dactylon</i> , <i>Oplismenus aemulus</i>
Result		1568		
Vegetation Formation		Wet Sclerophyll Forests (Shrubby Sub-formation)		

Search Item	Plot 1	Plot 2	Plot 3	Plot 4
Vegetation Class	North Coast Wet Sclerophyll Forests			
Estimate cleared value of PCT (%)	40			
Associated TEC	None			

Analysis of the floristic composition and landscape position of plots in the community (Plots 1 - 4 as per **Table 2**) against the Vegetation Information System (VIS) classification system did not provide a conclusive identification of a PCT.

In the absence of such, analysis of local regional mapping was undertaken against field data that was collected. According to LMCC (2016), native vegetation within the site was identified as three different MU types:

- MU5 – Alluvial Tall Moist Forest;
- MU11 – Coastal Sheltered Apple – Peppermint Forest; and
- MU30e – Coastal Plains Stringybark – Apple Forest.

Of the three separate MUs identified from LMCC (2016) mapping, only MU5 was found to occur following RDP surveys.

This vegetation community is present in a degraded condition. The canopy layer is comprised of *Eucalyptus saligna*, *Eucalyptus globoidea* and *Syncarpia glommulifera*. Where present, the shrub layer consists of scattered diagnostic species *Glochidion ferdinandi* var. *ferdinandi*, *Callistemon salignus*, *Acacia irrorata* subsp. *irrorata* and *Polyscias sambucifolia*, but is otherwise dominated by weed species including *Ligustrum sinense* and *Lantana camara*. The groundcover contains a suite of exotic species as a result of the disturbed nature of the site. However, native species such as *Lomandra longifolia*, *Dianella caerulea* var. *assera*, *Adiantum aethiopicum*, *Pteridium esculentum*, *Oplismenus imbecillis*, *Microlaena stipoides* var. *stipoides*, *Entolasia marginata* and *Imperata cylindrica* are found throughout the site.

### 1.3.3.1 PCT Consideration

Given the above results the following PCT were also assessed:

PCT 1915 – Coastal flats tall moist forest. Species making up this PCT include: *Eucalyptus saligna*, *Syncarpia glomulifera*, *Eucalyptus botryoides*, *Eucalyptus pilularis*, *Angophora floribunda*, *Angophora costata*, *Acmena smithii*, *Glochidion ferdinandii*, *Livistonia australis*, *Backhousia myrtifolia*, *Melaleuca linarifolia*, *Melaleuca styphelioides*, *Blechnum cartilagineum* and *Calochlaena dubia*. The tree layer within this PCT, whilst displaying similarities, is not reflective of the community on site and the overall composition was considered to be more closely matched to PCT 1568. Therefore, PCT 1636 was ruled out.

PCT 1564 – Blackbutt – Rough-barked Apple – Turpentine – ferny tall open forest of the Central Coast. Species making up this PCT include: *Syncarpia glomulifera*, *Angophora costata*, *Eucalyptus Pilularis*, *Angophora floribunda*, *Glochidion ferdinandii*, *Calochlaena dubia*, *Doodea aspera*, *Adiantum aethiopicum*, *Pseuderanthemum variable*, *Entolasia stricta* and *Lomandra longifolia*. The vegetation on site had similarities to this community, though contained a dominance of *Eucalyptus saligna*, which is not present in PCT 1564. Thus surrounding vegetation was more closely matched to PCT 1568. Therefore, PCT 1564 was ruled out.

Based on the information available, the most suitable PCT for the Subject Site was determined to be *Blackbutt – Turpentine – Sydney Blue Gum mesic tall open forest on ranges of the Central Coast* (PCT 1568).

PCT 1568 is mapped in **Figure 5**.

### 1.3.3.2 Patch Size

The native vegetation that exists within the Site is connected to vegetation to the south and west which, as defined by the BAM, extends as a patch for more than 100ha. As such, a patch size of “101” was entered into the BAM-C.

### 1.3.3.3 Vegetation Zones

As previously stated, PCT 1568 is present in very low condition with mostly only canopy and occasional native shrubs and groundcovers. Overall, this vegetation community covers approximately 3.2ha of the development area (including Zone 1 and Zone 2) (**Figure 5**).

Fieldwork revealed there were two vegetation management zones within the Impact Area:

- PCT 1568 *Blackbutt – Turpentine – Sydney Blue Gum mesic tall open forest on ranges of the Central Coast* Poor Condition – Low condition remnant (Zone 1) (0.28 ha); and
- PCT 1568 *Blackbutt – Turpentine – Sydney Blue Gum mesic tall open forest on ranges of the Central Coast* – Poor condition regenerating degraded (Zone 2) (0.05 ha).

PCT 1627 *Smooth-barked Apple – Swamp Mahogany – Red Mahogany – Cabbage Palm open forest on lowlands of the Central Coast* is also present within the Site, though not set to be impacted by the proposal.

**Table 3** presents the PCTs and condition classes present within the development footprint, as well as any corresponding threatened ecological communities (TECs) and PCT extent.

**Table 3 – Vegetation Zones in Development Footprint**

Vegetation Community	TEC	Area (ha)
PCT 1568 (Zone 1) – Blackbutt – Turpentine – Sydney Blue Gum mesic tall open forest on ranges of the Central Coast (degraded)	No	0.28
PCT 1568 (Zone 2) – Blackbutt – Turpentine – Sydney Blue Gum mesic tall open forest on ranges of the Central Coast (regenerating)	No	0.05
<b>Total Vegetation</b>		<b>0.33</b>

**PCT 1568 Blackbutt – Turpentine – Sydney Blue Gum mesic tall open forest on ranges of the Central Coast - Degraded (Zone 1)**

This vegetation zone comprises most of the native vegetation in the Site and covers approximately 3.2ha. The development footprint only impacts on 0.28ha of this vegetation zone.

The canopy layer consists of *Eucalyptus saligna*, *Eucalyptus globoides* and *Syncarpia glomulifera*. The mid-storey is dominated by *Callistemon salignus*, *Glochidion ferdinandii* and exotic species such as *Ligustrum sinense* and *Lantana camara*. The groundcovers include a number of native species including *Pteridium esculentum*, *Adiantum aethiopicum*, *Lobelia purpurascens* and *Dianella caerulea* and exotic species such as *Asparagus aethiopicus* and *Oplismenus aemulus*. **Plates 1 to 3** show examples of PCT 1568 (Degraded).



**Plates 1: Vegetation Zone 1 PCT 1568 (Degraded) - BAM Plot 1**





**Plates 2: Vegetation Zone 1 PCT 1568 (Degraded) - BAM Plot 3**

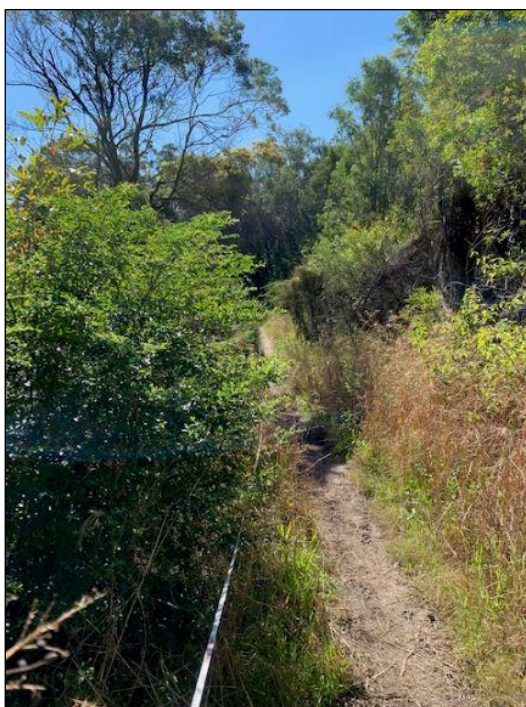


**Plates 3: Vegetation Zone 1 PCT 1568 (Degraded) - BAM Plot 4**

**PCT 1568 Blackbutt – Turpentine – Sydney Blue Gum mesic tall open forest on ranges of the Central Coast – Planted Regrowth (Zone 2)**

This vegetation zone is located on the western boundary of the Subject Site with the development footprint impacting on approximately 0.05ha.

This vegetation zone is made of up primarily exotic vegetation, with emergent species including *Acacia decurrens*, *Acacia implexa* and the exotic species *Cinnamomum camphora*. The shrub layer consists of some native species such as *Dodonaea triquetra*, *Callistemon salignus* and *Glochidion ferdinandii*, though is dominated by exotic species such as *Ligustrum sinense* and *Lantana camara*. The groundcover contains a mix of native and exotic species reflecting the heavily disturbed nature of this vegetation zone. **Plate 4** show examples of PCT 1568 (Planted Regrowth).



**Plates 4: Vegetation Zone 1 PCT 1568 (Planted Regrowth) - BAM Plot 2**



### **Non-remnant / Cleared Areas**

The managed land within the Subject Site (approx. 2.7ha) is comprised of exotic grassland consisting of *Avena barbata* (Bearded Oats), *Briza subaristata* (Briza), and *Bromus catharticus* (Prairie Grass). **Plate 5** show an example of the managed lands.



**Plates 5: Managed Lands**

Additional site photographs are included in **Appendix F**.

#### **1.3.3.4 Hollow-bearing Trees**

Five Hollow-bearing tree (HBT) and several stags containing hollows and fissures are present within the Study Area, none within the Subject Site. Two of these hollows would constitute potential roosting habitat for small arboreal fauna and microbats.

Despite thorough survey, very small hollows may have gone unnoticed that would be suitable for small species such as microbats.














### **Other Habitat Features**

The Subject Site also possesses other habitat features including rubbish and logs that provide potential habitat for reptiles and small mammals.



Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

## Legend

-  Site Boundary
-  Watercourse
-  BV mapped Lands
-  PCT 1568 (Degraded)
-  PCT 1568 (Planted Regrowth)
-  Maintained Lands
-  PCT 1627
-  Vegetation proposed for clearance
-  BAM Plot
-  BAM Transect
-  Rapid Data Point
-  Powerful Owl sighting
-  Tetraethca juncea



0 100  
metres



# AEP

Title: Figure 4 - Vegetation Communities

Location: Hillsborough Rd, Hillsborough

Client: Catalyst Project Consulting

Date: Aug 2021

BOAMs Ref: 27483

AEP Ref: 2078.01

Note:  
1. Boundaries are for survey accuracy.  
2. Do not scale off this plan.



### 1.3.4 Flora Survey Effort

#### 1.3.4.1 Vegetation Integrity Assessment

Four (4) vegetation plots were undertaken within the Subject Site during August 2020 and January 2021 within PCT 1568. Plots were undertaken above the requirements of Table 3 of the BAM. Plots were located by walking a random distance into the vegetation zone.

AEP BAM Plot field sheets are provided in **Appendix D**.

#### 1.3.4.2 Vegetation Integrity Score

Plot data was used to determine the composition, structure and function condition score for the zone, which informed the vegetation integrity score within the BAM-C. Plot data has been tabulated and includes corresponding scores along with the overall vegetation integrity score (refer **Table 4**).

**Table 4 – Vegetation Integrity Score Table**

Site Attribute	PCT 1568 (Degraded)	PCT 1568 (Planted Regrowth)	PCT 1568 (Degraded)	PCT 1568 (Degraded)
Plot #	1	2	3	4
Location	56	56	56	56
Bearing	107	337	345	7
<b>Composition</b>				
Tree	3	2	3	1
Shrub	4	7	7	1
Grass & Grass-like	6	6	3	4
Forb	3	3	3	1
Fern	2	1	1	1
Other	3	2	7	1
<b>Total Score</b>	<b>25.6</b>	<b>33.5</b>	<b>25.6</b>	<b>25.6</b>
<b>Structure</b>				
Tree	28	7	66	2
Shrub	35.3	20.7	37.6	5
Grass & Grass-like	5.6	7.7	4.2	4.4
Forb	0.3	0.5	0.3	0.1
Fern	3.5	10	1	80
Other	0.3	0.2	6.5	1
<b>Total Score</b>	<b>50.5</b>	<b>23.4</b>	<b>50.5</b>	<b>50.5</b>
<b>Function</b>				
Regenerating Stems (<5cm DBH)	Absent	Absent	Absent	Absent
Stem Classes (cm DBH)	5-9, 10-19, 20-29, 30-49, 50-79	5-9, 10-19, 20-29	5-9, 10-19, 20-29, 30-49, 50-79	5-9, 10-19
# Large Trees	2	0	13	0

Site Attribute	PCT 1568 (Degraded)	PCT 1568 (Planted Regrowth)	PCT 1568 (Degraded)	PCT 1568 (Degraded)
Plot #	1	2	3	4
Hollow-bearing Trees	0	0	0	0
Litter Cover (%)	61	41.6	61	72
Coarse Woody Debris (m)	6	0	11	0
High Threat Weed Cover	36	33.8	58.8	100
<b>Total Score</b>	<b>72.4</b>	<b>23.3</b>	<b>72.4</b>	<b>72.4</b>
<b>Overall Vegetation Integrity Score</b>	<b>45.4</b>	<b>26.4</b>	<b>45.4</b>	<b>45.4</b>

## 1.4 Threatened Species

Under the BAM, threatened species are classified into two types: 'Ecosystem Credit' and 'Species Credit' species, as detailed within the BioNet Atlas Threatened Species Profile Database (OEH).

A predicted Ecosystem Credit Species assessment is presented in **Table 5**, a Species Credit Species assessment is presented in **Table 6**.

Multiple field surveys were undertaken on the site during from February 2020 to January 2021. A summary of survey effort within the Subject Site is described in **Section 1.4** and **Table 7**, species listed are presented in **Appendix B** and **Appendix C**.

A streamlined assessment for small area only requires specific targeted assessment to be carried out when a threatened ecological community and/or a species at risk of a Serious and Irreversible Impact (SAIL) is detected on site. Furthermore, if a threatened species is incidentally recorded on site, further assessment must be undertaken to determine if species credits are required.

### 1.4.1 Ecosystem Credit Species

Ecosystem Credit species are associated with PCTs and other habitat surrogates that are used to predict their occurrence on a particular site.

The 'biodiversity risk weighting' for a species is based on the 'sensitivity to loss' and 'sensitivity to potential gain' score using criteria listed in Appendix I of the BAM and are used in credit calculations to assess impacts of the proposal on a threatened species. The sensitivity to gain class is listed within the BAM calculator for Ecosystem Credit species.

Those Ecosystem Credit species predicted to occur within the site are provided in **Table 5** below.

**Table 5 – Predicted Ecosystem Credit Species**

Scientific name	Common name	Sensitivity to Gain Class	Recorded within 10km (NSW BioNet Wildlife Atlas 2020) Y/N	Recorded within site nearby surrounds Y/N
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	Moderate	Y	N
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	High	Y	N
<i>Daphoenositta chrysoptera</i>	Varied Sittella	Moderate	Y	N
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	High	Y	N
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	High	Y	N
<i>Glossopsitta pusilla</i>	Little Lorikeet	High	Y	N
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	High	Y	N
<i>Lathamus discolor</i>	Swift Parrot	Moderate	Y	N
<i>Lophoictinia isura</i>	Square-tailed Kite	Moderate	Y	N
<i>Miniopterus australis</i>	Little Bentwing-bat	Very High	Y	N

Scientific name	Common name	Sensitivity to Gain Class	Recorded within 10km (NSW BioNet Wildlife Atlas 2020) Y/N	Recorded within site nearby surrounds Y/N
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	High	Y	Y
<i>Micronomus norfolkensis</i>	Eastern Freetail-bat	High	N	Y
<i>Ninox connivens</i>	Barking Owl	High	Y	N
<i>Ninox strenua</i>	Powerful Owl	High	Y	Y
<i>Petaurus australis</i>	Yellow-bellied Glider	High	N	N
<i>Phascolarctos cinereus</i>	Koala	High	Y	N
<i>Phoniscus papuensis</i>	Golden-tipped Bat	High	N	N
<i>Pseudomys gracilicaudatus</i>	Eastern Chestnut Mouse	High	N	N
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	High	Y	Y
<i>Ptilinopus magnificus</i>	Wompoo Fruit-Dove	Moderate	Y	N
<i>Ptilinopus regina</i>	Rose-crowned Fruit-Dove	Moderate	N	N
<i>Ptilinopus superbus</i>	Superb Fruit-Dove	Moderate	Y	N
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	High	Y	Y
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	High	N	Y
<i>Tyto novaehollandiae</i>	Masked Owl	High	Y	Y

The following species were excluded from the predicted ecosystem credits:

- *Anthochaera phrygia* (Regent Honeyeater): consultation of DPIE's BAM – Important Areas online map (DPIE, 2020) revealed that the Subject Site is not located within Regent Honeyeater Important Areas;
- *Lathamus discolor* (Swift Parrot): consultation of DPIE's BAM – Important Areas online map (DPIE, 2020) revealed that the Subject Site is not located within Swift Parrot Important Areas.

### 1.4.2 Species Credit Species

Additional threatened fauna species determined by the BAM calculator that have the potential to use the Subject Site area as suitable habitat are identified in **Table 6**. For the streamlined assessment, targeted surveys for these species are not required. This assessment focuses only on those entities at risk of a serious and irreversible impact (SAII).

The flora and fauna species lists for the site are included in **Appendix B** and **Appendix C**.



Contact with the BAM Support Team indicates that the site is not mapped as Important Areas for the Regent Honeyeater or the Swift Parrot, as such Species Credits are not incurred for these species.



**Table 6– Species Credit Species and SAIL**

Species Biodiversity Risk Weighting (BRW)	Recorded within 10km Y/N	Survey Technique and Timing	Habitat Requirements / Habitats Searched / General Notes	Survey Guidelines	Conclusion
<b>Fauna</b>					
Little Bent-winged Bat <i>Miniopterus australis</i> BRW–3	Y	Ultrasonic detection using an Anabat June 2020	Inhabits moist eucalypt forest, wet and dry sclerophyll forest, rainforest, vine thickets, Melaleuca swamps, dense coastal forest and banksia scrub. Is generally found in well-timbered areas. Roosting habitat can include cavel, tunnels, tree hollows, stormwater drains, culverts and bridges.	BAM-C/ TBDC Survey Period: Dec to Feb	No potential breeding habitat for this species was identified within the impact area. Only Breeding habitat is classified as an SAIL. <b>As a result, Species Credits do not apply.</b>
Large Bent-winged Bat <i>Miniopterus orianae oceanensis</i> BRW-3	Y	Ultrasonic detection using an Anabat June 2020	This species primary roosts in caves, but have also been known to use derelict mines, storm-water tunnels and other man-made structures. They form discreet populations around maternity caves during spring and summer but can disperse up to 300 km from these sites throughout the year. They hunt primarily in forested areas, feeding on moths and other insects.	BAM-C/ TBDC Survey Period: Dec to Feb	No potential breeding habitat for this species was identified within the impact area. Only Breeding habitat is classified as an SAIL. <b>As a result, Species Credits do not apply.</b>
Stuttering Frog <i>Mixophyes balbus</i> BRW-3	N	Nocturnal Search June 2020	<i>Mixophyes balbus</i> is found along the east coast of Australia from southern Queensland to north-eastern Victoria. Their primary habitat is rainforest and wet, tall open forest in the foothills and escarpments on the eastern side of the Great Dividing Range. Outside of breeding season, adults live in deep leaf litter and thick understorey vegetation, laying their eggs on rock shelves in small, flowing streams during breeding season.	BAM-C/ TBDC Survey Period: Sep to Mar	Not recorded on site. SAIL for this species only applies for the South Sydney Basin Bioregion. <b>As a result, Species Credits do not apply.</b>

Species Biodiversity Risk Weighting (BRW)	Recorded within 10km Y/N	Survey Technique and Timing	Habitat Requirements / Habitats Searched / General Notes	Survey Guidelines	Conclusion
<b>Flora</b>					
<b><i>Rhodamnia rubescens</i></b> Scrub Turpentine BRW - 3	Y	Habitat Assessment Targeted Search Parallel Transects October 2020	The species occurs in coastal districts north from Batemans Bay in New South Wales, approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Populations of <i>R. rubescens</i> typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m a.s.l. in areas with rainfall of 1,000-1,600 mm. Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	BAM-C/ TBDC Survey Period: throughout the year	Habitat assessment, targeted surveys and parallel transects were undertaken during recommended seasonality failed to detect any sign of the species. <b>As a result, Species Credits do not apply.</b>
<b><i>Rhodomirtus psidioides</i></b> <b><i>Native Guava</i></b> BRW - 3	N	Habitat Assessment Targeted Search Parallel Transects October 2020	This species is typically restricted to coastal and sub-coastal areas of low elevation however, has been known to occur up to 120 km inland in the Hunter and Clarence River catchments. It is a pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines.	BAM-C/ TBDC Survey Period: throughout the year	Habitat assessment, targeted surveys and parallel transects were undertaken during recommended seasonality failed to detect any sign of the species. <b>As a result, Species Credits do not apply.</b>

The following candidate threatened species did not require further consideration and were ruled out of the above list as habitat or location constraints were not met:

- *Anthochaera phrygia* (Regent Honeyeater): Investigations of DPIE's BAM – Important Areas online map (DPIE, 2020) revealed that the Subject Site is not located within mapped Regent Honeyeater habitat. Therefore, the species is not considered to be at risk of SAIL due to the proposed development and no further survey is required;
- *Lathamus discolor* (Swift Parrot): Investigations of DPIE's BAM – Important Areas online map (DPIE, 2020) revealed that the Subject Site is not located within mapped Swift Parrot habitat. Therefore, the species is not considered to be at risk of SAIL due to the proposed development and no further survey is required;
- *Ninox strenua* (Powerful Owl): The species was recorded within the study area on two occasions, however given the subject site has no suitable hollows for nesting the species is not considered a species credit species. Further assessment has been undertaken to determine if the species meets the requirements for an Investigations of Serious and Irreversible Impacts (SAILs) in **Section 2.3.1**.
- *Petaurus norfolcensis* (Squirrel Glider): The species was not recorded within the Subject Site. Further assessment has been undertaken to determine if the species meets the requirements for an Investigations of Serious and Irreversible Impacts (SAILs) in **Section 2.3.1**.
- *Tetratheca juncea* (Black-eyed Susan): The species was recorded within the Study Area, however the PCT that is within the development footprint is not suitable habitat for the species and hence not observed during seasonal surveys. No further assessment is required.

#### 1.4.2.1 Threatened Species Survey Effort

Four BAM plots were conducted within or in vegetation contiguous with the Subject Site by AEP Ecologists. **Figure 4** displays the location of those plots. Overall survey effort within the Subject Site (for plots and targeted searches) is detailed in **Table 7** and was conducted using relevant guidelines, in particular OEH survey guidelines for plants (2016) and fauna (2004), along with applicable EPBC guidelines (2010; 2011). Survey effort is shown in **Figures 5**.

Fauna surveys to date have identified 24 species within the Study Area, consisting of 12 mammals, two amphibians and 10 bird species. (**Appendix C**). One threatened fauna species, namely a Powerful Owl (*Ninox strenua*), was recorded within the Study Area.

Flora surveys by AEP have resulted in the identification of approximately 78 species within the Study Area. Approximately 40% of these species are exotics, principally invasive weed species associated with areas of previous disturbance and edge effects. A full list of flora species identified by surveys conducted within the Study Area is included in **Appendix B**.

**Table 7 – Field Survey Periods**

Date	Time	Field Activity	Personnel
25/2/2020	13:30-15:00	The perimeter of the grasslands on-site was walked in order to determine the dominant grassland species, the condition of fringing vegetation and the dominant species of forest vegetation.	2
17/04/2020	11:30-19:00	Three SATs were undertaken on-site to preliminarily determine evidence of koala activity. RDPs were undertaken throughout native vegetation to assist in vegetation mapping and nocturnal surveys were conducted with an emphasis on koala detection.	2
30/06/2020	12:00-14:00	A flora survey was undertaken for the mapped native regrowth area and <i>Syncarpia glomulifera</i> individuals were surveyed and way-pointed within the proposed APZ. Anabat acoustic bat detectors were deployed within the Study Area.	2
17/08/2020	9:00-14:30	Ground truthed vegetation mapping was determined and 2 BAM plots were conducted within the proposed area of clearing or nearby in contiguous vegetation.	2
17/08/2020	17:20-19:05	Nocturnal call-playback was conducted for Forest Owls.	1
19/08/2020	17:25-18:30	A stag-watch was undertaken prior to conducted nocturnal call-playback for Forest Owls.	1
12/10/2020	08:00- 14:00	Flora transects for <i>Cryptostylis hnteriana</i> , <b><i>Rhodamnia rubescens</i></b> , <b><i>Rhodomyrtus psidioides</i></b> and <i>Tetratheca juncea</i>	1
18/01/2021	9:30 – 15:30	Two additional BAM plots associated with the access from Waratah Avenue	3

Field sheets are provided in **Appendix D**, and flora and fauna species list for those species recorded during field surveys are provided in **Appendix B** and **Appendix C**. See **Figures 5** and **6** for survey effort undertaken.

#### 1.4.2.2 Species Presence

All candidate SAIL species as identified in **Table 6** were included for presence analysis based on targeted surveys. Candidate SAIL species credit species are assessed for potential to occur on site in **Table 7** along with survey effort undertaken to assess presence or otherwise.















#### 1.4.2.3 Summary of Survey Results

Given the works conducted on the development site and adjacent lands as detailed in Appendices b and C, it is considered that sufficient information exists to determine the presence of species or otherwise, and relative impact levels from development. Where seasonal surveys could not be



Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

## Legend

-  Site Boundary
-  Watercourse
-  BV mapped Lands
-  PCT 1568 (Degraded)
-  PCT 1568 (Planted Regrowth)
-  Maintained Lands
-  PCT 1627
-  Vegetation proposed for clearance
-  BAM Plot
-  BAM Transect
-  Rapid Data Point
-  Tetraethca juncea survey October 2020
-  Diurnal Survey Tracks
-  Nocturnal Survey Tracks
-  SATs
-  Camera Trap
-  Anabat



0 100  
metres

Note:  
1. Boundaries are for survey accuracy  
2. Do not scale off this plan



# AEP

Title: Figure 5 - Total Survey Effort

Date: Aug 2021

Location: Hillsborough Rd, Hillsborough

BOAMs Ref: 27483

Client: Catalyst Project Consulting

AEP Ref: 2078.01



## 2.0 Stage 2 – Impact Assessment (Biodiversity Values)

### 2.1 Avoid and Minimise Summary

Section 7 of the BAM provides a list of measures that need to be taken into consideration during project planning and design to minimise impacts upon native vegetation, habitat and other prescribed biodiversity values. Applicable measures taken as part of this project to minimise impacts are provided below.

The avoid and minimise strategy for the development (in accordance with Section 7 of the BAM), is discussed in greater detail in **Table 8** below.

The prescribed impact risk assessment and mitigation measures (in accordance with Section 9 of the BAM) are included in **Tables 9 to 15** below.

#### 2.1.1 Project Design, Construction & Operation

The following measures are provided to help mitigate impacts of the construction and ongoing operation of the proposed development on the biodiversity values identified within the Subject Site and surrounds.

##### 2.1.1.1 Management of Environmental Protection Zone (E2 lands)

The E2 lands located in a small portion of the south west corner are proposed to be managed as an Outer Protection Area (OPA) in accordance with the Planning for Bush Fire Protection (2019) (PBP).

This allows for the retention of 15% of canopy species within the OPA, resulting in the retention of all canopy trees and lower stratum within this area.

The shrub layer within this portion of the Subject Site comprises of Lantana and Small Leaved Privet, which are listed priority weeds for the Lake Macquarie region. These species and other listed weeds are proposed to be eradicated under the management of a Vegetation Management Plan (VMP) encouraging the growth of native grasses, herbs and forbs. The management of this areas will not allow any shrub growth to ensure adequate Bush Fire Protection measures are in place for the proposed development. Such management will promote suitable foraging habitat for the Powerful Owl.

##### 2.1.1.2 Vegetation Management Plan

The remaining vegetated areas within the Study Area, are proposed to maintained and managed for a period of three (3) years under a VMP. The VMP proposes to reduce priority and other weeds from the Study Area, while promoting natural regeneration. Given the sighting of the Powerful Owl, it also recommended that two (2) suitable best boxes installed within the Study Area to provide suitable breeding habitat for the species.

##### 2.1.1.3 General Measures

The following measures are provided to help mitigate impacts of the construction and ongoing operation of the proposed development on the biodiversity values identified within the Subject Site and surrounds:

- Fencing around the Subject Site is to be erected during the construction phase to limit incursions of fauna and delineate the boundary of clearing works;
- Where possible landscaping is to occur in conjunction with the proposed development and provide some future resources for native fauna in the area;
- Prior to clearing of any vegetation, an ecologist is to inspect the area for any signs of resident fauna requiring attention, and in particular nesting/roosting birds, or other habitat features not previously

identified. Where such is identified, appropriate strategies are to be developed and instigated to minimise impacts;

- In the event the pre-clearing survey identifies any habitat features or resident fauna, a staged approach to clearing is to be undertaken to provide fauna the opportunity to disperse outside the area of impact. Staging to include Phase 1 Clearing: Underscrubbing (minimal due to sparse shrub layer); Phase 2 Clearing: Removal of non-habitat trees, and Phase 3 Clearing: Removal of connecting and Habitat trees. All clearing works are to be undertaken under the supervision of the Project Ecologist;
- Civil Construction staff to be inducted into pre-clearing and clearing protocols and other related ecological considerations for the site;
- Implement hygiene protocols for machinery to prevent the spread of weeds outside the development site;
- Best practice erosion and sedimentation (ERSED) and dust suppression control methods are to be adopted, enforced and maintained throughout any vegetation clearing works. Such are to be in accordance with “Soils and Construction – Managing Urban Stormwater” published by Landcom;
- Incorporation of Water Sensitive Urban Design (WSUD) principles within stormwater infrastructure is to occur to minimise downstream hydrology changes;
- As per the proposed development plans, bushfire protection measures in the form of Asset Protection Zones (APZs) will be incorporated within the Site to avoid requirements for additional vegetation removal in surrounding areas; and
- A Vegetation Management Plan (VMP) will be enacted over the remaining vegetation within the site to mitigate for any lost habitat due to the need for minor shrub clearing as part of the APZs for the proposal. The VMP will focus on removal of weeds and other exotic species to promote natural regeneration and will occur over a 3 year time frame.

No further site-specific avoidance measures (as listed within Section 8.1 and 9.3 of the BAM) are proposed for the project.

**Table 8- Avoid and Minimise Impacts on Biodiversity Values**

Objectives/Requirements	Evidence of compliance
Locating a Project to Avoid and Minimise Impacts on Native Vegetation and Habitat	
<p><i>Knowledge of biodiversity values should inform decisions about the location of the proposal. The initial assessment of biodiversity values from Stage 1 may be used to inform the early planning of the route or location of a proposal.</i></p>	<p>Lands within the Study Area are zoned RE1 – ‘Public Recreation’ and E2 – ‘Environmental Conservation’. The entire site is approximately 6.8 ha, of which approximately 3.7 ha consists of native vegetation.</p> <p>The site contains existing open space managed as a public reserve, remnant native vegetation, Winding Creek and adjoining tributary and scattered trees. It is bounded by Newcastle Inner City Bypass to the west, Hillsborough Road and Hillsborough Public School to the north, Waratah Road to the east, and land zoned E2 – ‘Environmental Conservation’ to the south.</p> <p>The surrounding area has a range of zonings. To the immediate west is Newcastle Inner City Bypass and lots zoned E2, RE1, RU4 – ‘Primary Production Small Lots’, and RE2 – ‘Private Recreation’. To the north is the junction of Hillsborough Road and Newcastle Inner City Bypass followed by lots zoned RE1 and R2 – ‘Low Density Residential’ and Hillsborough Public School. To the east is the suburb of Charlestown predominantly zoned R2 and patches of E3 – ‘Environmental Management’ and RE1 zoning. To the immediate south is vegetated land zoned E2, as well as lots zoned R2 and RE2. Remnant vegetation extends from the east to the north-east and is separated from the Subject Site by The Avenue.</p> <p>The land within the Study Area corresponding with Winding Creek is mapped within the Biodiversity Values (BV) map as containing land with high biodiversity value which is sensitive to impacts from development and clearing. No vegetation communities within the subject site have been identified as being of high conservation value by previous or current assessment. Site surveys did not identify any Serious or Irreversible Impacts (SIIIs) within the Study Area.</p> <p>Works within the Subject Site are proposed to occur primarily within existing cleared areas with approximately 0.33 ha set to be cleared as part of the APZ and access road – noting that clearing will mostly involve the removal of exotic woody weeds in the understorey and selective pruning of the canopy to meet the Planning For Bushfire Outer Protection Area (OPA) Asset Protection Zone Standards.</p>
<p><i>Selecting a final proposal location may be an iterative process. Decisions may need to be revisited after all field surveys have been completed.</i></p>	<p>As discussed above, the development is located primary within an area that has already been cleared. The direct impacts proposed as part of the APZ and access road will be to</p>



Objectives/Requirements	Evidence of compliance
	approximately 0.28ha of degraded condition PCT 1568 (Zone 1) and 0.05 ha of low condition regenerating PCT 1568 (Zone 2). Therefore, the location of the proposed subdivision is considered to be environmentally optimal in the context of the broader locality.
<p><i>Impacts from clearing native vegetation and threatened species habitat can be avoided or minimised by locating the proposal in areas:</i></p> <ul style="list-style-type: none"> <li>a) <i>lacking biodiversity values</i></li> <li>b) <i>where the native vegetation or threatened species, habitat is in the poorest condition (i.e. areas that have a low vegetation integrity score)</i></li> <li>c) <i>that avoid habitat for species with a high biodiversity risk weighting or land mapped on the important habitat map, or native vegetation that is a TEC or a highly cleared PCT.</i></li> <li>d) <i>outside of the buffer area around breeding habitat features such as nest trees or caves.</i></li> </ul>	<ul style="list-style-type: none"> <li>a) As reflected in the Biodiversity Values Map, the Site contains biodiversity values. However, the area mapped on the BV map is not proposed to be impacted and will be protected via erosion control measures. The proposed impacts will be minimal as the majority of the development would occur in existing cleared land with a total of 0.33ha of disturbed native vegetation (1568) set to be impacted by the proposal.</li> <li>b) The proposed development is designed to be located primarily within pre-existing cleared lands, with minor impacts proposed to low-condition native vegetation as part of the APZ. This includes 0.28ha of PCT 1568 and 0.05 ha of regenerating PCT 1568 that has an absence of canopy trees. The proposal has been designed for maximum avoidance of biodiversity features.</li> <li>c) No habitat for threatened species was identified within the proposed clearing extent and no TECs were identified.</li> <li>a) The proposed development will impact slightly on connectivity features to the northeast of the site because of the access route required, though habitat in the location is already highly disturbed and likely to offer little value to fauna species. Other impacts will be limited as only 0.33 ha of disturbed native vegetation on the edge of existing cleared land will be impacted by the removal of weed species in the understorey and very minimal pruning to meet APZ standards.</li> </ul>
<p><i>When selecting a proposal's location, all of the following should be analysed. Justification for the decisions in determining the final location must be based on consideration of:</i></p> <ul style="list-style-type: none"> <li>a) <i>alternative modes or technologies that would avoid or minimise impacts on biodiversity values</i></li> <li>b) <i>alternative routes that would avoid or minimise impacts on biodiversity values</i></li> <li>c) <i>alternative locations that would avoid or minimise impacts on biodiversity values</i></li> </ul>	<ul style="list-style-type: none"> <li>a) Construction staff inductions will provide information on areas that should not be accessed or trampled (such as areas of vegetation surrounding the construction site). The current development plan proposes that all access routes be located within the lot, already providing access from the northern cleared section of the property or from within a previously unsealed road through the nearby school. The roads (entrances and exits) have been determined by the surrounding developments and the DCP. It is therefore not feasible for the development to proceed with alternative routes for roads and linear services and is likely that alternate roads would require more clearing than that already proposed.</li> <li>b) The Subject Site was considered an appropriate location as determined by the zoning of the land and Section 5.3 of the DCP. During this process, biodiversity values</li> </ul>

Objectives/Requirements	Evidence of compliance
<p>d) <i>alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values.</i></p>	<p>throughout the region were assessed, and given the low biodiversity value and highly degraded nature of the site it was considered development of the site would minimise impacts on areas of higher biodiversity value within the region. Alternative access locations utilising already existing infrastructure were investigated, however the final access path was the only feasible access to the site after external bodies rejected the other alternatives.</p> <p>c) Alternative locations were considered and deemed less ideal in terms of avoiding damage to biodiversity values. The current location is the result of adopting the principles of avoidance and minimisation of impacts.</p> <p>a) The proposed site location within the property boundary has undergone numerous iterations over the course of a year including investigation of three different access paths. The subject site has been positioned to ensure that the majority of the development occurs in cleared areas within the site.</p>
<p><i>The proposal may also list and map site constraints, such as:</i></p> <p>a) <i>bushfire protection requirements, including clearing for asset protection zones</i></p> <p>b) <i>flood planning levels</i></p> <p>c) <i>servicing constraints.</i></p>	<p>The impacts to native vegetation expected as a result of the proposed works is 0.33ha including the APZ clearance and for access into the site from Waratah Avenue. The APZs would be in the form of OPA and likely only involve the clearing of exotic woody weeds in the understorey and selective pruning in the canopy to meet PBP (2019) APZ standards. While the development footprint is not located within flood planning level nor are there any identified service constraints.</p>
<p><i>In the BDAR or BCAR, the assessor must document and justify any actions taken to avoid or minimise impacts through careful location of the proposal.</i></p>	<p>The Subject Site's location is the most feasible option to enable the project to progress. Considering the location of the project in the context of the locality, the proposed DA footprint has the least impact to biodiversity values, native vegetation, connectivity routes and fauna movements whilst still being located in an appropriate location with regards to access.</p>
Designing a Project to Avoid and Minimise Impacts on Native Vegetation and Habitat	
<p><i>The BDAR or BCAR must document the reasonable measures taken by the proponent to avoid or minimise clearing of native vegetation and threatened species habitat during proposal design, including placement of temporary and permanent ancillary construction and maintenance facilities. The types of measures that can be used to demonstrate this include:</i></p> <p>a) <i>reducing the proposal's clearing footprint by minimising the number and type of facilities</i></p> <p>b) <i>locating ancillary facilities in areas that have no biodiversity values</i></p>	<p>a) – d) The proposed design of the development is such that it maximises use of existing cleared land and minimises impact to native vegetation. A small area of 0.18ha would be affected by the need to establish an APZ, but even so, 0.05ha of the APZ would be established in poor condition regenerating vegetation dominated by exotic species. A further 0.1ha would be cleared to allow for access to the site though it should be noted that alternative options were investigated to reduce this but were rejected by external bodies. Given the small amount of area impacted, the quality of this habitat and the investigations made to limit impact for access it</p>

Objectives/Requirements	Evidence of compliance
<p>c) <i>locating ancillary facilities in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas with the lowest vegetation integrity scores)</i></p> <p>d) <i>locating ancillary facilities in areas that avoid habitat for species and vegetation that has a high threat status (e.g. an endangered ecological community (EEC) or critically endangered ecological community (CEEC) or is an entity at risk of a serious and irreversible impact (SAII))</i></p> <p>e) <i>actions and activities that provide for rehabilitation, ecological restoration and/or ongoing maintenance of retained areas of native vegetation, threatened species, threatened ecological communities and their habitat on the subject land.</i></p>	<p>is considered that the proposed impact area should be deemed suitable for development.</p> <p>d) – f) The proposed impacts will not affect larger ecosystem connectivity and have a relatively minor impact on local connectivity as the majority of the development adjoins existing cleared areas. The access path into the site from Waratah Avenue will likely add a small hurdle to wildlife traversal but it isn't considered that the corridor is of major ecological value and that most fauna will be able to continue to traverse this space. Consideration should be given to utilising endemic native species in any landscaping associated with the development, to provide future supplementary resources and connectivity for mobile fauna.</p> <p>Additionally, a 3 year vegetation management plan over the remaining vegetation within the site, in the form of weeding to allow for natural regeneration, will improve the vegetation integrity of remaining vegetation over time.</p>
<p><i>The BDAR or BCAR must document and justify efforts to avoid or minimise impacts through design.</i></p>	<p>As discussed above, the development and its subsequent impacts were deemed unavoidable to meet the development standards and connection to existing services such as roads. Section 2 of the BDAR explains in detail how the 'avoid and minimise principles' have been implemented as part of the biodiversity impact assessment for the project. Measures include fencing and erosion and sedimentation controls to limit indirect impacts on adjacent lands, and clearing under the supervision of a Project Ecologist, conducted in such a way as to reduce harm to fauna and facilitate dispersal into retained vegetation zones.</p>

**Table 9 – Prescribed Impact Avoidance and Minimisation**

Objectives/Requirements	Evidence of compliance
<b>Avoiding and Minimising Prescribed Biodiversity Impacts during Project Planning</b>	
<p><i>The timing and extent of a prescribed impact on the habitat of threatened entities can be difficult to assess and adequately offset through the provision of biodiversity credits. Prescribed impacts may occur on habitat features that are not native vegetation, e.g. caves, rocky outcrops and flyways. Because these types of features cannot be readily replaced or offset, it is important that measures to avoid or minimise impacts are undertaken and are clearly documented in the BDAR or BCAR.</i></p>	<p>No biodiversity values in addition to those noted in this SBDAR i.e. direct and indirect impacts to biodiversity were identified for the Subject Site. Direct and indirect impacts are considered in <b>Section 2.1.3</b> of this SBDAR in relation to Residual Impacts.</p>
<b>Locating a Project to Avoid and Minimise Prescribed Biodiversity Impacts</b>	
<p><i>To avoid or minimise prescribed biodiversity impacts, the proponent must consider how to:</i></p> <ul style="list-style-type: none"> <li>a) <i>locate surface works to avoid direct impacts on the habitat features identified in Chapter 6</i></li> <li>b) <i>locate subsurface works, in both the horizontal and vertical planes, to avoid and minimise operations beneath the habitat features identified in Chapter 6. For example, locating longwall panels away from geological features of significance, groundwater-dependent plant communities and their supporting aquifers</i></li> <li>c) <i>locate the proposal to avoid severing or interfering with corridors connecting different areas of habitat and migratory flight paths, to important habitat or local movement pathways</i></li> <li>d) <i>optimise the proposal layout to minimise interactions with threatened entities; for example, design a wind farm that has:</i> <ul style="list-style-type: none"> <li>i. <i>100 m turbine-free buffers around features that attract and support aerial species, such as forest edges, riparian corridors, wetlands, ridgetops and gullies</i></li> <li>ii. <i>turbine-free corridors in zones of regular movement for species of concern, to avoid a barrier effect</i></li> </ul> </li> <li>e) <i>locate the proposal to avoid impacts on water bodies or hydrological processes</i></li> </ul>	<ul style="list-style-type: none"> <li>a) The Subject Site: <ul style="list-style-type: none"> <li>(i) Does not contain karsts, caves, crevices, cliffs, rocks and other features of geological significance supporting threatened species and ecological communities;</li> <li>(ii) Does not contain rocks supporting habitat for threatened species and ecological communities;</li> <li>(iii) Does not contain human made structures containing habitat for threatened species and ecological communities;</li> <li>(iv) Does not contain non-native vegetation supporting threatened species and ecological communities;</li> </ul> <p>As described in 8.2.1.2 (b) above, connectivity for threatened species is already negligible, however would be maintained through retention of the Green Buffer with a minor barrier to north/south dispersal in the form of the access road.</p> <p>As described in 8.2.1.2 (c) above, the project envelope will not significantly affect the movement of threatened species critical to their life cycle.</p> <p>As described in 8.2.1.2 (d) above, the project is not expected to impact any waterbodies.</p> <p>As described in 8.2.1.2 (e) above, wind turbines are not a feature of the development proposed.</p> <p>As described in 8.2.1.2 (f) above, the project incorporates low speed local roads, to avoid and minimise the potential for fauna vehicle strike.</p> </li> <li>b) As discussed previously the total developmental potential of the Subject Site is to be utilised to realise the aims and objectives of the zone and Section 5.3 of the DCP. Consideration of sub-surface works and their impacts to habitat features is therefore considered unnecessary.</li> </ul>

Objectives/Requirements	Evidence of compliance
	<p>c) As discussed previously, the proposed impact area constitutes only 0.33ha of vegetation which is bordered by existing cleared lands to the north along with a small area (0.1ha) for an access road to the east. It is therefore considered unlikely that movement throughout the landscape will be hindered by the proposed development. The proposed impact mitigation measures and native landscape plantings will aid in creating movement pathways for these species. It is not envisaged that the access road will create a barrier to faunal dispersal.</p> <p>d) The project layout aims to maximise development potential of the Subject Site. As explained above, the subject site has not been identified as of high conservation value during detailed surveys and is zoned under the LEP for Highway Commercial Development. The direct impacts upon the vegetation that are associated with the proposal are considered unavoidable to allow for the Subject Site to be developed to the meet the Lake Macquarie LGA development standards, to provide the character and visual amenity consistent with surrounding developments. As a result, the project has sought to minimise the impacts on biodiversity by ensuring retained, remnant vegetation within the Site and adjacent lots is protected from impacts of the proposal's construction and operation.</p> <p>a) No natural waterbodies are present on Subject Site and the only man-made swale, which holds no biodiversity value, will be filled as part of the proposed development.</p>
<p><i>When locating a proposal, the following need to be analysed and justification should be provided for each alternative selected:</i></p> <ul style="list-style-type: none"> <li>a) <i>alternative modes or technologies that would avoid or minimise prescribed impacts</i></li> <li>b) <i>alternative routes that would avoid or minimise prescribed impacts</i></li> <li>c) <i>alternative locations that would avoid or minimise prescribed impacts</i></li> <li>d) <i>alternative sites within a property on which the proposal is located that would avoid or minimise prescribed impacts.</i></li> </ul>	<ul style="list-style-type: none"> <li>a) Given the small size of the proposed impact area (0.33ha) and the fact that the development is primarily taking place within cleared or degraded vegetation, it was not considered practical to assess alternative modes or technologies to avoid and minimise impacts to biodiversity on site. It should be noted that the largest impact to connectivity is due to the creation of the access road from Waratah Avenue. Multiple alternatives were investigated; however, each was denied by external bodies with no further recourse for negotiation or compromise.</li> <li>b) The proposed route was selected in order to minimise impact to native vegetation – Multiple other access paths were investigated during the design process, however due to external decisions beyond the control of the development these options were not possible.</li> <li>c) Given the low biodiversity value and degraded nature of the proposed impact area, it was considered that development of the site would minimise impacts on areas of higher biodiversity value within the region.</li> <li>a) As per section c).</li> </ul>
<p><i>Justifications for a proposal's location should identify any other site constraints that the proponent has considered in determining the location and design of the proposal, such as:</i></p>	<p>Bushfire constraints have meant that this development requires large Asset Protection Zones (APZs). No other constraints such Flooding were identified on site, the location is however constrained by the location of the Newcastle Inner city Bypass and surrounding development.</p>

Objectives/Requirements	Evidence of compliance
<ul style="list-style-type: none"> <li>a) bushfire protection requirements, including clearing for asset protection zones</li> <li>b) flood planning levels</li> <li>c) servicing constraints.</li> </ul>	
<p><i>The assessor must document and justify in the BDAR or BCAR all efforts to avoid, or the reasonable measures proposed to minimise, prescribed impacts when choosing the proposal's location.</i></p>	<p>Discussed above.</p>
Designing a Project to Avoid and Minimise Prescribed Biodiversity Impacts	
<p><i>Design measures that can avoid or minimise prescribed impacts include:</i></p> <ul style="list-style-type: none"> <li>a) engineering solutions, such as proven techniques to: <ul style="list-style-type: none"> <li>i. minimise fracturing of bedrock underlying features of geological significance, or groundwater-dependent communities and their supporting aquifers</li> <li>ii. restore connectivity and movement corridors</li> </ul> </li> <li>b) design elements that minimise interactions with threatened entities, such as: <ul style="list-style-type: none"> <li>i. designing turbines to dissuade perching and minimise the diameter of the rotor swept area</li> <li>ii. designing fencing to prevent animal entry to transport corridors</li> <li>iii. providing vegetated buffers rehabilitated with native species</li> </ul> </li> <li>c) maintaining environmental processes that are critical to the formation and persistence of habitat features not associated with native vegetation</li> <li>d) maintaining hydrological processes that sustain threatened entities</li> <li>e) controlling the quality of water released from the site, to avoid or minimise downstream impacts on threatened entities.</li> </ul>	<p>a)– e) Water Sensitive Urban Design (WSUD) will be implemented to ensure that water quality and runoff are appropriately similar to existing conditions within the Site and to minimise prescribed impacts on biodiversity values linked to hydrology and water quality.</p>
<p><i>The proposed measures must be evidence-based and directed towards the threatened entities identified in Chapter 6. The BDAR or BCAR must</i></p>	<p>Refer to Section 2 of the BDAR.</p>



Objectives/Requirements	Evidence of compliance
<i>document the designs that are proposed to avoid or minimise prescribed impacts.</i>	

## 2.2 Assessment of Impacts

Section 8 of the BAM states that the BDAR “must assess the impacts of the project on native vegetation and habitat”. In addition to this, Sections 9.1.4 and 9.2 require that further assessment be produced for any impact, including biodiversity impacts, expected in land surrounding the Subject Site. **Table 11 to 16** provide a summary of measures proposed to avoid and minimise direct, indirect and residual impacts on biodiversity.

**Table 10– Direct Impact Assessment**

Aspect	Project Phase	Potential Impact	Mitigation	Timing	Responsibility	Risk before mitigation	Risk after mitigation
Native vegetation	Construction and Operation	Removal of ~0.33ha of native vegetation including potential habitat for 5 ecosystem credit species	Landscaping within the development will utilise endemic native species suitable for future fauna use. Weed control will be implemented as part of a 3- year VMP.	Post-development	Council Project coordinator Ecologists	MR	LR
Threatened native vegetation	Construction	No threatened species have been identified on site, hence no impact.	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Habitat in the form of tree hollows	Pre-construction and Construction	No trees containing hollows are proposed to be removed.	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Fauna home range and connectivity	Pre-Construction and Construction	Disturbance to fauna habitat during clearing and construction operations	Installation of a fauna-protecting fence, including relevant signage, to create a fauna protection zone.	Pre-, during and post-development	Project coordinator Construction staff Site manager Project Ecologist	MR	LR
Fauna home range and connectivity	Operation	Reduction in connectivity	Reduction in connectivity will be negligible as only 0.28 ha of existing degraded native vegetation will be impacted. Vegetation to be impacted is adjacent to existing cleared lands, thus it will not impede on any existing corridors.	Post-development	Council Project coordinator Ecologists	LR	LR
Reduction of biodiversity values	Pre-Construction, Construction and Operation	Damage to retained trees	Installation of a fence as per the item above, including relevant signage, to create a tree protection zone.  Communication of fence location and mapping to all staff involved in clearing and construction operations.	Pre-, construction and during-development	Project coordinator Construction staff Site manager Project Ecologist	HR	LR

Aspect	Project Phase	Potential Impact	Mitigation	Timing	Responsibility	Risk before mitigation	Risk after mitigation
			Regular inspection of fence by Civil Contractor to monitor and fix if and where necessary.				
	Construction	Sediment run-off into retained vegetation area	Best practice erosion and sedimentation (ERSED) control methods to be adopted, enforced and maintained throughout vegetation works, so as to avoid any movement of sediment resulting from clearing and construction into the retained vegetation lands.	During development	Project coordinator Construction staff Site manager Project Ecologist	HR	LR
		Changes to stormwater evacuation	Incorporation of Water Sensitive Urban Design (WSUD) principles within stormwater infrastructure is to occur to minimise hydrology changes.	During development and Operational	Project coordinator Construction staff Site manager Project Ecologist	HR	LR

**Table 11– Prescribed Impact Assessment**

Subject of Prescribed Impact	Project Phase	Mitigation	Timing	Responsibility	Risk before mitigation	Risk after mitigation
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	Not applicable	No such impacts are expected on site.	Not applicable	Not applicable	Not applicable	Not applicable
Connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	Construction and operation	Reduction in connectivity will be negligible as only 0.33ha of existing degraded native vegetation will be impacted. Vegetation to be impacted is adjacent to existing cleared lands, thus it will not impede on any existing corridors.	Not applicable	Not applicable	Not applicable	Not applicable
Movement of threatened species that maintains their lifecycle	Construction and operation	No threatened species were identified within the proposed impact area. As the native vegetation to be impacted is degraded and small in area, it is not considered likely that the movement of threatened species would be impacted by the proposed works.	Not applicable	Not applicable	Not applicable	Not applicable
Water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities	Not applicable	No such impacts are expected on site.	Not applicable	Not applicable	Not applicable	Not applicable
Wind turbine strikes on protected animals	Not applicable	No wind turbines will be installed on site.	Not applicable	Not applicable	Not applicable	Not applicable
Vehicle strikes on threatened species or on animals that are part of a TEC	Construction, operation	Civil Construction staff to be inducted into pre-clearing and clearing protocols, and to identify environmental features for protection.	Pre- and during development	Project coordinator Construction staff Site manager	HR	MR



Subject of Prescribed Impact	Project Phase	Mitigation	Timing	Responsibility	Risk before mitigation	Risk after mitigation
		During operation, such impacts will be mitigated through the introduction of low-speed limits as well as speed limiting devices on the facilities' roads.		Project Ecologist		

**Table 12– Indirect Impact Assessment**

Aspect	Project Phase	Potential Impact	Mitigation	Timing	Responsibility	Risk before mitigation	Risk after mitigation
Noise	Construction	Noise during construction due to construction works and construction traffic. Potential disturbance to threatened species or reduced viability of adjacent retained habitat zone.	Timing of construction operations will be optimised as per an approved Construction Environmental Management Plan (CEMP) which will include a Noise Mitigation Plan.	During development	Project coordinator Construction staff Site manager	HR	MR
	Operation	Noise due to traffic. Potential disturbance to threatened species or reduced viability of adjacent retained habitat.	The proposal is unlikely to significantly increase the noise currently present at the Subject Site, given its proximity to the Newcastle Inner City Bypass.	During operations and Operational	Civil Contractor	MR	MR
Vibration	Construction	Disturbance to fauna which may lead to displacement to adjacent areas.	Conditions of construction operations will be optimised as per an approved Construction Environmental Management Plan (CEMP).	During construction	Project coordinator Site manager Construction staff	HR	MR
Dust	Construction	Dust deposits on native flora and fauna habitat, resulting in disturbance to and reduced viability of adjacent habitat.	Dust levels during operations managed according to an approved CEMP: <ul style="list-style-type: none"> <li>• Daily monitoring of dust generated by construction activities; and</li> <li>• Dust suppression measures (setting maximum speed limits and application of dust suppressants) will be implemented during construction works to limit dust on site.</li> </ul>	During construction	Project coordinator Site manager Construction staff	LR	LR
Light spill	Construction	Disturbance to nocturnal fauna, thus reducing	Optimal construction methods as per an approved CEMP will reduce	During construction	Project coordinator Site manager	LR	LR

Aspect	Project Phase	Potential Impact	Mitigation	Timing	Responsibility	Risk before mitigation	Risk after mitigation
		viability of adjacent retained habitat zone.	instances of light spill. Such measures will include limiting use of lights where necessary and directing lights in such a way as to limit impact on adjacent retained vegetation lands.		Construction staff		
	Operation	Disturbance to nocturnal fauna, thus reducing viability of adjacent retained habitat zone.	Provision of lighting will be in accordance with an approved CEMP. Permanent lighting shall be designed to minimise light spill into retained vegetation.	During operations	Civil Contractor	LR	LR
Non-native vegetation	Construction	Soil disturbance may lead to proliferation of exotic flora (including invasive weeds) through seeds and vegetation fragments.	As per an approved CEMP including a Biodiversity Management Plan: <ul style="list-style-type: none"> <li>• Appropriate handling of mulch created from the removal of exotic vegetation;</li> <li>• Appropriate cleaning of all construction equipment to limit the risk of weed seed and fragments to adjacent retained areas; and</li> <li>• Chemical and manual treatment of weeds where applicable.</li> <li>• Implementation of a 3 year VMP on with a focus on weed control and natural regeneration within the retained vegetation on site.</li> </ul>	During construction	Project coordinator Site manager Construction staff	MR	LR
Visual amenity	Construction	Rubbish and waste retained onsite attracting native fauna.	Activities on the Site will be managed in accordance with an approved CEMP and designed to limit the amount of rubbish and waste onsite through good housekeeping practices.	During construction	Project coordinator Site manager Construction staff	LR	LR

Aspect	Project Phase	Potential Impact	Mitigation	Timing	Responsibility	Risk before mitigation	Risk after mitigation
	Operation	Rubbish and waste retained onsite attracting native fauna.	Suitable fencing to be installed and maintained between development and retained lands to prevent access and degradation of retained lands.	During operations	Civil Contractor	LR	LR

**Table 13– Residual Impact Assessment**

Aspect	Project Phase	Potential Impact	Mitigation / Minimisation	Residual Impact Description	Impact to be offset (see Section 2.3.2)
Reduction of biodiversity values	Construction Operation	Clearing of 0.35 ha of native vegetation	Landscaping within the development will utilise endemic native species suitable for future fauna usage and providing supplementary connectivity through residential areas. Biodiversity values to be improved in retained vegetation by a 3 year VMP focussing on weed management and natural regeneration.	~0.33ha of PCT 1568	Yes
Noise, dust, light spill	Construction	Disturbance to local fauna	Application of CEMP / BMP as mentioned above	Noise, dust and light spill will still occur but a low magnitude, thus keeping the impact on local fauna to a low level	No



Table 14 – Risk Matrix

		Probability						
		A	B	C	D	E		
Maximum reasonable consequence	1	CR	CR	HR	HR	MR	CRITICAL	CR
	2	CR	HR	HR	MR	LR	HIGH RISK	HR
	3	HR	HR	MR	LR	LR	MEDIUM RISK	MR
	4	HR	MR	LR	LR	LR	LOW RISK	LR
	5	MR	LR	LR	LR	LR		

Table 15 – Assessment Criteria

Consequence criteria: Impacts on threatened species and/or threatened species habitat	
<b>1. CRITICAL</b>	Impact – Severe; Spatial scale – Widespread; Time scale – Long-term. Requires consideration of whether impacts may result in a Serious and Irreversible Impact that may lead to local extinction.
<b>2. MAJOR</b>	Impact – Moderate; Spatial scale – Moderate to widespread; Time scale – Mid- to long-term. May result in temporary or long-term damage.
<b>3. MODERATE</b>	Impact – Moderate; Spatial scale – Local to moderate; Time scale – Short- to mid-term. May result in a moderate, temporary impact. However, it may be difficult to rehabilitate impact and may have negative implications on the ecosystem
<b>4. MINOR</b>	Impact – Minor; Spatial scale – Local; Time scale – Short-term. May result in minor impacts that are relatively easily rehabilitated. Not likely to have negative implications on the ecosystem.
<b>5. NEGLIGIBLE</b>	Impact – Minor; Time scale – Short-term with no lasting effect.
Likelihood criteria	
<b>A. ALMOST CERTAIN</b>	Very high or certain probability that impact will occur, or event is of a continuous nature.
<b>B. LIKELY</b>	Likely probability that impact will occur, or event is frequent (frequency 1-5 years).
<b>C. MODERATE</b>	Moderate probability that impact will occur, or event is infrequent (frequency 5-20 years).
<b>D. UNLIKELY</b>	Low probability that impact will occur, or event is very infrequent (frequency 100 years).
<b>E. REMOTE</b>	Very low probability that impact will occur or may occur under extenuating circumstances. Event is very rare or stochastic in nature (frequency 1000 years)

### 2.2.1 Impact Summary

Credit offsets are required due to the VISs for each vegetation zone of 45.4 and 26.4 respectively being above lower threshold limits. Serious and Irreversible Impacts were surveyed and assessed but not found to be present.

### 2.2.2 Serious and Irreversible Impacts (SAILs)

Candidate SAILs are determined by decision makers (i.e. Council) for each threatened species or vegetation community based upon four (4) principles listed within the Guidance and criteria to assist a decision maker to determine a serious and irreversible impact (OEH 2017).

The following candidate SAILs were predicted as potentially occurring within the Subject Site. The potential for these species to occur within the Subject Site was based on both the candidate species predicted by the BAM-C for the PCT present on site as well as Bionet Atlas records from the locality and where potential habitat was present within or near the Subject Site. Appropriate targeted survey effort indicated that these species are either not resident within the Subject Site or the habitat constraint required for the species to be considered a credit species credit is not present within the Subject Site:

- ***Rhodamnia rubescens*** (Scrub Turpentine): Surveys revealed the species does not occur on site.
- ***Rhodomyrtus psidioides*** (Native Guava): Surveys revealed the species does not occur on site.
- ***Lathamus discolor*** (Swift Parrot): Surveys revealed the species does not occur on site and investigations of DPIE “mapped important area” showed that the Study Area is not mapped.
- ***Mixophyes balbus*** (Stuttering Frog): Surveys revealed the species does not occur on site.
- ***Miniopterus australis*** (Little Bent-winged Bat) (Breeding): No suitable caves occur on site for this species to breed.
- ***Miniopterus orianae oceanensis*** (Large Bent-winged Bat) (Breeding): No suitable caves occur on site for this species to breed.

The Calculator does not list the PCT identified on site as a Candidate SAIL given the community is not associated with a Threatened Ecological Community (TEC).

Consideration to other species (Powerful Owl, Squirrel Glider, Black-eyed Susan not identified in the BAM-C as potential SAIL has been assessed in accordance with section 9.1.2 of the BAM in **Table 16**.

Table 16 – SAIL Assessment

BAM s9.1.2 Sub Clause	BAM s9.1.2 Provision	Assessment - Powerful Owl	Assessment - Squirrel Glider	Assessment - Black-eyed Susan
2a	<p>Evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) presented by an estimate of the:</p> <ul style="list-style-type: none"> <li>i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or</li> <li>ii. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasites</li> </ul>	<p>Thorough investigation of LMCC, DPIE, other agencies and research institutions such as universities websites and published documents does not show any results suggesting that the species is rapid decline.</p> <p>The proposed regeneration method and nest box installation should increase foraging and nesting opportunities for the species within the subject site. should increase.</p> <p><b>Species does not meet Criteria for Principle 1</b></p>	<p>Thorough investigation of LMCC, DPIE, other agencies and research institutions such as universities websites and published documents does not show any results suggesting that the species is rapid decline.</p> <p>The proposed weed removal and promotion of natural regeneration should increase foraging and nesting opportunities for the species within the subject site. should increase.</p> <p><b>Species does not meet Criteria for Principle 1</b></p>	<p>Thorough investigation of LMCC, DPIE, other agencies and research institutions such as universities websites and published documents does not show any results suggesting that the species is rapid decline.</p> <p>The proposed weed removal and promotion of natural regeneration should increase habitat in the south western portion of the subject site.</p> <p><b>Species does not meet Criteria for Principle 1</b></p>
2b	<p>Evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) presented by:</p> <ul style="list-style-type: none"> <li>i. an estimate of the species' current population size in NSW, and</li> <li>ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and</li> <li>iii. where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations</li> </ul>	<p>The NSW Scientific committee (2008), estimated the population to be approx. 3,500 within NSW and also stated that there is no evidence of decline. It is unlikely that the proposed development will have a significant impact on the species population. Given there are no suitable hollow within the subject site for breeding and the species population is not likely to be risk due to the proposed development.</p>	<p>Thorough investigation of LMCC, DPIE, other agencies and research institutions such as universities websites and published documents did not result in data showing population estimates within region. Given the species was not detected on site during surveys and there are no suitable hollow bearing trees within the Subject Site the species population is not likely to be risk due to the proposed development.</p>	<p>Thorough investigation of LMCC, DPIE, other agencies and research institutions such as universities websites and published documents did not result in data showing population estimates within region. Given the species was not detected within the Subject Site (development footprint) and was restricted to the south western PCT 1627 also known as preferred habitat the species population is not likely to be risk</p>

BAM s9.1.2 Sub Clause	BAM s9.1.2 Provision	Assessment - Powerful Owl	Assessment - Squirrel Glider	Assessment - Black-eyed Susan
		<b>Species does not meet Criteria for Principle 2</b>	<b>Species does not meet Criteria for Principle 2</b>	due to the proposed development. <b>Species does not meet Criteria for Principle 2</b>
2c	Evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) presented by: i. extent of occurrence ii. area of occupancy iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences), and iv. whether the species' population is likely to undergo extreme fluctuations	The species does not have a limited geographical range, occurring across NSW. <b>Species does not meet Criteria for Principle 3</b>	The species does not have a limited geographical range, occurring across eastern NSW. <b>Species does not meet Criteria for Principle 3</b>	The species has a limited range, however the habitat within the proposed development footprint is not considered potential habitat for the species and hence not reducing the range of this species. <b>Species does not meet Criteria for Principle 3</b>
2d	Evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation) because: i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently	Thorough investigation of LMCC, DPIE, other agencies and research institutions such as universities websites and published documents does not show that the species does not respond to management practices or is at risk of severe decline even with management, hence the proposed development is proposing to regenerate native vegetation and provide suitable nesting boxes for the species to increase foraging and nesting opportunities.	Thorough investigation of LMCC, DPIE, other agencies and research institutions such as universities websites and published documents does not show that the species does not respond to management practices or is at risk of severe decline even with management, hence the proposed development is proposing to weed management encouraging natural regeneration increasing preferred habitat within the Study Area.	Thorough investigation of LMCC, DPIE, other agencies and research institutions such as universities websites and published documents does not show that the species does not respond to management practices or is at risk of severe decline even with management, hence the proposed development is proposing to weed management encouraging natural regeneration increasing preferred habitat within the Study Area.



<b>BAM s9.1.2 Sub Clause</b>	<b>BAM s9.1.2 Provision</b>	<b>Assessment - Powerful Owl</b>	<b>Assessment - Squirrel Glider</b>	<b>Assessment - Black-eyed Susan</b>
	negligible (e.g. frogs severely impacted by chytrid fungus).	<b>Species does not meet Criteria for Principle 4</b>	<b>Species does not meet Criteria for Principle 4</b>	<b>Species does not meet Criteria for Principle 4</b>
3	Where the TBDC indicates data is 'unknown' or 'data deficient' for a species for a criterion listed in Subsection 9.1.2(2.), the assessor must record this in the BDAR or BCAR.	Refer above	Refer above	Refer above
4a	The impact on the species' population (Principles 1 and 2) presented by: i. an estimate of the number of individuals (mature and immature) present in the subpopulation on the subject land (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population, and ii. an estimate of the number of individuals (mature and immature) to be impacted by the proposal and as a percentage of the total NSW population, or iii. if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the proposal	As stated above there is limited to no data on the actual or estimated population of this species within the last 10 years. The proposed regeneration method and nest box installation should increase foraging and nesting opportunities for the species within the subject site. should increase. <b>Species does not meet Criteria for Principle 1 &amp; 2</b>	As stated above there is limited to no data on the actual or estimated population of this species within the last 10 years. The proposed weed removal and promotion of natural vegetation regeneration should increase foraging and nesting opportunities for the species within the subject site. should increase. <b>Species does not meet Criteria for Principle 1</b>	As stated above there is limited to no data on the actual or estimated population of this species within the last 10 years. The proposed weed removal and promotion of natural regeneration should increase foraging and nesting opportunities for the species within the subject site. should increase. <b>Species does not meet Criteria for Principle 1</b>
4b	Impact on geographic range (Principles 1 and 3) presented by: i. the area of the species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW	Given this species is highly mobile and distributed across the state it is unlikely that the proposed impact of approx. 0.33ha will have a significant impact on the habitat resulting in	Given this species is highly mobile and distributed across the state it is unlikely that the proposed impact of approx. 0.33ha will have a significant impact on the habitat resulting in	As stated above the species is highly unlikely to occur in the PCT which will be impacted upon by the proposed development. <b>Species does not meet Criteria for Principle 1 &amp; 3</b>

BAM s9.1.2 Sub Clause	BAM s9.1.2 Provision	Assessment - Powerful Owl	Assessment - Squirrel Glider	Assessment - Black-eyed Susan
	<p>ii. the impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted</p> <p>iii. to determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (e.g. seed dispersal) and pollination distance for the species</p> <p>iv. to determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens and parasites. Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR.</p>	<p>fragmentation. The management practices proposed for the remaining vegetation within the Study Area should result in improved connectivity across the site through the removal of the weedy shrub layer.</p> <p><b>Species does not meet Criteria for Principle 1 &amp; 3</b></p>	<p>fragmentation. The management practices proposed for the remaining vegetation within the Study Area should result in improved connectivity across the site through the removal of the weedy shrub layer.</p> <p><b>Species does not meet Criteria for Principle 1 &amp; 3</b></p>	
5	The assessor may also provide new information that can be used to demonstrate that the	The surveys and desktop investigation for this assessment	The surveys and desktop investigation for this assessment	The surveys and desktop investigation for this assessment

<b>BAM s9.1.2 Sub Clause</b>	<b>BAM s9.1.2 Provision</b>	<b>Assessment - Powerful Owl</b>	<b>Assessment - Squirrel Glider</b>	<b>Assessment - Black-eyed Susan</b>
	principle identifying the species as at risk of an SAIL, is inaccurate.	did not identify any information that would suggest that the species is at risk of an SAIL is inaccurate.	did not identify any information that would suggest that the species is at risk of an SAIL is inaccurate.	did not identify any information that would suggest that the species is at risk of an SAIL is inaccurate.

## 2.2.3 Impacts requiring offset.

### 2.2.3.1 Ecosystem Credits

As per Section 10.3 of the BAM, the removal of native vegetation within the site will require offsetting to achieve the 'no net loss standard' detailed within Section 11 of the BAM. To calculate the required offsets in the form of ecosystem credits, the BAM Calculator has taken into consideration the impact area and the projected loss in vegetation integrity score along with the biodiversity risk weighting of the PCT. Details of each along with the required credit outputs is provided in **Table 17**. A total of six (6) ecosystem credits are required to offset the proposed development.

**Table 17 – Ecosystem credit requirements**

Vegetation Zone (PCT)	Impact Area (ha)	Future VIS	Vegetation Integrity Score Loss	Biodiversity Risk Weighting	Credit Requirements
Zone 1 (1568)	0.28	0	45.4	1.5	5
Zone 2 (1568)	0.05	0	26.4	1.5	1

### 2.2.3.2 Species Credits

If a Species Credit species is either identified on the site during survey, assumed to be present, or confirmed present within an expert report, a 'species polygon' is required to be produced for the area of suitable habitat within the site for the species. The size of this polygon is entered into the BAM Calculator, which determines the number of credits required to offset the removal of suitable habitat based upon the quality of habitat and biodiversity risk weighting of the species.

In the case of applying the Streamlined Assessment Module under the BAM, only candidate Species Credit species that are an SAI need further survey.

Targeted surveys did not identify and SAI species this species as being present on site. Therefore, no further assessment for offsetting is required under the BAM.

### 2.2.3.3 Areas not requiring assessment

The total Study Area is 6.81ha, of which only approx. 0.33ha of native vegetation is proposed to be impacted. As per Section 10.4 of the BAM, areas outside of the proposed impact area do not require assessment for credits. These are indicated in **Figure 5**.

## 2.3 Biodiversity Credit Report

The Biodiversity Credit Report generated within the BAM Calculator is provided in **Appendix E** and includes potential offset variations that are applicable to the proposal.

Note that Species Credit obligations are to be omitted from the credit report as per s2.3.2.2 above.



### 3.0 Conclusion

Application of the BAM against the proposal has quantified current biodiversity values within the site and calculated offset requirements for residual impacts following avoid and mitigation efforts.

The vegetation within the proposed impact area was found to be commensurate with PCT 1568. The remainder of the site predominantly comprised cleared areas and PCT 1627.

The proposal will require impact upon of 0.33ha of native vegetation. As a result, the following credit requirements were calculated within the BAM Calculator to offset the residual impacts of vegetation impact and achieve a no net loss standard.

**Table 18 – Ecosystem Credit Requirements**

Impacted PCT	Native Vegetation to be Removed (ha)	Number of Credits
PCT 1568	0.33	6

The full biodiversity credit report is attached as **Appendix E**.

## 4.0 References

Australian Koala Foundation (2009) The Spot Assessment Technique: Determining the Importance of Habitat Utilisation by Koala (*Phascolarctos cinereus*). Australian Koala Foundation, Brisbane.

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NSW Department of Environment and Conservation (2004) Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities. Working Draft, November 2004.

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OEH (2021a) BioNet Vegetation Classification. Available from <https://www.environment.nsw.gov.au/research/Visclassification.htm> Accessed June 2020.

OEH (2018) 'Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method. NSW Office of Environment and Heritage.

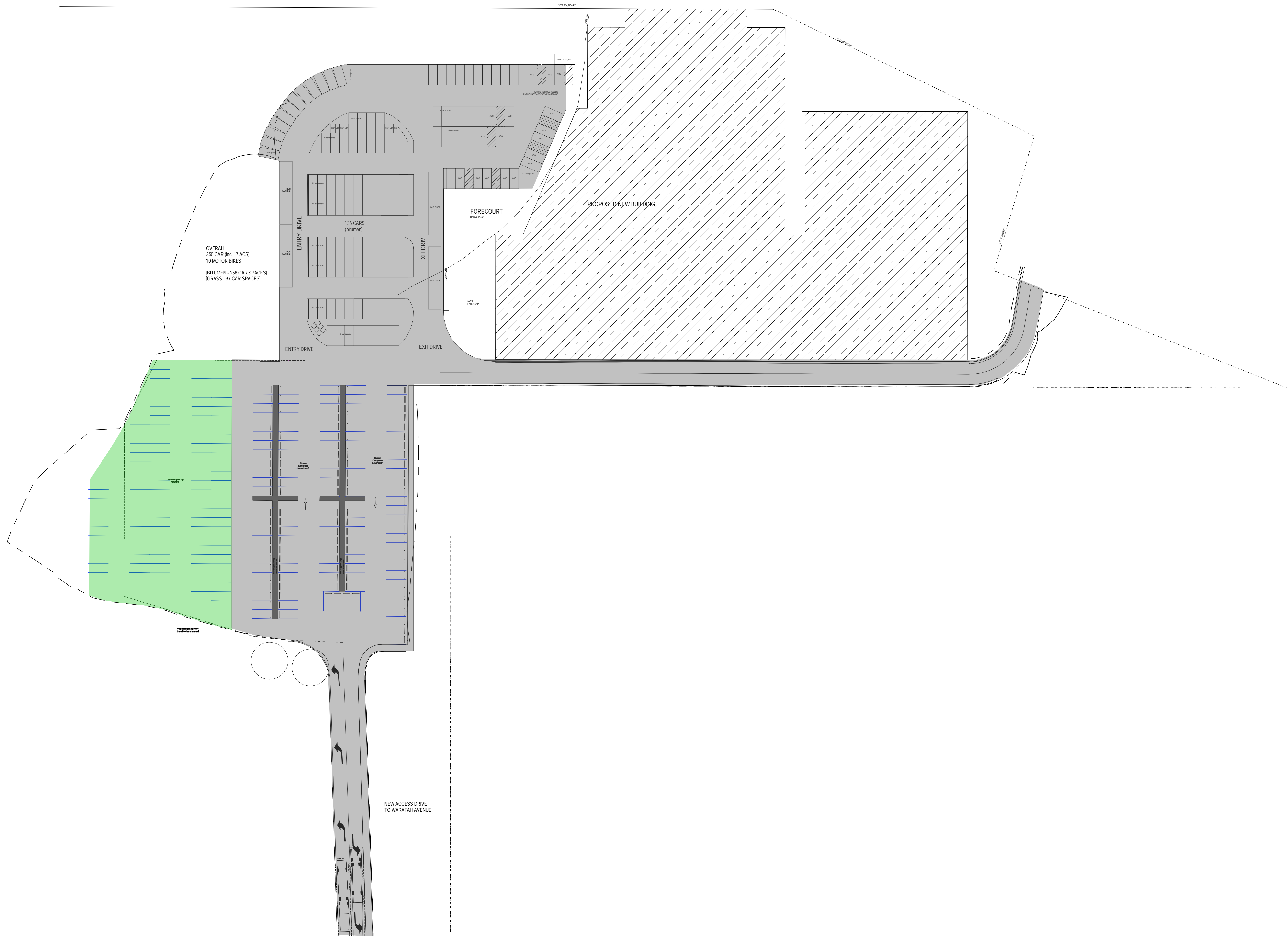
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## **Appendix A – Development Plan**

D10301241



**EJE ARCHITECTURE**  
ACN 002 912 843 | ABN 82 644 649 849  
Nominated Architect - Bernard Collins  
P +61 2 4929 2353 | F +61 2 4929 3069 | E mail@eje.com.au | W www.eje.com.au  
A 412 KING STREET, NEWCASTLE, NSW 2300



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0 25mm 100mm 200mm ON ORIGINAL A1

REV	DATE	COMMENTS
A	25/09/2020	ISSUE FOR TENDER
B	22/10/2020	REVISED ISSUE FOR TENDER
C	10/08/2021	REVISED ISSUE FOR DA REVIEW
D	19/08/2021	REVISED ISSUE FOR DA REVIEW

DRN	CHKD	VRFD
ANT		
ANT		
ANT		
ANT		

PROJECT: HILLSBOROUGH INDOOR STADIUM

CLIENT: HANSEN YUNCKEN

SITE: 62-62a HILLSBOROUGH RD  
HILLSBOROUGH AND  
109 WARATAH AV, CHARLESTOWN

DRAWING: SITE PLAN  
OVERALL

WORK IN FIGURED DIMENSIONS IN PREFERENCE TO SCALE. CHECK DIMENSIONS AND LEVELS ON SITE PRIOR TO THE ORDERING OF MATERIALS OR THE COMPLETION OF WORKSHOP DRAWINGS. IF IN DOUBT ASK. REPORT ALL ERRORS AND OMISSIONS.

DRAWN: ANT  
DATE: SEPT 2020

PROJECT No: 13017  
PHASE: SK  
DRAWING No: A001  
REV: D

SCALES:





## **Appendix B – Flora Species List**

## FLORA SPECIES LIST

The following list includes all species of vascular plants observed in the Study Area during field investigations. It should be noted that such a list cannot be considered comprehensive, but rather indicative of the flora present on the site. It can take many years of flora surveys to record all of the plant species occurring within any area, especially plant species that are only apparent in some seasons such as Orchids.

A number of species cannot always be accurately identified during a brief survey, generally due to a lack of suitable flowering and/or fruiting material. Any such species are identified as accurately as possible, and are indicated in the list as thus:

- specimens that could only be identified to genus level are indicated by the generic name followed by the abbreviation “sp.”, indicating an unidentified species of that genus;
- specimens for which identification of the genus was uncertain are indicated by a question mark (“?”) placed in front of the generic, which is followed by the abbreviation “sp.” and;
- specimens that could be accurately identified to genus level but could not be identified to species level with only a degree of certainty are indicated by a (“?”) placed in front of the epithet.

Authorities for the scientific names are not provided in the list. These follow the references outlined below.

Harden, G. (ed) (2000). *Flora of New South Wales, Volume 1*. Revised edition. UNSW, Kensington, NSW.

Harden, G. (ed) (2002). *Flora of New South Wales, Volume 2*. Revised edition. UNSW, Kensington, NSW.

Harden, G. (ed) (1992). *Flora of New South Wales, Volume 3*. UNSW, Kensington, NSW.

Harden, G. (ed) (1993). *Flora of New South Wales, Volume 4*. UNSW, Kensington, NSW.

Names of families and higher taxa follow a modified Cronquist System (1981).

Introduced species are indicated by an asterisk “\*”.

Family Name	Scientific Name	Common Name
Adiantaceae	<i>Adiantum aethiopicum</i>	Common Maidenhair
Apiaceae	<i>Centella asiatica</i>	Swamp Pennywort
Araliaceae	<i>Hedera helix</i>	English Ivy
Araliaceae	<i>Polyscias sambucifolia</i>	Elderberry Panax
Araceae	<i>Alocasia brisbanensis</i>	Cunjevoi
Asparagaceae	<i>Asparagus aethiopicus</i> *	Asparagus Fern
Asteraceae	<i>Bidens pilosa</i> *	Cobbler's Pegs
Asteraceae	<i>Conyza bonariensis</i> *	Flax-leaf Fleabane
Asteraceae	<i>Facelis retusa</i> *	
Asteraceae	<i>Gamochaeta calviceps</i> *	Cudweed
Asteraceae	<i>Hypochaeris albiflora</i> *	White Flatweed
Asteraceae	<i>Hypochaeris radicata</i> *	Flatweed
Asteraceae	<i>Senecio madagascariensis</i> *	Fireweed
Campanulaceae	<i>Lobelia purpurascens</i>	Whiteroot
Caprifoliaceae	<i>Lonicera japonica</i> *	Japanese Honeysuckle
Campanulaceae	<i>Wahlenbergia gracilis</i>	Australian Bluebell
Casuarinaceae	<i>Allocasuarina littoralis</i>	Black She-oak
Commelinaceae	<i>Commelina cyanea</i>	Scurvy Weed
Commelinaceae	<i>Tradescantia fluminensis</i>	
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed
Cyperaceae	<i>Cyperus gracilis</i>	Slender Flat Sedge
Davalliaceae	<i>Nephrolepis cordifolia</i> *	Fish-bone Fern
Dennstaedtiaceae	<i>Pteridium esculentum</i>	Bracken
Dicksoniaceae	<i>Calochlaena dubia</i>	Rainbow Fern
Dilleniaceae	<i>Hibbertia scandens</i>	Climbing Guinea Flower
Epacridaceae	<i>Leucopogon juniperinus</i>	Prickly Beard-heath
Euphorbiaceae	<i>Euphorbia peplus</i> *	Spurge
Euphorbiaceae	<i>Homalanthus populifolius</i>	Bleeding Heart
Fabaceae	<i>Acacia implexa</i>	Hickory Wattle
Fabaceae	<i>Acacia irrorata</i>	
Fabaceae	<i>Acacia longifolia</i>	
Fabaceae	<i>Acacia longissima</i>	Long-leaf Wattle
Fabaceae	<i>Glycine clandestina</i>	
Fabaceae	<i>Kennedia rubicunda</i>	Dusky Coral Pea
Fabaceae	<i>Vicia sativa</i>	
Lauraceae	<i>Cassytha glabra</i>	
Lauraceae	<i>Cinnamomum camphora</i> *	Camphor Laurel
Lomandraceae	<i>Lomandra longifolia</i>	Spiky-headed Mat-rush
Luzuriagaceae	<i>Eustrephus latifolius</i>	Wombat Berry
Malvaceae	<i>Modiola caroliniana</i> *	Red-flowered Mallow
Menispermaceae	<i>Stephania japonica</i>	Snake vine
Myrtaceae	<i>Callistemon salignus</i>	Willow Bottlebrush
Myrtaceae	<i>Eucalyptus acmenoides</i>	White Mahogany
Myrtaceae	<i>Eucalyptus grandis</i>	Flooded gum
Myrtaceae	<i>Eucalyptus saligna</i>	Sydney Blue Gum
Myrtaceae	<i>Eucalyptus umbra</i>	Broad-leaved White Mahogany
Myrtaceae	<i>Leptospermum trinervium</i>	Slender Tea-tree
Malvaceae	<i>Sida rhombifolia</i> *	Paddy's Lucerne
Myrtaceae	<i>Syncarpia glomulifera</i>	Turpentine

Family Name	Scientific Name	Common Name
Ochnaceae	<i>Ochna serrulata</i> *	Mickey Mouse Plant
Oleaceae	<i>Ligustrum lucidum</i> *	Large-leaved Privet
Oleaceae	<i>Ligustrum sinense</i> *	Small-leaved Privet
Oleaceae	<i>Notelaea longifolia</i>	Mock Olive
Oxalidaceae	<i>Oxalis latifolia</i> *	Pink Fishtail
Oxalidaceae	<i>Oxalis thompsoniae</i> *	
Phormiaceae	<i>Dianella caerulea</i> var. <i>producta</i>	Blue Flax Lily
Phyllanthaceae	<i>Glochidion ferdinandi</i> var. <i>ferdinandi</i>	Cheese Tree
Pittosporaceae	<i>Pittosporum undulatum</i>	Sweet Pittosporum
Plantaginaceae	<i>Plantago lanceolata</i> *	Ribwort
Poaceae	<i>Bothriochloa macra</i>	Red Grass
Poaceae	<i>Cenchrus clandestinum</i> *	Kikuyu Grass
Poaceae	<i>Cynodon dactylon</i>	Common Couch
Poaceae	<i>Imperata cylindrica</i>	Blady Grass
Poaceae	<i>Microlaena stipoides</i>	Weeping Grass
Poaceae	<i>Oplismenus aemulus</i>	Basket Grass
Poaceae	<i>Paspalum dilatatum</i> *	Paspalum
Poaceae	<i>Paspalum urvillei</i> *	Vasey Grass
Poaceae	<i>Setaria palmifolia</i> *	Palm Grass
Poaceae	<i>Setaria parviflora</i> *	
Poaceae	<i>Sporobolus africanus</i> *	Parramatta Grass
Poaceae	<i>Stenotaphrum secundatum</i> *	Buffalo Grass
Proteaceae	<i>Stenocarpus salignus</i>	Scrub Beefwood
Rosaceae	<i>Rubus fruticosus</i> *	Blackberry complex
Rubiaceae	<i>Richardia humistrata</i> *	
Rutaceae	<i>Zieria smithii</i>	
Smilacaceae	<i>Smilax australis</i>	Lawyer Vine
Verbenaceae	<i>Lantana camara</i> *	Lantana
Verbenaceae	<i>Verbena officinalis</i> *	Common Verbena

## **Appendix C – Fauna Species List**





### EXPECTED FAUNA SPECIES LIST

The following list includes fauna species that could be reasonably expected to occur on the study site at some point, given site attributes and location.

“●” - species observed or indicated by scats, tracks, etc. within the Study Area by AEP (2019/2020).

\* - Introduced species

? - Unconfirmed record, anecdotal records etc.

A - NSW Atlas of Wildlife record of threatened species for the site.

Threatened species listed under the *Biodiversity Conservation Act 2016* (BC Act), and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) are indicated in **bold font**.

Family	Presence	Scientific Name	Common Name
<b>Birds</b>			
Columbidae		<i>Chalcophaps indica</i>	Emerald Dove
Columbidae		<i>Columba leucomela</i>	White-headed Pigeon
Columbidae		<i>Columba livia</i> *	Rock Dove
Columbidae		<i>Geopelia humeralis</i>	Bar-shouldered Dove
Columbidae		<i>Lopholaimus antarcticus</i>	Topknot Pigeon
Columbidae		<i>Macropygia amboinensis</i>	Brown Cuckoo-Dove
Columbidae		<i>Ocyphaps lophotes</i>	Crested Pigeon
Columbidae		<i>Streptopelia chinensis</i> *	Spotted Turtle-Dove
Podargidae		<i>Podargus strigoides</i>	Tawny Frogmouth
Aegothelidae		<i>Aegotheles cristatus</i>	Australian Owlet-nightjar
Apodidae		<i>Apus pacificus</i>	Fork-tailed Swift
Apodidae		<i>Hirundapus caudacutus</i>	White-throated Needletail
Ardeidae		<i>Egretta novaehollandiae</i>	White-faced Heron
Threskiornithidae		<i>Threskiornis molucca</i>	Australian White Ibis
Accipitridae		<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk
Accipitridae		<i>Accipiter fasciatus</i>	Brown Goshawk
Accipitridae		<i>Accipiter novaehollandiae</i>	Grey Goshawk
Accipitridae		<i>Aviceda subcristata</i>	Pacific Baza
Accipitridae		<i>Haliastur sphenurus</i>	Whistling Kite
Falconidae		<i>Falco cenchroides</i>	Nankeen Kestrel
Falconidae		<i>Falco longipennis</i>	Australian Hobby
Falconidae		<i>Falco peregrinus</i>	Peregrine Falcon
Charadriidae	•	<i>Vanellus miles</i>	Masked Lapwing
Cacatuidae		<i>Cacatua galerita</i>	Sulphur-crested Cockatoo
Cacatuidae		<i>Cacatua sanguinea</i>	Little Corella
Cacatuidae	•	<i>Calyptorhynchus funereus</i>	Yellow-tailed Black-Cockatoo
Cacatuidae		<i>Eolophus roseicapillus</i>	Galah
Psittacidae		<i>Alisterus scapularis</i>	Australian King-Parrot
Psittacidae		<i>Glossopsitta pusilla</i>	Little Lorikeet
Psittacidae		<i>Lathamus discolor</i>	Swift Parrot
Psittacidae		<i>Platycercus elegans</i>	Crimson Rosella
Psittacidae	•	<i>Platycercus eximius</i>	Eastern Rosella
Psittacidae		<i>Trichoglossus chlorolepidotus</i>	Scaly-breasted Lorikeet
Psittacidae	•	<i>Trichoglossus haematodus</i>	Rainbow Lorikeet
Centropodidae		<i>Centropus phasianinus</i>	Pheasant Coucal
Cuculidae		<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo
Cuculidae		<i>Cacomantis variolosus</i>	Brush Cuckoo
Cuculidae		<i>Chalcites basalis</i>	Horsfield's Bronze-Cuckoo
Cuculidae		<i>Chalcites lucidus</i>	Shining Bronze-Cuckoo
Cuculidae		<i>Eudynamys orientalis</i>	Eastern Koel
Cuculidae		<i>Scythrops novaehollandiae</i>	Channel-billed Cuckoo

Family	Presence	Scientific Name	Common Name
Strigidae		<i>Ninox novaeseelandiae</i>	Southern Boobook
<b>Strigidae</b>	•	<b><i>Ninox strenua</i></b>	<b>Powerful Owl</b>
Alcedinidae	•	<i>Dacelo novaeguineae</i>	Laughing Kookaburra
Alcedinidae		<i>Todiramphus sanctus</i>	Sacred Kingfisher
Coraciidae		<i>Eurystomus orientalis</i>	Dollarbird
Climacteridae		<i>Cormobates leucophaea</i>	White-throated Treecreeper
Ptilonorhynchidae		<i>Ptilonorhynchus violaceus</i>	Satin Bowerbird
Ptilonorhynchidae		<i>Sericulus chrysocephalus</i>	Regent Bowerbird
Maluridae		<i>Malurus cyaneus</i>	Superb Fairy-wren
Maluridae		<i>Malurus lamberti</i>	Variegated Fairy-wren
Acanthizidae		<i>Acanthiza lineata</i>	Striated Thornbill
Acanthizidae		<i>Acanthiza nana</i>	Yellow Thornbill
Acanthizidae		<i>Acanthiza pusilla</i>	Brown Thornbill
Acanthizidae		<i>Gerygone mouki</i>	Brown Gerygone
Acanthizidae		<i>Sericornis frontalis</i>	White-browed Scrubwren
Pardalotidae		<i>Pardalotus punctatus</i>	Spotted Pardalote
Meliphagidae		<i>Acanthorhynchus tenuirostris</i>	Eastern Spinebill
Meliphagidae		<i>Anthochaera carunculata</i>	Red Wattlebird
Meliphagidae		<i>Anthochaera chrysoptera</i>	Little Wattlebird
Meliphagidae		<i>Caligavis chrysops</i>	Yellow-faced Honeyeater
Meliphagidae	•	<i>Manorina melanocephala</i>	Noisy Miner
Meliphagidae		<i>Manorina melanophrys</i>	Bell Miner
Meliphagidae		<i>Meliphaga lewinii</i>	Lewin's Honeyeater
Meliphagidae		<i>Melithreptus lunatus</i>	White-naped Honeyeater
Meliphagidae		<i>Myzomela sanguinolenta</i>	Scarlet Honeyeater
Meliphagidae		<i>Philemon corniculatus</i>	Noisy Friarbird
Meliphagidae		<i>Phylidonyris niger</i>	White-cheeked Honeyeater
Psophodidae		<i>Psophodes olivaceus</i>	Eastern Whipbird
Campephagidae		<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike
Campephagidae		<i>Coracina tenuirostris</i>	Cicadabird
Pachycephalidae		<i>Colluricincla harmonica</i>	Grey Shrike-thrush
Pachycephalidae		<i>Pachycephala pectoralis</i>	Golden Whistler
Pachycephalidae		<i>Pachycephala rufiventris</i>	Rufous Whistler
Oriolidae		<i>Oriolus sagittatus</i>	Olive-backed Oriole
Oriolidae		<i>Sphecotheres vieilloti</i>	Australasian Figbird
Artamidae		<i>Cracticus nigrogularis</i>	Pied Butcherbird
Artamidae	•	<i>Cracticus tibicen</i>	Australian Magpie
Artamidae		<i>Cracticus torquatus</i>	Grey Butcherbird
Artamidae		<i>Strepera graculina</i>	Pied Currawong
Dicruridae		<i>Dicrurus bracteatus</i>	Spangled Drongo
Rhipiduridae		<i>Rhipidura albiscapa</i>	Grey Fantail
Rhipiduridae		<i>Rhipidura leucophrys</i>	Willie Wagtail

Family	Presence	Scientific Name	Common Name
Rhipiduridae		<i>Rhipidura rufifrons</i>	Rufous Fantail
Corvidae		<i>Corvus coronoides</i>	Australian Raven
Monarchidae		<i>Grallina cyanoleuca</i>	Magpie-lark
Monarchidae		<i>Monarcha melanopsis</i>	Black-faced Monarch
Petroicidae		<i>Eopsaltria australis</i>	Eastern Yellow Robin
Petroicidae		<i>Petroica rosea</i>	Rose Robin
Timaliidae		<i>Zosterops lateralis</i>	Silvereye
Hirundinidae	•	<i>Hirundo neoxena</i>	Welcome Swallow
Sturnidae	•	<i>Sturnus tristis</i> *	Common Myna
Nectariniidae		<i>Dicaeum hirundinaceum</i>	Mistletoebird
Estrildidae		<i>Neochmia temporalis</i>	Red-browed Finch
<b>Amphibians</b>			
Myobatrachidae	?	<i>Crinia signifera</i>	Common Eastern Froglet
Myobatrachidae	?	<i>Limnodynastes peronii</i>	Brown-striped Frog
Myobatrachidae		<i>Limnodynastes tasmaniensis</i>	Spotted Grass Frog
Myobatrachidae		<i>Paracrinia haswelli</i>	Haswell's Froglet
Myobatrachidae		<i>Pseudophryne bibronii</i>	Bibron's Toadlet
Myobatrachidae		<i>Pseudophryne coriacea</i>	Red-backed Toadlet
Myobatrachidae		<i>Uperoleia fusca</i>	Dusky Toadlet
Myobatrachidae		<i>Uperoleia laevigata</i>	Smooth Toadlet
Hylidae		<i>Litoria caerulea</i>	Green Tree Frog
Hylidae		<i>Litoria dentata</i>	Bleating Tree Frog
Hylidae		<i>Litoria fallax</i>	Eastern Dwarf Tree Frog
Hylidae		<i>Litoria jervisiensis</i>	Jervis Bay Tree Frog
Hylidae		<i>Litoria latopalmata</i>	Broad-palmed Frog
Hylidae		<i>Litoria peronii</i>	Peron's Tree Frog
Hylidae		<i>Litoria phyllochroa</i>	Leaf-green Tree Frog
Hylidae		<i>Litoria tyleri</i>	Tyler's Tree Frog
<b>Reptiles</b>			
Scincidae		<i>Bellatorias major</i>	Land Mullet
Scincidae		<i>Cryptoblepharus virgatus</i>	Cream-striped Shinning-skink
Scincidae		<i>Ctenotus robustus</i>	Robust Ctenotus
Scincidae		<i>Ctenotus taeniolatus</i>	Copper-tailed Skink
Scincidae		<i>Eulamprus quoyii</i>	Eastern Water-skink
Scincidae		<i>Lampropholis delicata</i>	Dark-flecked Garden Sunskink
Scincidae		<i>Lampropholis guichenoti</i>	Pale-flecked Garden Sunskink
Scincidae		<i>Saiphos equalis</i>	Three-toed Skink
Scincidae		<i>Tiliqua scincoides</i>	Eastern Blue-tongue
Agamidae		<i>Amphibolurus muricatus</i>	Jacky Lizard
Agamidae		<i>Intellagama lesueurii</i>	Eastern Water Dragon
Agamidae		<i>Pogona barbata</i>	Bearded Dragon

Family	Presence	Scientific Name	Common Name
Varanidae		<i>Varanus varius</i>	Lace Monitor
Colubridae		<i>Dendrelaphis punctulatus</i>	Common Tree Snake
Elapidae		<i>Cacophis squamulosus</i>	Golden-crowned Snake
Elapidae		<i>Demansia psammophis</i>	Yellow-faced Whip Snake
Elapidae		<i>Hemiaspis signata</i>	Black-bellied Swamp Snake
Elapidae		<i>Pseudechis porphyriacus</i>	Red-bellied Black Snake
<b>Mammals</b>			
Tachyglossidae		<i>Tachyglossus aculeatus</i>	Short-beaked Echidna
Peramelidae		<i>Isodon macrourus</i>	Northern Brown Bandicoot
Peramelidae		<i>Perameles nasuta</i>	Long-nosed Bandicoot
Petauridae		<i>Petaurus breviceps</i>	Sugar Glider
<b>Petauridae</b>		<b><i>Petaurus norfolcensis</i></b>	<b>Squirrel Glider</b>
Pseudocheiridae	•	<i>Pseudocheirus peregrinus</i>	Common Ringtail Possum
Acrobatidae		<i>Acrobates pygmaeus</i>	Feathertail Glider
Phalangeridae	•	<i>Trichosurus vulpecula</i>	Common Brushtail Possum
Macropodidae		<i>Wallabia bicolor</i>	Swamp Wallaby
<b>Pteropodidae</b>	•	<b><i>Pteropus poliocephalus</i></b>	<b>Grey-headed Flying-fox</b>
Molossidae		<i>Auromomus australis</i>	White-striped Freetail-bat
<b>Molossidae</b>		<b><i>Mormopterus norfolkensis</i></b>	<b>Eastern Freetail-bat</b>
Molossidae		<i>Mormopterus ridei</i>	Eastern Free-tailed Bat
Vespertilionidae		<i>Chalinolobus gouldii</i>	Gould's Wattled Bat
Vespertilionidae		<i>Chalinolobus morio</i>	Chocolate Wattled Bat
<b>Vespertilionidae</b>		<b><i>Miniopterus australis</i></b>	<b>Little Bentwing-bat</b>
<b>Vespertilionidae</b>		<b><i>Miniopterus schreibersii oceanensis</i></b>	<b>Eastern Bentwing-bat</b>
<b>Vespertilionidae</b>		<b><i>Scoteanax rueppellii</i></b>	<b>Greater Broad-nosed Bat</b>
Vespertilionidae	?	<i>Vespadelus pumilus</i>	Eastern Forest Bat
Vespertilionidae	?	<i>Vespadelus regulus</i>	Southern Forest Bat
<b>Vespertilionidae</b>		<b><i>Vespadelus troughtoni</i></b>	<b>Eastern Cave Bat</b>
Vespertilionidae	?	<i>Vespadelus vulturnus</i>	Little Forest Bat
Muridae		<i>Mus musculus</i> *	House Mouse
Muridae		<i>Rattus rattus</i> *	Black Rat
Canidae	•	<i>Canis lupus</i> *	Dingo, domestic dog
Canidae		<i>Vulpes vulpes</i> *	Fox
Felidae		<i>Felis catus</i> *	Cat
Leporidae		<i>Oryctolagus cuniculus</i> *	Rabbit





## **Appendix D – BAM Field Sheets**

Date: 18/1/21	Job number: 2078.02.	Site: Hillsborough	Plot ID: P1	Bearing:	Observers: BY/IS/AM.
Starting point Easting / Northing:			End point Easting / Northing:		

Upper stratum	C	Ab	Mid stratum	C	Ab	Lower stratum	C	Ab	Lower stratum	C	Ab
<i>Syncaesia glauca</i>	60	10	<i>Lantana camara</i>	1	10	<i>Lorandra longifolia</i>	0.2	10	<i>Opilomenus imbecillis</i>	3	200
<i>Glochidion feedianii</i>	1	3	<i>Ligustrum sinense</i>	35	100	<i>Pseudanthemum urticale</i>	0.1	50	<i>Poa sp. 1</i>	0.1	20
<i>Eucalyptus (robusta)</i>	5	1	<i>Juniperus</i> (sp.)	0.5	6	<i>Eustrephys latifolia</i>	0.1	1	<i>Entolasia sp. (stricta)</i>	1	50
<i>Eleocharis reticulata</i>	0.1	1	<i>RF#1 (red vine)</i>	0.1	1				<i>Panic like sp.</i>	2	200
<i>Camphora Einnamomum</i>	20	4	<i>Tribble leaf Zieria smithii</i>	0.5	3	<i>Hibbertia scandens</i>	0.1	1	<i>Poa sp. 2</i>	0.1	10
			<i>Pittosporum</i>						<i>Scleria palmifolia</i>	3	10
			<i>Arcia sp (b)</i>	1	1	<i>Labellia purpurea</i>	0.1	10		1	50
			<i>Pittosporum undulatum</i>	35	20	<i>Dimella crenata var. pedata</i>	0.1	3			
			<i>Breynia pinnatifida</i>	0.2	1	<i>Stephania japonica</i>	0.1	1			
			<i>Senna septentrionalis</i>		1	<i>Vine - Pandorea pandorana</i>	0.5	1			
						<i>Desmodium virgatum</i>	0.5				
			<i>Xanthorrhoea</i>	0.2	1	<i>Adiantum aethiopicum</i>	0.5	20			
			<i>Ochna</i>	0.1	5	<i>Asparagus aethiopicus</i>	1	5			
			<i>Dodonaea triquetra</i>	0.3	3	<i>Hardenbergia violacea</i>	0.1	1	<i>Desmodium rhizophyllum</i>	1	20
			<i>Ligustrum lucidum</i>	1	1	<i>Colocasia esculenta</i>	0.5	3	<i>Rubus</i>	0.1	1
						<i>Hedera helix</i>	0.1	1	<i>Tradescantia</i>	0.1	2
						<i>Calochortus</i>	5	50	<i>Wandering Jew</i>		
									<i>Soft leaf herb</i>	0.1	1
Total Cover DO FIRST											

20mx20m plot = 400m<sup>2</sup> Note: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% = 2x2m, 5% = 4x5m, 25% = 10x10m

C (%): 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ... (to nearest 5%). Include overhanging plants.

Abundance: 1-20, 50, 100, 500, 1000 etc. (numbers >20 are estimates only. For overhanging plants, record abundance as 1.

Puffballs.

Bolus mushroom.

Creek on eastern margin of plot.

D10301241

Date: 18/02	Job number: 2018.02	Site: Hillsborough	Plot ID: BAM1	Bearing: 345°	Observers: ACm, BY, Am, IS
Starting point Easting / Northing: 32° 57.681 151° 40.822			End point Easting / Northing: 0376683, 6352265		



Arrival time: Departure time: Weather: Fine, warm

TWO Transect photos (one landscape one Portrait) taken ☒

1000m<sup>2</sup> plot

Mapped Vegetation community:

Transect GPS points taken ☒

Tree Stem Size Class DBH (1.3m high)	Presence/Absence Count above 50 cm	Count of Hollow Bearing Trees	Leaf Litter Cover within 5 x 1m <sup>2</sup> sub-plots		
			Note: - located at 5m, 15m, 25m, 35m and 45m along the transect - first plot located 5m on the left of the transect Litter includes leaves, seeds, twigs and branches less than 10cm in diameter. Also include dead material attached to living plants that is touching the ground.		
< 5 cm	P / A			Leaf litter	Live vegetation, bare ground, rocks, etc.
5 - 9 cm	P / A		1	90	
10 - 19 cm	P / A		2	5	creekline - bare ground
20 - 29 cm	P / A	Length of logs (m) Note: >10cm diameter, >50cm length ### ###	3	70	
30 - 49cm	P / A		4	40	
50 - 79cm	###     8		5	100	
>80cm	### 5		Average		
Plot Disturbance: (weediness, clearing, erosion, edge effects, grazing, fire, other) Some native trees, <del>other</del> privet dominating					
Habitat features, comments and incidental fauna observations: Creekline through plot					

Note: Tree Stem Size Class <5cm refers to any regenerating stems and does not require a height of 1.3m.

Outside plot: tradescantia

D10301241

# Incidental Habitat Form

PLOT Number

Job No 2078.02

Survey Date

Observers BY, AGM, IS

General Description of Habitat at Plot	Symplocaria dominant weedy understorey <del>low</del> riparian zone			
Prescribe Impact	Present / Absent (drop down list)	Waypoint Number	Easting and Northing	Comments / Photo (list numebr taken)
karst, caves, crevices, cliffs and other geological features of significance,	A			
rocks,	A			
human made structures	<del>Fence</del> P			Fence
connectivity of different areas of habitat	P			connects with adjacent veg
water quality, water bodies	P			bit murky - creekline
wind turbine strikes	A			
vehicle strikes	A			
Indirect Impact	Present / Absent (drop down list)	Waypoint Number	Easting and Northing	Comments / Photo (list numebr taken)
Adjoining Vegetation	P			
Domestic animals / Pest species	A			
Rabbits / Warrens	A			
Barbed Wire Fences	A			
Domestic stock	A			
Trampling of Flora	A			
Waterbodies (onsite and downstream)	P			
Habitat in adjoining lands	P			urban residential <del>urban</del> high highway
Adjoining lands weed coverage	P			high weed cover

D10301241

Indirect Impact	Present / Absent (drop down list)	Waypoint Number	Easting and Northing	Comments / Photo (list numebr taken)
Adjoining land use (potential for contamination)	P			Weed contamination? Urban runoff into creek
Tidal	A			
Rubbish	P			plastic bits
Wood collection	A			
Bush rock removal	A			
Clearing on site and adjoining land	A			
Fire Risk (evidence of previous)	P			Low
Flood (evidence of previous)	A			unlikely
Infrastructure (road rail,	P			highway

Other Impacts




**AEP**  
 ECOLOGY | BIODIVERSITY | OFFSETS | BUSHFIRED10301241

2x Bird's nest in Ligustrum sinense made of  
bracken.

Silvereye.

White Throated gerygone.

Date: 18/1	Job number: 2078.02	Site: Hillsborough	Plot ID: BAm2	Bearing: 007°	Observers: BY, IS, ACM
Starting point Easting / Northing: 0376720, 6352221			End point Easting / Northing: 0376743, 6352257		



Arrival time: Departure time: Weather:

TWO Transect photos (one landscape one Portrait) taken ☒

1000m<sup>2</sup> plot Mapped Vegetation community:

Transect GPS points taken ☒

Tree Stem Size Class DBH (1.3m high)	Presence/Absence Count above 50 cm	Count of Hollow Bearing Trees	Leaf Litter Cover within 5 x 1m <sup>2</sup> sub-plots		
			Note: - located at 5m, 15m, 25m, 35m and 45m along the transect - first plot located 5m on the left of the transect Litter includes leaves, seeds, twigs and branches less than 10cm in diameter. Also include dead material attached to living plants that is touching the ground.		
< 5 cm	P / A	0		Leaf litter	Live vegetation, bare ground, rocks, etc.
5 - 9 cm	P / A		1	50	
10 - 19 cm	P / A		2	100	
20 - 29 cm	P / A	Length of logs (m) Note: >10cm diameter, >50cm length	3	100	
30 - 49cm	P / A		4	90	
50 - 79cm	#		5	20	
>80cm	#		Average		
		Total metres			

Plot Disturbance: (weediness, clearing, erosion, edge effects, grazing, fire, other)

~~to~~ Highly disturbed, barbed wire fence, rubbish, exotic dominance

Habitat features, comments and incidental fauna observations:

Note: Tree Stem Size Class <5cm refers to any regenerating stems and does not require a height of 1.3m.

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# Incidental Habitat Form

PLOT Number

Job No

Survey Date

Observers

BY, ACIM, 15

General Description of Habitat at Plot	Exotic dominance Lantana/bracken/ Privet thicket			
Prescribe Impact	Present / Absent (drop down list)	Waypoint Number	Easting and Northing	Comments / Photo (list numebr taken)
karst, caves, crevices, cliffs and other geological features of significance,	A			
rocks,	A			
human made structures	P			fence, rubbish
connectivity of different areas of habitat	P			Adjacent vegetation
water quality, water bodies	A			
wind turbine strikes	A			
vehicle strikes	A			
Indirect Impact	Present / Absent (drop down list)	Waypoint Number	Easting and Northing	Comments / Photo (list numebr taken)
Adjoining Vegetation	P			Surrounding veg
Domestic animals / Pest species	A			
Rabbits / Warrens	A			
Barbed Wire Fences	P			20m along transect (50m)
Domestic stock	A			
Trampling of Flora	P			in doing the plot (human cause)
Waterbodies (onsite and downstream)	P			chek nearby
Habitat in adjoining lands	P			Adjoining larger vegetation (moderate)
Adjoining lands weed coverage	P			High, some native vegetation persisting

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Indirect Impact	Present / Absent (drop down list)	Waypoint Number	Easting and Northing	Comments / Photo (list numebr taken)
Adjoining land use (potential for contamination)	P			residential highway
Tidal	A			
Rubbish	P			
Wood collection	A			
Bush rock removal	A			
Clearing on site and adjoining land	A			
Fire Risk (evidence of previous)	A			
Flood (evidence of previous)	A			
Infrastructure (road rail,	P			Highway, residential

Other Impacts

Date: 17/8/20 Job number: 2078 Site: Hillsborough Plot ID: P1 Bearing: 107 E Observers: TM JM

Upper stratum	C	Ab	Mid stratum	C	Ab	Lower stratum	C	Ab	Lower stratum	C	Ab
E. globoidea	8		Lantana camara	5		Lomandra long	5		Asparagus aethiopicus	0.1	1
E. saligna	15		Calistemon salignus	35		Pteridium esculentum	2	55			
			Glochidion ferd.	5		Imperata cylindrica	2	25			
			SL Privet	30		Oplismenus imbecilis	0.1	15			
			Pittosporum undulatum	0.1	2	Stephania japonica	0.1	5			
			Acacia	0.1	1	Honeysuckle	0.8	50			
			Polyscias sambuc.	0.1	2	Pandorea pandorana	0.1	5			
						Adiantum aethiopicum	1.5	100			
						Geitophesium gymsum	0.1	3			
						Dianella caerulea. prod.	0.1	5			
						Morinda jesminoides	0.1	5			
						Pratia purpurescens	0.1	10			
						Entolasia marginata	0.1	1			
						Microlaena stip.	0.1	10			
						Cassytha sp.	2	100			
						Buffalo Grass	0.1	5			
						Entolasia stricta	0.1	1			
						Pseuderanthemum var.	0.1	3			
Total Cover DO FIRST				70.80			14.5				

20mx20m plot = 400m<sup>2</sup> Note: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% = 2x2m, 5% = 4x5m, 25% = 10x10m

C (%): 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ... (to nearest 5%). Include overhanging plants.

Abundance: 1-20, 50, 100, 500, 1000 etc. (numbers >20 are estimates only. For overhanging plants, record abundance as 1.



Date: 17/8 Job number: 2078 Site: Hillsborough Plot ID: P2 Bearing: 337 N Observers: TM JM

Upper stratum	C	Ab	Mid stratum	C	Ab	Lower stratum	C	Ab	Lower stratum	C	Ab
Camphor laurel	5	3	Lantana	10	21	Hyparrhenia hirta	7		Imperata cyl.	3	
Acacia decurrens	5		Dodonaea triquetra	2	18	Plantago lanceolata	1		Cassytha sp.	2	
Acacia implexa?	2	3	Acacia long.	1	5	Hydrocotyl bonariensis	0.1	10	Oxalis perennans	0.1	1
			SL Privet	5	16	Crofton	1		Chloris gayana	3	
			Callistemon salignus.	15	13	Cynodon dactylon	1		Oplismenus imbricatus	0.2	20
			Glochidion ferd.	2	6	Trifolium repens	0.1	10	Pandorea pandorana	0.1	1
			<del>Acacia decurrens</del>			Verbena bonariensis	0.3		Stephania japonica	0.1	5
			Melaleuca nodosa	0.1	1	Pteridium esculentum	10		Briza	3	
			Leptospermum continentale	0.1	1	Senecio madagasc.	0.1	3	Sida rhomb.	0.1	5
			Acacia falcata	0.5		Hardenbergia viol.	0.1	5	Ehrharta erecta	0.5	20
						Bidens pilosa	2		Rubus fruticosus	0.1	5
						Paspalum urvillei	5		Dianella caerulea prol.	0.1	3
						Vetch (Vicia sp.)	0.1	10	Andropogon virginicus	0.1	5
						Hypochaeris radicata	1		Lomandra long	0.1	1
						Juncus usitatus	0.3				
						Cirsium vulgare	0.1	1			
						Pratia purp.	0.3	50			
						Thymela triandra	0.1	10			
Total Cover DO FIRST	12			35.7			42				

20mx20m plot = 400m<sup>2</sup> Note: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% = 2x2m, 5% = 4x5m, 25% = 10x10m

C (%): 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ... (to nearest 5%). Include overhanging plants.

Abundance: 1-20, 50, 100, 500, 1000 etc. (numbers >20 are estimates only. For overhanging plants, record abundance as 1.

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Date: 17/8/20	Job number: 2078	Site: Hallsborough	Plot ID: P1	Bearing: 107E	Observers: TM JM
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Arrival time:      Departure time:      Weather:

1000m<sup>2</sup> plot

Mapped Vegetation community:

Transect photos and GPS points taken ☐

Tree Stem Size Class DBH (1.3m high)	Presence/Absence Count above 50 cm	Count of Hollow Bearing Trees	Leaf Litter Cover within 5 x 1m <sup>2</sup> sub-plots		
			<b>Note:</b> - located at 5m, 15m, 25m, 35m and 45m along the transect - first plot located 5m on the left of the transect Litter includes leaves, seeds, twigs and branches less than 10cm in diameter. Also include dead material attached to living plants that is touching the ground.		
< 5 cm	P / A	Total		Leaf litter	Live vegetation, bare ground, rocks, etc.
5 - 9 cm	P / A		1	50	
10 – 19 cm	P / A		2	70	
20 – 29 cm	P / A	Length of logs (m) Note: >10cm diameter, >50cm length  6	3	65	
30 – 49cm	P / A		4	62	
50 -79cm	# 1		5	58	
>80cm	# 1		Average		
Total metres					

Plot Disturbance: (weediness, clearing, erosion, edge effects, grazing, fire, other)

Habitat features, comments and incidental fauna observations:

Ringtail Possum, Nankeen Kestrel, Pow owl?

Note: Tree Stem Size Class <5cm refers to any regenerating stems and does not require a height of 1.3m.

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Date: 17/8	Job number: 2078	Site: Hillsborough	Plot ID: P2	Bearing:	Observers: TM JM
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Arrival time:      Departure time:      Weather:

1000m<sup>2</sup> plot

Mapped Vegetation community:

Transect photos and GPS points taken ☒

Tree Stem Size Class DBH (1.3m high)	Presence/Absence Count above 50 cm	Count of Hollow Bearing Trees	Leaf Litter Cover within 5 x 1m <sup>2</sup> sub-plots		
			<b>Note:</b> - located at 5m, 15m, 25m, 35m and 45m along the transect - first plot located 5m on the left of the transect Litter includes leaves, seeds, twigs and branches less than 10cm in diameter. Also include dead material attached to living plants that is touching the ground.		
< 5 cm	(P) / A	0		Leaf litter	Live vegetation, bare ground, rocks, etc.
5 - 9 cm	(P) / A		1	10	
10 - 19 cm	(P) / A		2	15	
20 - 29 cm	(P) / A	Length of logs (m) Note: >10cm diameter, >50cm length	3	70	
30 - 49cm	P / A		4	20	
50 - 79cm	# 0		5	70	
>80cm	# 0		Average 6.	65	
		Total			
		Total metres			

Plot Disturbance: (weediness, clearing, erosion, edge effects, grazing, fire, other)

Habitat features, comments and incidental fauna observations:

Non-standard Plot 10m x 60m - could not fit the full 100m due to fence line & inner-city bypass.

Note: Tree Stem Size Class <5cm refers to any regenerating stems and does not require a height of 1.3m.

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## **Appendix E – Biodiversity Credit Report**



## BAM Biodiversity Credit Report (Like for like)

### Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00027482/BAAS18147/21/00027483		10/06/2021
Assessor Name	Assessor Number	BAM Data version *
Ian Douglas Benson	BAAS18147	45
Proponent Names	Report Created	BAM Case Status
	26/08/2021	Finalised
Assessment Revision	Assessment Type	Date Finalised
0	Part 4 Developments (Small Area)	26/08/2021
BOS entry trigger	* 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.	
BOS Threshold: Area clearing threshold		

### Potential Serious and Irreversible Impacts

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

### Additional Information for Approval

Assessment Id	Proposal Name	Page 1 of 4
00027482/BAAS18147/21/00027483		

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## BAM Biodiversity Credit Report (Like for like)

### PCTs With Customized Benchmarks

PCT

No Changes

### Predicted Threatened Species Not On Site

Name

No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast	Not a TEC	0.3	0	6	6

**1568-Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast**

#### Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
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## BAM Biodiversity Credit Report (Like for like)

	North Coast Wet Sclerophyll Forests This includes PCT's: 487, 613, 661, 684, 686, 692, 693, 694, 695, 699, 747, 748, 752, 812, 826, 827, 1073, 1208, 1217, 1222, 1237, 1244, 1245, 1257, 1259, 1260, 1261, 1265, 1266, 1282, 1284, 1285, 1504, 1561, 1562, 1563, 1566, 1567, 1568, 1569, 1572, 1573, 1575, 1579, 1841, 1843, 1915	North Coast Wet Sclerophyll Forests <50%	1568_Degraded	No	5	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
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## BAM Biodiversity Credit Report (Like for like)

	North Coast Wet Sclerophyll Forests This includes PCT's: 487, 613, 661, 684, 686, 692, 693, 694, 695, 699, 747, 748, 752, 812, 826, 827, 1073, 1208, 1217, 1222, 1237, 1244, 1245, 1257, 1259, 1260, 1261, 1265, 1266, 1282, 1284, 1285, 1504, 1561, 1562, 1563, 1566, 1567, 1568, 1569, 1572, 1573, 1575, 1579, 1841, 1843, 1915	North Coast Wet Sclerophyll Forests <50%	1568_Planted_Regen	No	1	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

### Species Credit Summary

No Species Credit Data

### Credit Retirement Options

Like-for-like credit retirement options



## **Appendix F – Site Photographs**



Above: BAM Plot 1. Below: BAM Plot 2.







Above: Powerful Owl  
Below: Ringtail possum drey







**Above/Below: Winding Creek**







**Above/Below: Disturbed vegetation along fence line**



## **Appendix G – Other Legislation**

## EPBC Act Assessment

A Protected Matters Search of an area of 5km radius of the Study Area was conducted in April 2020 for Matters of National Environmental Significance as relevant to the Environment Protection & Biodiversity Conservation Act 1999 (EPBC Act). The following Matters of National Significance are considered in this assessment.

### World Heritage Properties:

The site is not a World Heritage area and is not in close proximity to any such area.

### National Heritage Places:

The site is not a National Heritage place, and it is not in close proximity to any such place.

### Wetlands of International Significance (declared Ramsar wetlands);

The site is proximate within 10km of the Ramsar listed Hunter estuary wetlands. The development as proposed will not impact the Ramsar listed wetlands.

### Great Barrier Reef Marine Park:

The site is not part of, or within close proximity to, the Great Barrier Reef Marine Park.

### Commonwealth Marine Areas:

The site is not part of, or within close proximity to, any Commonwealth Marine Area.

### Threatened Ecological Communities:

The Protected Matters Search revealed that the listed Critically Endangered Ecological Community; *“Central Hunter Valley eucalypt forest and woodland”* and Endangered Ecological Community; *“Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community”* may occur within the 5km radius search area surrounding the Study Area. Field surveys have determined that these communities do not occur and are highly unlikely to have occurred previously. No other vegetation communities present would constitute a Threatened Ecological Community.

### Threatened Species:

#### ***Tetratheca juncea***

The species was observed during the recent surveys within the Study Area and though none was recorded within the Subject Site. Habitat assessment of the Subject Site also showed that there is limited to no habitat present, with the high level of weeds dominating the understorey prohibiting ***Tetratheca juncea* from colonising the Subject Site**. Given the small area of affected habitat and the amount of available habitat in the adjoining forest to the south and east it is considered highly unlikely that the proposal will result in the extinction of the local population.

**Migratory Species:**

A number of EPBC listed migratory species have potential to utilise the site on an irregular basis. The limited number and sporadic nature of records close to the Study Area appear to reflect opportunistic rather than regular use of any habitat considered of importance to any threatened species.

It is not considered that the development of this land as proposed is likely to significantly affect the availability of potential habitat for such mobile species, or disrupt migratory patterns.

**EPBC Act Assessment Conclusion:**

No Matters of National Environmental Significance (specifically in this instance threatened species, threatened ecological communities or listed migratory species) are expected to be impacted upon significantly as a result of the proposal therefore referral is considered unlikely to be required.



## SEPP (Koala Habitat Protection) 2020 Assessment

The site is located within the LGA of Lake Macquarie and as such an assessment under SEPP (Koala Habitat Protection, 2020) is required. No approved Koala Plan of Management applies to the site.

The Subject Site was surveyed for koala feed trees and for evidence of koalas. The following tree species identified from the City of Lake Macquarie (Central Coast Koala Management Area) LGA Koala Tree Species List (Appendix B of the Koala SEPP) were recorded on site:

- *Eucalyptus saligna*; and
- *Eucalyptus globoidea*.

Three Koala SATs were conducted within the Subject Site, which found no evidence of koala scat.

One night of nocturnal work, i.e. call-playback and spotlighting for 1.5 hours by an AEP ecologist was carried out on 17 April 2020. No evidence of koalas was heard or observed.

There are five BioNet records within 10km of the Subject Site (accessed 21<sup>st</sup> August 2020). There is one record within 500m of the Subject Site from 19 September 2014 in habitat connected to the site.

As the site contains important trees for Koala, and these trees make up more than 15% of the canopy species, the vegetation on site is considered highly suitable Koala habitat. However, the lack of evidence of utilisation as evidenced via field survey, and the age and distance of the records from the Subject Site indicates that the site is not Core Koala habitat. Therefore, no further provision of the Koala SEPP applies.



## Squirrel Glider Assessment

Further to the 5-part test, the potential for the proposed development to have significant impact upon any Squirrel Glider population in the locality was assessed against LMCC *Draft Squirrel Glider Planning and Management Guidelines* (2015). The assessment is summarised in **Table 1** below.

**Table 1 – Squirrel Glider – Vegetation Corridor Assessment**

Assessment Criteria	Proposed Development
An area of Squirrel Glider habitat of more than 4ha will be cleared.	Proposal will remove approx. 0.33ha .
and/or	
More than 1ha of habitat will be cleared and the habitat patch size will be reduced to less than 4ha.	Less than one 1ha to be removed and patch size will not be reduced to less than 4ha
and/or	
There is greater than 5% loss of habitat patches with an area of more than 10ha.	Patch size will be reduced by about 0.04%
and/or	
Habitat connectivity to a habitat patch will be lost, or narrowed to a width that is not suitable for maintaining in the long term.	The site is already managed and previously disturbed. Removal of a strip of disturbed remnant vegetation (0.33ha ) adjacent to already cleared area to allow for a building envelope will not cut connectivity and will not significantly reduce the width the habitat patch.
In addition to the above	
For the population in the north east of Lake Macquarie LGA any loss of habitat greater than 1,000 square metres or 10 trees is likely to have a significant impact on squirrel gliders and a reduction of habitat patch size below 4 ha would be significant.	Proposal will remove approx. 0.33ha , however, all canopy trees are proposed to be retained within the western portion of the development only the understory which is dominated by weeds will be eradicated to allow for native grasses, herbs, forbs to regenerate in a managed form. The tree clearing limited to the access off Waratah Avenue. Based on the LMCC guidelines, approximately 15 trees will be impacted, therefore further investigation to determine if the species is an SAI (refer to Section 2.2.2 for the assessment).

As can be seen in **Section 2.2.2**, significant impact on Squirrel Glider will not occur based.

To further limit any potential impact upon the species it is proposed that a Vegetation and Fauna Management Plan (VFMP) be produced by the proponent as a Consent Condition prior to works occurring on the site. The VFMP will include details on items such as rehabilitation of areas of the riparian corridor, nest box installation (where required) and tree pruning protocols. Further details on the VFMP are provided in **Section 14**.

## Forest Owl Assessment

Reference to the LMCC Interim Lake Macquarie Large Forest Owl Planning and Management Guidelines (2014) provide guidelines on determining the significance of development impacts.

For the purposes of assessing development application under Section 5A of the EP&A Act, a significant impact on large forest owls according to the Guidelines is shown in **Table 1** below.

**Table 1 – Forest Owl Assessment**

Assessment Criteria	Proposed Development
Encroaches within 100m of confirmed nest trees	No known nest tree within 100m of Study Area.
and/or	
Encroaches within 50m of confirmed breeding roost trees	No known breeding roost trees within 50m of the Study Area.
and/or	
Severs vegetation connectivity between a confirmed nest and/or breeding roost tree and adjoining large forest owl habitat	No vegetation will become isolated as a result of the development.
and/or	
Affects connectivity corridors such that prey species are significantly impacted	As above, connectivity will remain post development.
Cumulative impacts - >5ha of large forest owl habitat on land zoned residential, within 2km of a confirmed nest tree where: home range extent habitat within the area has already been reduced to less than 500ha.	Approximately 0.33ha of vegetation is being removed which is less than the 5ha threshold.

As can be seen in **Table 1**, significant impacts on large forest owls are unlikely to occur based on the assessment criteria within the Guidelines.



## **Appendix H – BDAR CHECKLIST**

**Minimum information requirements for the Biodiversity Development Assessment Report and the Biodiversity Certification Assessment Report – Stage 1: Biodiversity assessment.**

BAM Reference	Information	BDAR Section	Completed
<b>Report</b>			
<b>Introduction - Chapters 2 and 3</b>	Introduction to the biodiversity assessment including: <ul style="list-style-type: none"> <li>• brief description of proposed development</li> <li>• identification of subject land boundary, including: operational footprint (if BDAR), construction footprint indicating clearing associated with temporary/ancillary construction facilities and infrastructure (if BDAR), land proposed for biodiversity certification (if BDAR)</li> <li>• general description of the subject land</li> <li>• sources of information used in the assessment, including reports and spatial data</li> </ul>	<b>1.1</b>	✓
	Sources of information used in the assessment, including reports and spatial data	<b>1.1.4</b>	✓
	Identification of assessment method applied (i.e. linear or site-based)	<b>1.2.3.1</b>	✓
<b>Landscape - Section 3.1, 3.2 and Appendix E</b>	General description of subject land topographic and hydrological setting, geology and soils	<b>1.2</b>	✓
	Percent native vegetation cover in the assessment area (as described in BAM Subsection 3.2).	<b>1.2.3.2</b>	✓
	IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.))	<b>1.2.1</b>	✓
	Rivers and streams classified according to stream order (as described in BAM Subsection 3.1.3(3.) and Appendix E)	<b>1.2.2</b>	✓
	Wetlands within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(3.))	<b>1.2.2</b>	✓
	Connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6.))	<b>1.2.2</b>	✓
	Karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(12.))	<b>1.2.2</b>	✓
	Areas of geological significance and soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(8-9.))	<b>1.2.2</b>	✓
	Any additional landscape features identified in any SEARs for the proposal	<b>NA</b>	✓
	NSW (Mitchell) landscape on which the subject land occurs	<b>1.2.1</b>	✓
<b>Native vegetation, Chapter 4, Appendix A and Appendix H</b>	Identify native vegetation extent within the subject land, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery (as described in BAM Section 4.1(1–3.) and Subsection 4.1.1)	<b>1.3</b>	✓
	Provide justification for all parts of the subject land that do not contain native vegetation (as described in BAM Subsection 4.1.2)	<b>1.3.3.7, Table 3</b>	✓
	Review of existing information on native vegetation including references to previous vegetation maps of the subject land and assessment area (described in BAM Section 4.1(3.) and Subsection 4.1.1)	<b>1.3.1</b>	✓

BAM Reference	Information	BDAR Section	Completed
	Describe the systematic field-based floristic vegetation survey undertaken in accordance with BAM Section 4.2	1.3.3.8	✓
	Where relevant, describe the use of more appropriate local data, provide reasons that support the use of more appropriate local data and include the written confirmation from the decision-maker that they support the use of more appropriate local data (as described in BAM Subsection 1.4.2 and Appendix A)	1.3.2.3, Table 2	✓
	For each PCT within the subject land, describe: <ul style="list-style-type: none"> <li>• vegetation class</li> <li>• extent (ha) within subject land</li> <li>• evidence used to identify a PCT including any analyses undertaken, references/sources, existing vegetation maps (BAM Section 4.2(1–3.))</li> <li>• plant species relied upon for identification of the PCT and relative abundance of each species</li> <li>• if relevant, TEC status including evidence used to determine vegetation is the TEC (BAM Subsection 4.2.2(1–2.))</li> <li>• estimate of percent cleared value of PCT (BAM Subsection 4.2.1(5.))</li> </ul>	1.3.2	✓
	Describe the vegetation integrity assessment of the subject land, including: <ul style="list-style-type: none"> <li>• identification and mapping of vegetation zones (as described in BAM Subsection 4.3.1)</li> <li>• assessment of patch size (as described in BAM Subsection 4.3.2)</li> <li>• survey effort (i.e. number of vegetation integrity survey plots) as described in BAM Subsection 4.3.4(1–2.)</li> <li>• use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM Subsection 4.3.3(5.))</li> </ul>	1.3, Appendix G	✓
	Where use of more appropriate local benchmark data is proposed (as described in BAM Subsection 1.4.2, BAM Subsection 4.3.3(5.) and BAM Appendix A): <ul style="list-style-type: none"> <li>• identify the PCT or vegetation class for which local benchmark data will be applied</li> <li>• identify published sources of local benchmark data (if benchmarks obtained from published sources)</li> <li>• describe methods of local benchmark data collection (if reference plots used to determine local benchmark data)</li> <li>• provide justification for use of local data rather than BioNet Vegetation Classification benchmark values</li> <li>• provide written confirmation from the decision-maker that they support the use of local benchmark data</li> </ul>	NA	✓
Threatened Species, Chapter 5	Identify ecosystem credit species likely to occur on the subject land, including: <ul style="list-style-type: none"> <li>• list of ecosystem credit species derived from the BAM-C (as described in BAM Subsection 5.1.1 and Section 5.2(1.))</li> <li>• justification and supporting evidence for exclusion of any ecosystem credit species based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2)</li> <li>• justification for addition of any ecosystem credit species to the list</li> </ul>	1.4.1	✓
	Identify species credit species likely to occur on the subject land, including: <ul style="list-style-type: none"> <li>• list of species credit species derived from the BAM-C (as described in BAM Subsection 5.1.1)</li> <li>• justification and supporting evidence for exclusions based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2)</li> <li>• justification and supporting evidence for exclusions based on degraded habitat constraints and/or microhabitats on which the species depends (as described in BAM Subsection 5.2.2)</li> <li>• justification for addition of any species credit species to the list</li> </ul>	1.4.2	✓
	From the list of candidate species credit species, identify: <ul style="list-style-type: none"> <li>• species assumed present within the subject land (if relevant) (as described in BAM Subsection 5.2.4(2.a.))</li> </ul>	Table 7	✓



BAM Reference	Information	BDAR Section	Completed
	<ul style="list-style-type: none"> <li>species present within the subject land on the basis of being identified on an important habitat map for a species (as described in BAM Subsection 5.2.4(2.d.))</li> <li>species for which targeted surveys are to be completed to determine species presence (Subsection 5.2.4(2.b.))</li> <li>species for which an expert report is to be used to determine species presence (Subsection 5.2.4(2.c.))</li> </ul>		
	Present the outcomes of species credit species assessments from: <ul style="list-style-type: none"> <li>threatened species survey (as described in BAM Section 5.2.4)</li> <li>expert reports (if relevant) including justification for presence of the species and information used to make this determination (as described in BAM Section 5.2.4 and 5.3, Box 3)</li> </ul>	<b>Table 7</b>	✓
	Where survey has been undertaken include detailed information on: <ul style="list-style-type: none"> <li>survey method and effort, (as described in BAM Section 5.3)</li> <li>justification of survey method and effort (e.g. citation of peer-reviewed literature) if approach differs from the Department's taxa-specific survey guides or where no relevant guideline has been published</li> <li>timing of survey in relation to requirements in the TBDC or the Department's taxa-specific survey guides. Where survey was undertaken outside these guides include justification for the timing of surveys</li> <li>survey personnel and relevant experience</li> <li>describe any limitations to surveys and how these were addressed/overcome</li> </ul>	<b>1.3.3.8, 1.4.2.10, Table 7, Appendix M</b>	✓
	Where an expert report has been used in place of survey (as described in BAM Section 5.3, Box 3), include: <ul style="list-style-type: none"> <li>justification of the use of an expert report</li> <li>identify the expert, provide evidence of their expert credentials and Departmental approval of expert status</li> <li>all requirements of Box 3 have been addressed in the expert report</li> </ul>	<b>NA</b>	✓
	Where use of local data is proposed (BAM Subsection 1.4.2): <ul style="list-style-type: none"> <li>identify relevant species</li> <li>identify data to be amended</li> <li>identify source of information for local data, e.g. published literature, additional survey data, etc.</li> <li>justify use of local data in preference to VIS Classification or TBDC data</li> <li>provide written confirmation from the decision-maker that they support the use of local data</li> </ul>	<b>NA</b>	✓
	Species polygon completed for species credit species present within the subject land (assumed present or determined on the basis of survey, expert report or important habitat map) ensuring that: <ul style="list-style-type: none"> <li>the unit of measure for each species is documented for species assessed by area:</li> <li>the polygon includes the extent of suitable habitat for the target species within the subject land (as described in BAM Subsection 5.2.5)</li> <li>a description of, and evidence-based justification for, the habitat constraints, features or microhabitats used to map the species polygon including reference to information in the TBDC for that species and any buffers applied</li> <li>for species assessed by counts of individuals:               <ul style="list-style-type: none"> <li>the number of individual plants present on the subject land (as described in BAM Subsection 5.2.5(3.))</li> <li>the method used to derive this number (i.e. threatened species survey or expert report) and evidence-based justification for the approach taken</li> </ul> </li> <li>the polygon includes all individuals located on the subject land with a buffer of 30 m around the individuals or groups of individuals on the subject land</li> </ul> Identify the biodiversity risk weighting for each species credit species identified as present within the subject land (as described in BAM Section 5.4)	<b>NA</b>	✓

BAM Reference	Information	BDAR Section	Completed
<b>Prescribed impacts - Chapter 6</b>	Identify potential prescribed biodiversity impacts on threatened entities, including: <ul style="list-style-type: none"> <li>karst, caves, crevices, cliffs, rocks and other geological features of significance (as described in BAM Subsection 6.1.1)</li> <li>occurrences of human-made structures and non-native vegetation (as described in BAM Subsection 6.1.2)</li> <li>corridors or other areas of connectivity linking habitat for threatened entities (as described in BAM Subsection 6.1.3)</li> <li>water bodies or any hydrological processes that sustain threatened entities (as described in BAM Subsection 6.1.4)</li> <li>protected animals that may use the proposed wind farm development site as a flyway or migration route (as described in BAM Subsection 6.1.5)</li> <li>where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community (as described in BAM Subsection 6.1.6)</li> </ul>	<b>2.1, Table 9</b>	✓
	Identify a list of threatened entities that may be dependent upon or may use habitat features associated with any of the prescribed impacts	<b>1.4, Table 7</b>	✓
	Describe the importance of habitat features to the species including, where relevant, impacts on life-cycle or movement patterns (e.g. Subsection 6.1.3)	<b>1.4, Table 7</b>	✓
	Where the proposed development is for a wind farm: <ul style="list-style-type: none"> <li>identify a candidate list of protected animals that may use the development site as a flyway or migration route, including: resident threatened aerial species, resident raptor species and nomadic and migratory species that are likely to fly over the proposal area (as described in BAM Subsection 6.1.5)</li> <li>provide details of targeted survey for candidate species of wind farm developments undertaken in accordance with BAM Subsection 6.1.5(2–3.)</li> <li>predict the habitual flight paths for nomadic and migratory species likely to fly over the subject land and map the likely habitat for resident threatened aerial and raptor species (BAM Subsection 6.1.5(4.))</li> </ul>	<b>NA</b>	✓
<b>Maps</b>			
<b>Introduction - Chapters 2 and 3</b>	Map of the subject land boundary showing the final proposal footprint, including the construction footprint for any clearing associated with temporary/ancillary construction facilities and infrastructure (if BDAR)	<b>Appendix A</b>	✓
<b>Landscape - Section 3.1, 3.2 and Appendix E</b>	Site Map <ul style="list-style-type: none"> <li>boundary of subject land</li> <li>cadastre of subject land</li> <li>landscape features identified in BAM Subsection 3.1.3</li> </ul>	<b>Figure 1 &amp; 2</b>	✓
	Location Map <ul style="list-style-type: none"> <li>digital aerial photography at 1:1,000 scale or finer</li> <li>boundary of subject land</li> <li>assessment area (i.e. the subject land and either 1500 m buffer area or 500 m buffer for linear development)</li> <li>landscape features identified in BAM Subsection 3.1.3</li> <li>additional detail (e.g. local government area boundaries) relevant at this scale</li> </ul>	<b>Figure 1 &amp; 2</b>	✓

BAM Reference	Information	BDAR Section	Completed
	Landscape features identified in BAM Subsection 3.1.3 and to be shown on the Site Map and/or r Location map include: <ul style="list-style-type: none"> <li>• IBRA bioregions and subregions</li> <li>• rivers, streams and estuaries</li> <li>• wetlands and important wetlands</li> <li>• connectivity of different areas of habitat</li> <li>• karst, caves, crevices, cliffs, rocks and other geological features of significance and if required, soil hazard features</li> <li>• areas of outstanding biodiversity value occurring on the subject land and assessment area</li> <li>• any additional landscape features identified in any SEARs for the proposal</li> <li>• NSW (Mitchell) landscape on which the subject land occurs</li> </ul>	<b>Figure 1 &amp; 2</b>	✓
<b>Native vegetation, Chapter 4, Appendix A and Appendix H</b>	Map of native vegetation extent within the subject land at scale not greater than 1:10,000 including identification of cleared areas (as described in BAM Section 4.1(1–3.)) and all parts of the subject land that do not contain native vegetation (BAM Subsection 4.1.2)	<b>Figure 3</b>	✓
	Map of PCTs within the subject land (as described in BAM Section 4.2(1.))	<b>Figure 4</b>	✓
	Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCTs boundaries	<b>Figure 5</b>	✓
	Map of TEC distribution on the subject land and table of TEC listing, status and area (ha)	<b>Figure 4</b>	✓
	Map of patch size locations for each native vegetation zone and table of patch size areas (as described in BAM Subsection 4.3.2)	<b>Figure 4</b>	✓
<b>Prescribed impacts Chapter 6</b>	Map showing location of any prescribed impact features (i.e. karst, caves, crevices, cliffs, rocks, human-made structures, etc.)	<b>NA</b>	✓
	Maps of habitual flight paths for nomadic and migratory species likely to fly over the site and maps of likely habitat for threatened aerial species resident on the site (for wind farm developments only)	<b>NA</b>	✓
<b>Tables</b>			
<b>Native vegetation, Chapter 4, Appendix A and Appendix H</b>	Table of current vegetation integrity scores for each vegetation zone within the site and including: <ul style="list-style-type: none"> <li>• composition condition score</li> <li>• structure condition score</li> <li>• function condition score</li> <li>• presence of hollow bearing trees</li> </ul>	<b>Appendix G</b>	✓
<b>Threatened Species, Chapter 5</b>	Table showing ecosystem credit species in accordance with BAM Section 5.1.1, and identifying: <ul style="list-style-type: none"> <li>• the ecosystem credit species removed from the list</li> <li>• the sensitivity to gain class of each species</li> </ul>	<b>Table 4</b>	✓
	Table detailing species credit species in accordance with BAM section 5.2 and identifying: <ul style="list-style-type: none"> <li>• the species credit species removed from the list of species because the species is considered vagrant, out of geographic range or the habitat or micro habitat features are not present</li> <li>• the candidate species credit species not recorded on the subject land as determined by targeted survey, expert report or important habitat map</li> </ul>	<b>Table 5</b>	✓
	Table detailing species credit species recorded or assumed as present within the subject land, habitat constraints or microhabitats associated with the species, counts of individuals (flora)/extent of suitable	<b>Table 7</b>	✓

BAM Reference	Information	BDAR Section	Completed
	habitat (flora and fauna) (as described in BAM Subsection 5.2.6) and biodiversity risk weighting (BAM Section 5.4)		
<b>Prescribed impacts Chapter 6</b>	Table detailing species credit species recorded or assumed as present within the subject land, habitat constraints or microhabitats associated with the species, counts of individuals (flora)/extent of suitable habitat (flora and fauna) (as described in BAM Subsection 5.2.6) and biodiversity risk weighting (BAM Section 5.4)	<b>Table 7</b>	✓
<b>Data</b>			
<b>Landscape - Section 3.1, 3.2 and Appendix E</b>	All report maps as separate jpeg files / Individual digital shape files of: <ul style="list-style-type: none"> <li>• subject land boundary</li> <li>• assessment area ((i.e. subject land and 1500 m buffer area) boundary</li> <li>• cadastral boundary of subject land</li> <li>• areas of native vegetation cover</li> <li>• landscape features</li> </ul>	<b>Attached files</b>	
<b>Native vegetation, Chapter 4, Appendix A and Appendix H</b>	All report maps as separate jpeg files <ul style="list-style-type: none"> <li>• Plot field data (MS Excel format)</li> <li>• Plot field data sheets</li> </ul>		
	Digital shape files of: <ul style="list-style-type: none"> <li>• PCT boundaries within subject land</li> <li>• TEC boundaries within subject land</li> <li>• vegetation zone boundaries within subject land</li> <li>• floristic vegetation survey and vegetation integrity plot locations</li> </ul>		
<b>Threatened Species, Chapter 5</b>	Digital shape files of suitable habitat identified for survey for each candidate species credit species		
	Survey locations including GPS coordinates of any plots, transects, grids		
	Digital shape files of each species polygon including GPS coordinates of located individuals		
	Species polygon map in jpeg format		
	Expert reports and any supporting data used to support conclusions of the expert report		
	Field data sheets detailing survey information including prevailing conditions, date, time, equipment used, etc		

BAM Reference	Information	BDAR Section	Completed
<b>Prescribed impacts Chapter 6</b>	<ul style="list-style-type: none"> <li>Digital shape files of prescribed impact feature locations</li> <li>Prescribed impact features map in jpeg format</li> </ul>		

**Minimum information requirements for the BDAR or BCAR – Stage 2: Impact assessment (biodiversity values)**

BAM Reference	Information	BDAR Section	Completed
<b>Report</b>			
<b>Avoid and minimise impacts – Chapter 7</b>	Demonstration of efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with Chapter 7, including an analysis of alternative: <ul style="list-style-type: none"> <li>modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology</li> <li>routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route</li> <li>alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location</li> <li>alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site</li> </ul>	<b>2, Table 8, Table 9</b>	✓
	Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design (as described in BAM Subsections 7.1.2 and 7.2)	<b>2, Table 8, Table 9</b>	✓
	Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal (as described in BAM Subsection 7.2.1(3.))	<b>2, Table 8, Table 9</b>	✓
<b>Assessment of Impacts - Chapter 8, Section 8.1 and 8.2</b>	Determine the impacts on native vegetation and threatened species habitat, including a description of direct impacts of clearing of native vegetation, threatened ecological communities and threatened species habitat (as described in BAM Section 8.1)	<b>2.2, Table 10</b>	✓
	Assessment of indirect impacts on vegetation and threatened species and their habitat including (as described in BAM Section 8.2): <ul style="list-style-type: none"> <li>description of the nature, extent, frequency, duration and timing of indirect impacts of the proposal</li> <li>documenting the consequences to vegetation and threatened species and their habitat including evidence-based justifications</li> <li>reporting any limitations or assumptions, etc. made during the assessment</li> <li>identification of the threatened entities and their habitat likely to be affected</li> </ul>	<b>2.2, Table 12</b>	✓
	Assessment of prescribed biodiversity impacts (as described in BAM Section 8.3) including: assessment of the nature, extent and duration of impacts on the habitat of threatened species or ecological communities associated with: <ul style="list-style-type: none"> <li>karst, caves, crevices, cliffs, rocks and other features of geological significance</li> <li>human-made structures</li> <li>non-native vegetation</li> </ul>	<b>2.2, Table 11</b>	✓

BAM Reference	Information	BDAR Section	Completed
	<ul style="list-style-type: none"> <li>connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range</li> <li>movement of threatened species that maintains their life cycle</li> <li>water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities</li> </ul> <p>assessment of the impacts of wind turbine strikes on protected animals</p> <p>assessment of the impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC</p>		
<b>Mitigation and Management of Impacts - Chapter 8, Section 8.4 and 8.5</b>	Identification of measures to mitigate or manage impacts in accordance with the recommendations in BAM Sections 8.4 and 8.5, including: <ul style="list-style-type: none"> <li>techniques, timing, frequency and responsibility</li> <li>identify measures for which there is risk of failure</li> <li>evaluate the risk and consequence of any residual impacts</li> <li>document any adaptive management strategy proposed</li> </ul>	<b>2.1, Table 10 to 13</b>	✓
	Identification of measures for mitigating impacts related to: <ul style="list-style-type: none"> <li>displacement of resident fauna (as described in BAM Subsection 8.4.1(2.))</li> <li>indirect impacts on native vegetation and habitat (as described in BAM Subsection 8.4.1(3.))</li> <li>mitigating prescribed biodiversity impacts (as described in BAM Subsection 8.4.2)</li> </ul>	<b>2.1, Table 10 to 13</b>	✓
	Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (BAM Section 8.5)	<b>2.2</b>	✓
	Identification and assessment of impacts on TECs and threatened species that are at risk of a serious and irreversible impacts (SAIL, in accordance with BAM Section 9.1) including: <ul style="list-style-type: none"> <li>addressing all criteria in Subsection 9.1.1 for each TEC listed as at risk of an SAIL present on the subject land</li> <li>addressing all criteria in Subsection 9.1.2 for each threatened species at risk of an SAIL present on the subject land</li> <li>documenting assumptions made and/or limitations to information</li> <li>documenting all sources of data, information, references used or consulted</li> <li>clearly justifying why any criteria could not be addressed</li> </ul>	<b>2.3</b>	✓
<b>Impact Summary - Chapter 9</b>	Identification of impacts requiring offset in accordance with BAM Section 9.2	<b>2.3, Table 13</b>	✓
	Identification of impacts not requiring offset in accordance with BAM Subsection 9.2.1(3.)	<b>2.3.3</b>	✓
	Identification of areas not requiring assessment in accordance with BAM Section 9.3	<b>2.3.4</b>	✓
<b>Biodiversity credit report – Chapter 10</b>	Description of credit classes for ecosystem credits and species credits at the development or clearing site or land to be biodiversity certified (BAM Section 10.2)	<b>Appendix H</b>	✓
<b>Biodiversity certification offsets and strategy (biodiversity certification only) - Chapter 12 and Appendix J</b>	Land-based conservation measures including (strategic biodiversity certification only): <ul style="list-style-type: none"> <li>identification of parcels subject to land-based conservation measures</li> <li>identification of land-based conservation measures proposed for each parcel</li> <li>supporting information to demonstrate suitability of land-based conservation measures (Appendix J)</li> <li>credit score of land-based conservation measures (Appendix J)</li> </ul>	<b>NA</b>	✓
	Biodiversity certification strategy including: <ul style="list-style-type: none"> <li>land proposed for biodiversity certification</li> </ul>	<b>NA</b>	✓



BAM Reference	Information	BDAR Section	Completed
	<ul style="list-style-type: none"> <li>land proposed for biodiversity conservation</li> <li>proposed conservation measures</li> <li>legal mechanisms for securing delivery of proposed conservation measures</li> <li>parties to the biodiversity certification and responsibilities, noting where biodiversity certification agreements are proposed</li> <li>timing for delivery of conservation measures</li> <li>funding sources for delivery of conservation measures</li> <li>framework for monitoring, reporting or auditing implementation of conservation measures</li> </ul>		
<b>Maps</b>			
<b>Avoid and minimise impacts – Chapter 7</b>	Map of alternative footprints considered to avoid or minimise impacts on biodiversity values; and of the final proposal footprint, including construction and operation	NA	✓
	Maps demonstrating indirect impact zones where applicable	NA	✓
<b>Assessment of Impacts - Chapter 8, Section 8.1 and 8.2</b>	No Maps		
<b>Mitigation and Management of Impacts - Chapter 8, Section 8.4 and 8.5</b>	No Maps		
<b>Impact Summary – Chapter 9</b>	Map showing the extent of TECs at risk of an SAIL within the subject land	NA	✓
	Map showing location of threatened species at risk of an SAIL within the subject land	NA	✓
	Map showing location of: <ul style="list-style-type: none"> <li>impacts requiring offset</li> <li>impacts not requiring offset</li> <li>areas not requiring assessment</li> </ul>	Figure 4	✓
<b>Impact Summary - Chapter 10</b>	No Maps		
<b>Biodiversity credit report – Chapter 10</b>	No Maps		
<b>Biodiversity certification offsets and strategy (biodiversity certification only) - Chapter 12 and Appendix J</b>	Maps of parcels of land proposed for land-based conservation measures	Figure 4	✓
	Maps as per Appendix M as required in relation to any land-based conservation measures	NA	✓
<b>Tables</b>			
<b>Avoid and minimise impacts – Chapter 7</b>	Table of measures to be implemented to avoid and minimise the impacts of the proposal, including action, outcome, timing and responsibility	Tables 10 to 13	✓
<b>Assessment of</b>	Table showing change in vegetation integrity score for each vegetation zone as a result of identified impacts	Table 14	✓

BAM Reference	Information	BDAR Section	Completed
<b>Impacts – Chapter 8, Section 8.1 and 8.2</b>			
<b>Mitigation and Management of Impacts - Chapter 8, Section 8.4 and 8.5</b>	Table of measures to be implemented to mitigate and manage impacts of the proposal, including action, outcome, timing and responsibility	<b>Tables 10 to 13</b>	✓
<b>Impact Summary - Chapter 9</b>	No Tables		
<b>Impact Summary - Chapter 10</b>	Table of PCTs requiring offset and the number of ecosystem credits required	<b>Table 14</b>	✓
	Table of threatened species requiring offset and the number of species credits required	<b>NA</b>	
<b>Biodiversity credit report – Chapter 10</b>	Table of credit class and matching credit profile	<b>Appendix H</b>	✓
<b>Biodiversity certification offsets and strategy (biodiversity certification only)</b>	Tables as per Appendix M as required in relation to any land-based conservation measures	<b>NA</b>	✓
	Table of credit scores for land-based conservation measures, including scores produced by BAM and weighting adjusted scores as per Appendix J	<b>NA</b>	✓
<b>Data</b>			
<b>Avoid and minimise impacts – Chapter 7</b>	Digital shape files of: <ul style="list-style-type: none"> <li>• final proposal footprint</li> <li>• direct and indirect impact zones</li> </ul> Maps in jpeg format		
<b>Assessment of Impacts - Chapter 8, Section 8.1 and 8.2</b>	No data.		
<b>Mitigation and Management of Impacts - Chapter 8, Section 8.4 and 8.5</b>	No Data		
<b>Impact Summary - Chapter 9</b>	Digital shape files of: <ul style="list-style-type: none"> <li>• extent of TECs at risk of an SAI within the subject land</li> <li>• threatened species at risk of an SAI within the subject land</li> <li>• boundary of impacts requiring offset</li> <li>• boundary of impacts not requiring offset</li> <li>• boundary of areas not requiring assessment</li> </ul>		



BAM Reference	Information	BDAR Section	Completed
	Maps in jpeg format		
<b>Impact Summary - Chapter 10</b>	BAM credit report in pdf format		
<b>Biodiversity credit report – Chapter 10</b>	BAM credit report in pdf format		
<b>Biodiversity certification offsets and strategy (biodiversity certification only) - Chapter 12 and Appendix J</b>	Digital shape files of parcels of land proposed for land-based conservation measures		
	Maps in jpeg format		



## **Appendix I – CVs**

# BONNI YARE

## Curriculum Vitae

*Bonni works with AEP in the role of Ecologist. She is expected to graduate with a Bachelor of Science, majoring in Natural Resource Management in November 2020. Bonni has experience in a variety of environmental work, both paid and unpaid in, flora and fauna terrestrial and aquatic field surveys, reporting, GIS and mapping, habitat restoration and community volunteering.*

### Qualifications

- Bachelor of Science (Natural Resource Management) University of Newcastle, to be completed in November, 2020

### Further Education & Training

- Bush Regeneration Training
- NSW Driver's Licence: Car (Class "C").
- Chemqual (RTO 70207)
- First Aid (Provide first aid HLTAID003)

### Fields of Special Competence

- Ecological field survey, covering terrestrial and aquatic flora and fauna
- Growing proficiency at botanical surveys

### Relevant Employment History

<b>2019-present</b>	<p><b>Ecologist</b></p> <p>Anderson Environmental Planning, Newcastle</p> <p>Currently employed by Anderson Environment &amp; Planning to assist in the provision of consulting services to land, property, legal and government sectors. Covering ecological, project management, environmental, planning services, advices, strategy and representation.</p>
<b>2015-2016</b>	<p><b>Green Army Participant</b></p> <p>Bush regeneration/supporting local land care groups</p> <p>Supported local land care groups and reserve areas in weed removal and site restoration, also involved tree planting, seed collection and some nursery work. Bird surveying and koala surveys were also carried out.</p>

### Relevant Ecological Experience

<b>2018-present</b>	<b>Field assistance</b>
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Participated as a volunteer in various PhD and Honours projects with the University of Newcastle and University of Technology Sydney. I have experience with small mammal trapping for squirrel gliders, nest box construction, aquatic surveys and infaunal sampling, mark recapture population surveys for the Green and Golden Bell Frog.

**2019 Undergraduate Research Project associated with NPWS**

Undertook flora and habitat surveys for a locally threatened orchid, *Diuris praecox*, supervised volunteers, data analysis and project write up.

**2019 Volunteer Botanical Training Program**

Australian National Herbarium

Understanding of Herbarium practices, including fieldwork, use of databases, using maps and GPS, botanical terminology and up to date taxonomic information, curatorial experience including identification and processing of specimens.

**2018 Stream sampling using macroinvertebrates as bioindicators**

Newcastle Council

Contracted to finish stream sampling for the community program, Waterbug Blitz, which involved water quality testing of Newcastle's urban streams.



# Chris Wark

## Curriculum Vitae

*Chris is an Ecologist with AEP. He has been involved in ecology for the past 15 years both in the UK and Australia. Chris has previously worked as a research technician, research assistant and ecological consultant and has worked on numerous other ecological programs.*

### Personal Details

Full Name: Christopher Wark  
 Email: [chris@andersonnep.com.au](mailto:chris@andersonnep.com.au)  
 Phone Mobile: 0468601393

### Qualifications

- Diploma of Conservation and Land Management (2017)
- Bachelor of Teaching (Secondary School), University of Technology, NSW (2008)
- Bachelor of Science Hons (Ecology and Zoology), University of Sydney (2004)
- Bachelor of Science (Cell Biology and Biochemistry), University of Newcastle (2000)

### Relevant Further Education & Training

- QLD WHS General Construction Induction (White Card)
- NSW Class C Driver's Licence
- Experienced 4wd operator

### Fields of Special Competence

- Land conservation management
- Ecological field survey, covering terrestrial flora and fauna
- Arid zone ecology and feral cat management

### Professional Affiliations / Memberships (past / present)

- BTO Ringers association
- CIEEM (Chartered Institute of Ecology and Environmental Management)
- The Ratcatchers desert ecology group

### Relevant Employment History

<b>2018 – present</b>	<b>Ecologist</b>
	Anderson Environment & Planning, Environment & Planning Consultants, Newcastle

<b>2013 – 2017</b>	<b>Ecological consultant</b> Applied Ecology Ltd, Cambridge UK
<b>2012</b>	<b>Laboratory and Field Technician</b> Cygnet Potato Breeders, Cambridge, UK
<b>2009 – 2011</b>	<b>Secondary School Teacher</b> Taylors College, Waterloo, Sydney
<b>2005 – 2007</b>	<b>Research Assistant and University Tutor</b> Biological Sciences, University of Sydney, Sydney, NSW

**Relevant Ecological Experience**

Volunteer Bat surveys with Cambridge Bat group

Volunteer Fieldwork with NPWS – Brush tailed Rock wallaby habitat surveys

Volunteer ecology work with Ratcatchers desert ecology group in arid zone Australia

Volunteer Fieldwork with University of Sydney PhD candidates across numerous ecological projects

# FRANCES O'BRIEN

## Curriculum Vitae

*Frances is an Ecologist with AEP. For the past 13 years, she has worked in the fields of conservation land management, bush regeneration, wildlife rescue and rehabilitation, environmental sustainability, and public interest environmental law.*

### **Personal Details**

Full Name: Frances O'Brien  
 Email: [frances@andersonnep.com.au](mailto:frances@andersonnep.com.au)  
 Phone Mobile: 0420 898 606

### **Qualifications**

- Master of Environmental Law, University of Sydney, New South Wales (2017)
- Graduate Diploma of Legal Practice, Australian National University, Australian Capital Territory (2016)
- Bachelor of Environment (Climate Science) with Bachelor of Laws, Macquarie University, NSW (2013)

### **Relevant Further Education & Training**

- NSW Biodiversity Accredited Assessment Scheme (BAAS) - 20013
- NSW WHS General Construction Induction (White Card)
- NSW Class C Driver's Licence
- Advanced Plant Identification (University of New South Wales)
- First Aid in Remote Situations Certificate
- Bush Regeneration Training
- Wildlife Rescue and Care (Hunter Wildlife Rescue) with additional Snake training
- Wildlife Rescue and Care (Sydney Metropolitan Wildlife Services) with additional Possum and Echidna training

### **Fields of Special Competence**

- Botanical surveys including BAM transects
- Land conservation management
- Threatened fauna surveys, including koalas and frogs
- Environmental law and policy
- Climate impacts

### **Professional Affiliations / Memberships (past / present)**

- Professionals Australia (Member)
- Hunter Community Environment Centre (Managing Committee)
- Hunter Intrepid Landcare (Group Facilitator)
- Hunter Wildlife Rescue (Rescuer)

- Wahroonga Waterways Landcare (Group Coordinator for 3 years)
- Sydney Metropolitan Wildlife Services
- Lane Cove National Park Bushcare
- Ku-ring-gai Municipal Council Bushcare
- Young Lawyers NSW

### **Relevant Employment History**

<b>2018 – present</b>	<b>Ecologist</b> Anderson Environment & Planning, Newcastle
<b>2014 – 2017</b>	<b>Environmental Officer</b> Seventh-day Adventist Aged Care (Greater Sydney) Ltd, Sydney
<b>2014</b>	<b>Environmental Journalist</b> <i>The Australian Bulletin</i> (online), Sydney
<b>2012 – 2013</b>	<b>Indigenous Tutoring Assistance Scheme Environmental Tutor</b> Warawara, Department of Indigenous Studies, Macquarie University, Sydney
<b>2012 – 2013</b>	<b>Research Assistant</b> Centre for International and Environmental Law, Macquarie University, Sydney
<b>2012</b>	<b>Scientist</b> Forestry Division, Department of Agriculture, Fisheries and Forestry, Canberra
<b>2011</b>	<b>Scientist</b> Climate Impacts, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra

## Natalie Black

### Curriculum Vitae

*Natalie works with AEP in the role of Senior Environmental Manager. She has extensive knowledge in environmental management, environmental planning, and report writing and assessment. With a detail understanding of planning, catchment management, coastal management and rehabilitation. Natalie has had a successful career with both state and local government in conservation, planning and field investigation roles. Natalie has also gained extensive communication skills and project management through her previous career in lecturing. Her background and experience in the ecological and planning fields is utilised in a diverse array of application in her current role.*

#### Qualifications

- B.Sc (Hons), University of Newcastle, 2002 Sustainable Resource Management and Marine Science.
- Master Planning, University of Technology Sydney 2007.
- Certificate IV Training and Assessment at NSW TAFE 2012.
- BAM Assessor; accreditation number: BAAS19076.

#### Certification

- Evidence Gathering and Legal Process (Australian Institute of Environmental Health).
- Conflict Resolution Course (LGSA).
- Report Writing Course (LGSA).
- Powerful Presentation (LGSA).
- NSW Rural Fire Services Bush Fire Assessment
- Relocation of Threatened Species (Botanical Gardens Sydney).
- Sustainable Home Assessment Reduction Revolution.
- Flora and Fauna Survey Assessments Niche Environment and Heritage.
- First Aid TAFE.

#### Fields of Special Competence

- Environmental Planning
- Environmental Management and rehabilitation of catchments coastal waterways. Statement of Environmental Effects (preparation and assessing).
- Fish Passage
- Marine ecosystems including; mangroves, seagrasses, algae, Fauna and habitat assessment.
- vegetation.
- Communicating with a wide range of stakeholders.
- Development Application.
- Education in both Environmental and Planning industries.
- Koala Plans of Management.
- Policy Development.

#### Employment History

2019 to present AEP Senior Environmental Manager

2010 to 2019

Natalie Black is the Principal Environmental Planner for Black EARTH Environmental. Working a range of projects, Bush Fire Assessments, Landscaping, Development Applications, Statements of Environmental Effect's, Environmental Management Plans, Sustainability Assessment of both private and businesses, sustainable gardens, environmental assessments for proposed projects and environmental advice and volunteering for local Sustainable Community Group and Landcare. During this time Natalie also lectured at Hunter TAFE teaching a range of environmental units both face to face and on-line to a varying range of qualification and levels.

#### 2003 to 2010

Natalie was the Natural Resource Manager and Development Assessment Officer at Lismore City Council working with diverse range of professions such as engineers, town planners, environmental health officer, accountants, building surveyors, arborists, councillors. During this time the main projects were grants application, restoration projects, flora and fauna assessments, environmental legal adviser, bush fire assessments, strategic work, development application assessment (ranging from sheds to Designated Developments) and council development application team for internal projects, Council's for climate change, water wise programs and others.

2002 to 2003 was a step into the Policy unit within DPI where Natalie was part of the team working on the Jervis Bay Indigenous Fishing Strategy, and the closure of Port Botany. Dealing with many stakeholders and running workshops with Ministers and community. During 2003 with Natalie was the North Coast Fish Passage Officer. Managing an Environmental Trust Grant of \$1 million to remove 50 structures that block fish passage within the catchments of the North Coast. This project had all 50 sites contracted by the end of the 12 months with 70% of these projects commenced. This role allowed for the development of field assessments, independent work and communication with a range of stakeholders.

2000 saw the commencement of Natalie's career with NSW Department of Primary Industries (Fisheries Unit) in the Office of Conservation in Sydney. Natalie was part of the Conservation team that reviewed integrated development applications in the Sydney Region, with a focus on the seagrasses present within the estuaries. The assessments ranged from jetties to the Lane Cove Tunnel, North West T-Way and the expansion of the M7 and fish ladders.

BSc Honours Project was research paper into the variations of *Zostera capricorni* wrack located within the Tuggerah Lakes system in comparison to Brisbane Waters and Lake Macquarie.



# Stevie Kay

## Curriculum Vitae

*Stevie works with AEP in the role of Ecologist. Whilst studying at the University of Newcastle he conducted ecological field studies as a requirement of his degree courses. Working for NSW Department of Primary Industries (NSW DPI) at Port Stephens Fisheries Institute he gained further experience in ecological field surveys as a field technician and project officer. He has experience in targeted fauna and flora surveys, Koala Spot Assessment Technique (SAT) surveys and tree surveys.*

### Qualifications

- Bachelor of Science (Marine Science), University of Newcastle (2003)

### Licences/Certificates

- Senior First Aid
- Class C NSW Drivers Licence
- Work at Heights
- 4WD Safe Driving
- Construction White Card

### Field Survey Experience

- Aquatic vegetation and fish survey
- Terrestrial fauna survey, including koala SAT surveys and spotlighting

### Volunteer Experience

- Bush Regeneration Volunteer, Hunter Indigenous Plants
- Permaculture Design, various locations

### Employment History

Feb 2020 – Current	<b>Ecologist</b> Anderson Environment & Planning, Newcastle
Nov 2016 – May 2017	<b>Observer</b> NSW DPI Fisheries
Jan 2002 – Feb 2009	<b>Technician/Project Officer</b> NSW DPI Fisheries
Sept 2010 – Feb 2020	<b>Facilitator</b> Pinnacle Team Events

## Tim Mouton

### Curriculum Vitae

*Tim works with AEP in the role of Ecologist. Tim has over 10 years of professional experience managing projects in the fields of ecology, natural area restoration, biodiversity conservation, community education, and construction environmental management. Tim also has 5 years experience working in the field as a bush regenerator.*

#### Qualifications

- Bachelor of Environmental Science University of Newcastle (2001)
- Conservation Land Management Certificate II Tafe (2003)
- Master of Environmental Science Southern Cross University (2008)

#### Further Education & Training (select summary)

- Biodiversity Assessment Methodology (BAM) Accredited Assessor (BAAS: 19083)
- NSW Class C Driver's Licence. Experienced 4WD operator.
- OH&S NSW White Card
- Erosion & Sediment Control Training (4 day Blue Book course / CPESC)
- Feral Animal Control training (1080 & Pindone baiting)
- Certificate 3 in Chemical Application (AQF3)

#### Fields of Special Competence

- Ecological field survey, covering terrestrial and aquatic flora and fauna
- Highly proficient at botanical surveys and establishing monitoring programs
- Project Management and auditing
- Restoration Science

#### Professional Affiliations / Memberships (past / present)

- Board of Management member for Worimi Conservation Lands (NPWS & Worimi LALC)
- Certified Practitioner in Erosion & Sediment Control (CPESC) (not currently active)

**Relevant Employment History****2019-present      Ecologist**

Anderson Environment &amp; Planning, Newcastle

Currently employed by Anderson Environment & Planning to assist in the provision of consulting services to land, property, mining industry, legal and government sectors. Covering ecological, project management, environmental, planning services, advices, strategy and representation.

**2015-2018      Senior Project Officer / Ecologist**

Conservation Volunteers Australia / WetlandCare Australia

- Project managing on-ground restoration works including revegetation, site stabilisation, weed control and bush regeneration.
- Facilitating community engagement events, and supervision of volunteers.
- Undertaking site assessments, ecological surveys, and preparing plans of management.
- Scoping and preparing grant applications, managing all aspects of grant delivery, budgets, and reporting.

**2009-2015      Senior Ecologist / Environmental Scientist**

Onsite Environmental Management

- Undertaking and project managing detailed environmental assessments including flora and fauna surveys, threatened species assessments, management plans and monitoring reports.
- Environmental site management, monitoring and compliance auditing on large scale infrastructure projects and extractive industries.

**2008-2009      Bush Regenerator / Leading Hand**Lane Cove Council  
Australian Wetlands

- Undertaking bush regeneration activities including removal of environmental/noxious weeds, track construction and maintenance, native seed collection and propagation, fire assisted regeneration, feral animal control and supervision and training of volunteers.
- Supervising bush regeneration and weed management teams.
- Undertaking large scale revegetation works on infrastructure projects involving mass tubestock planting, site stabilisation and maintenance weeding.

**2006-2007      Ecologist / Environmental Scientist**

GeoLINK Consulting

- Undertaking and project managing detailed environmental assessments including flora and fauna surveys, threatened species assessments, management plans and monitoring reports.
- Monitoring and analysis of wetland, groundwater, and domestic wastewater systems.

**2002-2006      Bush Regenerator / Leading Hand**Gondwana Bush Restoration  
Willoughby City Council

- Undertaking bush regeneration activities including removal of environmental/noxious weeds, track construction and maintenance, native seed collection and propagation, fire assisted regeneration, feral animal control and translocation of vegetation.
- Supervision and training of bush regeneration teams and volunteers.

**2001-2002      John Holland Construction**  
Environmental Officer

- Environmental site management and monitoring and reporting on large scale infrastructure projects.

**Relevant Volunteer Experience**

**2014 - Current      Burwood Beach Coastcare - Facilitator (Volunteer)**

Supporting and managing volunteers, on-ground works, promotion and funding opportunities on a monthly basis, to undertake conservation and restoration activities within Glenrock State Conservation Area (NPWS estate).

**2013 - 2016      Humane Society International – EPBC Act Nomination Support**

Preparation of Threatened Ecological Community (TEC) nominations under the Commonwealth Environment Protection and Biodiversity Conservation Act, 1999 (EPBC Act).