1 Larapinta Place, Glenhaven

Biodiversity Development Assessment Report

Hills Awqaf Pty Ltd

4 July 2019

Final

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Report No. 18010RP1

The preparation of this report has been in accordance with the brief provided by the Client and has relied upon the data and results collected at or under the times and conditions specified in the report. All findings, conclusions or commendations contained within the report are based only on the aforementioned circumstances. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted by Cumberland Ecology.

Version	Date Issued	Amended by	Details
1	4 July 2019	MD/JL/CE	Final issued to client

Approved by:	**Dr David Robertson**
Position:	Director
Signed:	
Date:	4 July, 2019

Table of Contents

Table of Tables

Table of Photographs

Table of Appendices

Table of Figures

Glossary

APZ	Asset Protection Zone
Assessment area	Area of land within a 1500 m buffer around the outer boundary of the subject land
AHD	Australian Height Datum
BAAS	Biodiversity Assessor Accreditation System
BAM	Biodiversity Assessment Method
BC Act	*Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
°C	Degrees Celsius
CEEC	Critically Endangered Ecological Community
Development site	Areas directly impacted as part of the Project
DoEE	Commonwealth Department of the Environment and Energy
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
GIS	Geographic Information System
GPS	Global Positioning System
ha	Hectares
IBRA	Interim Biogeographic Regionalisation for Australia
IPZ	Inner Protection Zone
km	kilometres
LGA	Local Government Area
NSW	New South Wales
MNES	Matters of National Environmental Significance
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
PMST	Commonwealth Protected Matter Search Tool
the Project	The proposed construction of a Mosque, landscaping, associated infrastructure and an APZ
RFS	NSW Rural Fire Service
SAII	Serious and Irreversible Impacts
SEPP	State Environmental Planning Policy
Subject land	The allotment of land subject to this BAM assessment. Lot 7 DP 249716.

TEC	Threatened Ecological Community

Executive Summary

S1 Introduction

Cumberland Ecology was commissioned by Hills Awqaf Pty Ltd (the 'proponent') to prepare a Biodiversity Development Assessment Report (BDAR) for a proposed development at 1 Larapinta Place, Glenhaven New South Wales (NSW) (the 'Project'). The Project involves the construction of a mosque and associated infrastructure. This BDAR will form part of the required documentation to support an application for Local Development Consent under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

Under the NSW *Biodiversity Conservation Act 2016* (BC Act), all development that requires development consent under Part 4 of the EP&A Act that exceeds the Biodiversity Offset Scheme (BOS) thresholds as set out in Sections 7.1 to 7.3 of the NSW *Biodiversity Conservation Regulation 2017* must be assessed using the Biodiversity Assessment Method (BAM) with the results presented in a BDAR. The Project has been determined to exceed the BOS threshold of clearing of native vegetation on land included on the 'Biodiversity Values Map' (Section 7.3 NSW *Biodiversity Conservation Regulation 2017*) and therefore a BDAR has been prepared.

The purpose of this BDAR is to document the findings of an assessment undertaken for the Project in accordance with Stage 1 (Biodiversity Assessment) and Stage 2 (Impact Assessment) of the BAM.

S2 Background

The Project is located at 1 Larapinta Place, Glenhaven, NSW, also known as Lot 7 DP 249716 (hereafter referred to as the "subject land"). The subject land is located approximately 5.2 km to the east of the Rouse Hill Town Centre, 4.6 km to the northwest of the Castle Hill Town Centre and occurs within The Hills Shire Local Government Area (LGA). The entire subject land covers an approximate area of 2.03 hectares (ha).Of the 2.03 ha, approximately 1.17 ha is proposed to be directly impacted by the Project, as part of the proposed development envelope and Asset Protection Zone (APZ) (collectively known as the "development site"). The 1.17 ha area to be impacted consists of remnant native vegetation, planted native vegetation, exotic vegetation and cleared land.

The subject land is generally bounded by residential lots to the east, Glenhaven road to the south, Larapinta Place to the west and a partially cleared residential lot to the north containing remnant vegetation. The subject land is zoned as RU6 – Transition under *The Hills Shire Council Local Environment Plan 2012*

The Project involves a development across a portion of the subject land. The Project will include the following components:

- Demolition of the existing dwelling and associated structures within the development site;
- Construction of a two storey Mosque and basement and associated parking areas;
- Construction of car access from Larapinta Drive and pedestrian access from Glenhaven Road;
- Establishment of landscape elements surrounding the Mosque including turfed areas, boundary plantings, garden beds and understorey reinstatement in select areas;

- Construction of a Leaky Wall Nutrient Retention Wetland to be planted with native wetland species;
- Establishment of onsite wastewater disposal areas;
- Establishment of an Asset Protection Zone (APZ) extending approximately 85 m from the edge of the proposed Mosque; and
- Establishment of 5 m exclusion zones surrounding the two threatened flora (*Darwinia biflora*) individuals within the APZ;

S3 Landscape Features

As the project is being assessed as a site-based project, the assessment area comprises the area of land within a 1,500 m buffer around the outer boundary of the subject land. A summary of the landscape features identified within the assessment area are detailed below:

- Native vegetation covers 52.39% of the assessment area;
- First, second, third and fourth order watercourses have been identified within the assessment area. One first order watercourse occurs within the northern portion of the subject land and flows northward.
- There are substantial tracts of native vegetation throughout the assessment area associated with the courses of Cattai Creek and Dooral Dooral Creek. These vegetated areas provide the majority of habitat connectivity within the assessment area. There is local connectivity between the native vegetation of the subject land and the large contiguous area of native vegetation north of the subject land.
- No karsts, caves, crevices cliffs or areas of geological significance were identified within the assessment area; and
- No Areas of Outstanding Biodiversity Value as declared by the Minister for the Environment were identified within the assessment area.

S4 Native Vegetation

The development site has been subject to detailed flora surveys by Cumberland Ecology for the purpose of this BDAR. Vegetation surveys included vegetation mapping, identification of Plant Community Types (PCTs), completion of four BAM plots, targeted threatened flora searches, detailed habitat assessments, as well as assessment of vegetation patches against the Final Determinations for Threatened Ecological Communities (TECs) with potential to occur.

Native vegetation occupies approximately 0.63 ha (54%) of the development site, and includes one PCT in two broad condition states that align to the following community:

- 1083 - Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion

PCT 1083 does not conform to a Threatened Ecological Community (TEC); under the NSW *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The remainder of the development site consists of non-native vegetation and cleared areas, comprising a 0.53 ha area (46%). In accordance with Section 5.1.1.5 of the BAM, the areas of cleared land do not require further assessment, unless they provide habitat for species credit species or are proposed for restoration as part of an offset.

S5 Threatened Species

The BAM Calculator generates a list of species credit species requiring assessment utilising a number of variables. The predicted ecosystem credit species for the two vegetation zones within the development site produced a list of 32 ecosystem credit species and 63 species credits. No ecosystem credit species were removed from further assessment. Of the 63 species credit species identified by the BAM Calculator, 40 were removed from further assessment as they were considered unlikely to occur.

Targeted threatened flora surveys detected the presence of the threatened plant species *Darwinia biflora* within the subject land and the development site. This species is listed as Vulnerable under both the BC Act and the EPBC Act. A total of two individuals were found within the development site throughout PCT 1083. *Eucalyptus* sp. Cattai was thought to occur within the development site by a previous consultant but has since been identified as *Eucalyptus notabilis* <-> *resinifera* subsp. *resinifera* intergrade following identification by Cumberland Ecology and formal analysis by the Royal Botanical Gardens (See **Appendix D**). Of the remaining potentially occurring threatened flora and fauna species credit species, the Square-tailed Kite, the Southern Myotis, the Red-crowned Toadlet, the Large-Eared Pied Bat, the Bush-Stone Curlew, and *Tetratheca glandulosa* were assumed to be present within the development site due to survey periods not aligning with the timing of the Project.

S6 Prescribed Impacts

The project is considered to potentially result in the following prescribed impacts:

- Removal of rocky habitat;
- Reduced connectivity of different areas of habitat that facilitates movement across a species range; and
- Impacts on water quality, water bodies, and hydrological processes.

S7 Avoid and Minimise Impacts

A number of measures to avoid and minimise the potential impacts of the development have been applied during the design process. The development envelope is positioned over an area within the subject land containing the lowest biodiversity values, consisting predominantly of an existing dwelling, cleared areas, exotic grassland, exotic trees, garden beds and some scattered native trees, including some non-endemic native species. In doing so, the Project has considered the biodiversity values of the vegetation within the subject land and has demonstrated reasonable steps to avoid and minimise impacts based upon the Project location within the subject land.

Direct impacts have been completely avoided throughout the 0.83 ha area of Red Bloodwood - scribbly gum heathy woodland and the 0.03 ha artificial wetland within the northern portion of the subject land. Additionally, a 0.35 ha area of Red Bloodwood - scribbly gum heathy woodland and a 0.07 ha area of scattered native trees will be partially retained throughout the APZ and incorporated into the landscaping of the Project respectively.

The Project will avoid and minimise direct impacts on clearing of native vegetation and habitat by:

- Locating the development envelope predominantly in areas where there are lower biodiversity values (such as previously cleared areas);
- Selective retention of habitat features and canopy species within the APZ;
- Situating the development envelope to avoid clearing of native vegetation and rocky habitat where possible; and
- Locating the project in the southern portion of the subject land to reduce impacts to waterways.

S8 Impact Assessment

S8.1 Direct Impacts

The primary and direct impact resulting from the proposed development is the loss of vegetation and associated habitat within the subject land.

One native vegetation community; PCT 1083 in two broad condition states, will be impacted as a result of the Project. Within this PCT, 0.23 ha will be completely cleared to establish the development envelope, with 0.42 ha to be partially cleared or modified to meet the APZ requirements of the Bushfire Assessment. A further 1.70 ha area of land will be impacted, comprising exotic planted vegetation, exotic grassland and cleared land.

The Project will result in the loss of all habitat features within the development envelope, comprising three hollow-bearing trees and a log. Within the APZ, a further two hollow-bearing trees, a stag and two trees containing stick nests occur that will be prioritised for retention where feasible providing they can safely be preserved and comply with the Bushfire Assessment Report's guidelines relating to establishing the APZ. The remaining habitat features within the subject land will be retained.

S8.2 Indirect Impacts

The following indirect impacts to native vegetation and habitat may occur as a result of the Project:

- Inadvertent impacts on adjacent habitat or vegetation;
- Reduced viability of adjacent habitat due to edge effects;
- Reduced viability of adjacent habitat due to noise, dust or light spill; and
- Inadvertent impacts to hydrological processes.

S8.3 Mitigation Measures

The following measures will be undertaken to mitigate impacts to native vegetation and habitat prior to and during construction:

- Measures to limit the impact of construction:
- Appropriate timing of construction works;
- Delineation of clearing areas;

- Pre-clearance surveys;
- Sedimentation control measures; and
- Weed management.

The project is considered unlikely to result in any uncertain impacts that require adaptive management as listed in Section 9.4.2 of the BAM.

S9 Offset Liability

As the project includes the removal of some areas of native vegetation, offsets are required in the form of both ecosystem credits and species credits. This assessment indicated that the removal of the native vegetation within the subject land requires a total of 12 ecosystem credits for PCT 1083 and a total of 95 species credits for *Darwinia biflora*, the Square-tailed Kite, the Southern Myotis, the Red-crowned Toadlet, the Large-Eared Pied Bat the Bush-Stone Curlew, and *Tetratheca glandulosa*.

S10 Conclusion

With the implementation of the proposed mitigation measures and the purchase and retirement of biodiversity credits described previously, it is considered that the impacts of this project on biodiversity will be minimal and can be appropriately managed.

1. Introduction

Cumberland Ecology was commissioned by Hills Awqaf Pty Ltd (the 'proponent') to prepare a Biodiversity Development Assessment Report (BDAR) for a proposed development at 1 Larapinta Place, Glenhaven New South Wales (NSW) (the 'Project'). The Project involves the construction of a mosque and associated infrastructure. This BDAR will form part of the required documentation to support an application for Local Development Consent under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

1.1. Requirement for BDAR

Under the NSW *Biodiversity Conservation Act 2016* (BC Act), all development that requires development consent under Part 4 of the EP&A Act that exceeds the Biodiversity Offset Scheme (BOS) thresholds as set out in Sections 7.1 to 7.3 of the NSW *Biodiversity Conservation Regulation 2017* must be assessed using the Biodiversity Assessment Method (BAM) with the results presented in a BDAR. The Project has been determined to exceed the BOS threshold of clearing of native vegetation on land included on the Biodiversity Values Map (Section 7.3 NSW *Biodiversity Conservation Regulation 2017*) and therefore a BDAR has been prepared.

1.2. Purpose

The purpose of this BDAR is to document the findings of an assessment undertaken for the Project in accordance with Stage 1 (Biodiversity Assessment) and Stage 2 (Impact Assessment) of the BAM. Specifically, the objectives of this BDAR are to:

- Identify the landscape features and site context (native vegetation cover) within the subject land and assessment area;
- Assess native vegetation extent, plant community types (PCTs), threatened ecological communities (TECs) and vegetation integrity (site condition) within the subject land;
- Assess habitat suitability for threatened species that can be predicted by habitat surrogates (ecosystem credits) and for threatened species that cannot be predicted by habitat surrogates (species credit species);
- Identify potential prescribed biodiversity impacts on threatened species;
- Describe measures to avoid and minimise impacts on biodiversity values and prescribed biodiversity impacts during project planning;
- Describe impacts to biodiversity values and prescribed biodiversity impacts and the measures to mitigate and manage such impacts;
- Identify the thresholds for the assessment and offsetting of impacts, including:
    - Impact assessment of potential entities of serious and irreversible impacts (SAII);
    - Impacts for which an offset is required;
    - Impacts for which no further assessment is required;
- Describe the application of the no net loss standard, including the calculation of the offset requirement.

1.3. Project Description

1.3.1. Location

The Project is located at 1 Larapinta Place, Glenhaven, NSW, also known as Lot 7 DP 249716 (hereafter referred to as the "subject land"). The subject land is located approximately 5.2 km to the east of the Rouse Hill Town Centre, 4.6 km to the northwest of the Castle Hill Town Centre and is located within The Hills Shire Local Government Area (LGA).The subject landcovers an approximate area of 2.03 hectares (ha) Of this area, approximately 1.17 ha is proposed to be impacted by the Project within the proposed development envelope and APZ, consisting of native vegetation, exotic vegetation and cleared land.

The subject land is generally bounded by residential lots to the east, Glenhaven road to the south, Larapinta Place to the west and a partially cleared residential lot to the north containing remnant vegetation. The subject land is zoned as RU6 – Transition under *The Hills Shire Council Local Environment Plan 2012*

A site map and location map have been prepared in accordance with the BAM and are presented in **Figure 1** and **Figure 2**, respectively.

1.3.2. Project Overview

The Project involves a development across a portion of the subject land. The Project will include the following components:

- Demolition of the existing dwelling and associated structures within the development site;
- Construction of a two storey Mosque and basement and associated parking areas;
- Construction of car access from Larapinta Drive and pedestrian access from Glenhaven Road;
- Establishment of landscape elements surrounding the Mosque including turfed areas, boundary plantings, garden beds and understorey reinstatement in select areas;
- Construction of a Leaky Wall Nutrient Retention Wetland to be planted with native wetland species;
- Establishment of onsite wastewater disposal areas;
- Establishment of an Asset Protection Zone (APZ) extending approximately 85 m from the edge of the proposed Mosque; and
- Establishment of 5 m exclusion zones surrounding the two threatened flora (*Darwinia biflora*) individuals within the APZ;

1.3.3. Identification of the Development Site Footprint

The layout of the Project is shown in **Figure 3**. The development site footprint comprises the area of land directly impacted by the Project including the "development envelope" and the "APZ". It is assumed that the area within the development envelope will be completely cleared whilst it is assumed that the area within the APZ will be partially cleared to meet inner protection area specifications as set out in the associated bushfire report (Australian Bushfire Protection Planners PTY Limited 2019) The development envelope and APZ for the

Project are referred to hereafter as the "development site". For the purposes of this assessment, the development site comprises both the construction footprint and the operational footprint of the Project.

1.3.4. General Description of the Development Site and Subject Land

1.3.4.1. Historical and Present Land Use

The subject land has historically been used as a residential property. It consists of a mixture of cleared land, exotic garden vegetation, scattered native trees and patches of remnant native vegetation. Many of the surrounding properties have been historically modified for agriculture and rural residential development uses.

1.3.4.2. Topography and Soils

The subject land slopes gently downwards from the development site located at the Glenhaven Road/Larapinta Place intersection to the northern boundary. The highest elevation is on the eastern boundary at 102 m Australian Height Datum (AHD), dropping to 80 m AHD at its lowest point located at the gully head within the northern portion of the subject land.

The majority of the subject land falls within the Glenorie soil landscape, characterised by shallow to moderately deep red, red and brown podzolic soils on upper slopes and deep yellow and gleyed podzolic soils along drainage lines. This soil landscape is underlaid by Wianamatta Group Ashfied Shale and Bringelly Shale formations (Bannerman and Hazelton 1990).

A small south western portion of the subject land in falls within the Hawkesbury soil landscape, characterised by shallow, discontinuous lithosols/siliceous sands along rocky outcrops, earthy sands, yellow earths and locally deep sands inside benches, joins and fractures, yellow and red podzolic soils in association with shale lenses, with siliceous sands and secondary yellow earths occurring along drainage lines. This soil landscape is derived from Hawkesbury Sandstone geology (Bannerman and Hazelton 1990). fere

1.3.4.3. Hydrology

The subject land lies within the Hawkesbury/Nepean Rivers catchment. The hydrology of the subject land and surrounding properties has historically been modified as a result of agricultural and residential land uses, including clearing of native vegetation altering surface water runoff patterns.

An unnamed, Category 1 watercourse is present running northward parallel to the eastern boundary of the subject land. The watercourse originates within the northern portion of the subject land and is a tributary of Dooral Dooral Creek; a Category 4 watercourse downstream of the subject land. The drainage line within the subject land is ephemeral and would likely be fed by runoff from the subject land and neighbouring properties.

1.3.4.4. Vegetation

The vegetation within the subject land is comprised of a combination of exotic garden vegetation, exotic lawns and remnant native vegetation, including scattered trees along the southern boundary within the development site and a large patch extending out from the northern boundary into contiguous vegetation outside of the subject land. The remnant native vegetation within the subject land has been mapped as Sandstone Ridgetop Woodland under the remnant vegetation mapping for the Cumberland Plain: Western Sydney (OEH 2013b), and as a combination of Sandstone Gully Forest and Sandstone Heath under the Hills Shire Council Interactive

Mapping portal(The Hills Shire Council 2019). Surveys by Cumberland Ecology have identified the remnant vegetation of the subject land to conform to Plant Community Type (PCT) 1083 - Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux, which aligns most closely with the remnant vegetation mapping for the Cumberland Plain (OEH 2013b)

The vegetation of the subject land has been subject to historical clearing relating to the rural residential development, common throughout the surrounding area. It is considered that the cleared portions of the land would have likely once been composed of Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux vegetation prior to clearing.

1.4. Information Sources

1.4.1. Databases

A number of databases were utilised during the preparation of this BDAR, including:

- OEH BioNet Atlas;
- OEH Threatened Biodiversity Data Collection;
- OEH BioNet Vegetation Classification database;
- Commonwealth Department of the Environment and Energy (DoEE) Species Profile and Threat Database;
- DoEE Protected Matters Search Tool (PMST); and
- DoEE Directory of Important Wetlands in Australia.

1.4.2. Literature

This BDAR has utilised the results and/or spatial data from the following documents:

- The Remnant Vegetation of the Cumberland Plain (OEH 2013b);
- Biodiversity Development Assessment Report for a New Mosque at 1 Larapinta Place, Glenhaven (2019) GIS Environmental Consultants
- Arborist Report, 1 Larapinta Place, (2019), Valuation Solutions PTY LTD
- Amended Bushfire Protection Assessment for the proposed Mosque on Lot 7 in DP 249716, No. 1 Larapinta Place, Glenhaven (2019) Australian Bushfire Protection Planners PTY Limited

1.4.3. Aerial Photography

The aerial imagery utilised in this BDAR is sourced from NearMap and is dated 07/04/2019.

1.5. Authorship and Personnel

This document has been authorised by Dr David Robertson (BAM Accredited Assessor No: BAAS17027). This document and associated field surveys and Geographic Information Systems (GIS) mapping, was prepared with

the assistance of additional personnel as outlined in **Table 1**. Notwithstanding the assistance of the additional personnel, the assessment presented within this document is Dr Robertson's.

Table 1 Personnel

Name	Tasks	Relevant Qualifications / Training	BAM Accredited Assessor No.
Dr David Robertson	Document preparation, document review	Doctor of Philosophy. Ecology, University of Melbourne, 1986 Bachelor of Science (Honours) in Ecology, University of Melbourne, 1980 BAM Accredited Assessor Training. Muddy Boots, 2017	BAAS17027
Dr Trevor Meers	Document review	Doctor of Philosophy, Restoration Ecology. University of Melbourne, 2007 Bachelor of Applied Science (Honours) in Natural Resource Management. Deakin University, 2002 BAM Accredited Assessor Training. Muddy Boots, 2017	BAAS18119
Mikael Peck	Document Preparation	Master of Marine Science and Management. Macquarie University, 2013 Bachelor of Science. Washington State University, 2005 BAM Accredited Assessor Training. Muddy Boots, 2017	BAAS19002
Bryan Furchert	Field surveys, Document preparation	Bachelor of Biodiversity and Conservation. Macquarie University, 2012 Diploma of Conservation and Land Management. TAFE NSW, 2008 BAM Accredited Assessor Training. Muddy Boots, 2017	BAAS18095
Dr Rohan Mellick	Field surveys	Doctor of Philosophy, Evolutionary Ecology. The University of Adelaide, 2012 Bachelor of Applied Science (Honours) in Natural Resource Management, Southern Cross University, 2000. BAM Accredited Assessor Training. Muddy Boots, 2017	BAAS18075
Cecilia Eriksson	Field surveys, Document review	Master of Science (Major in Marine Science and Management). University of Technology Sydney, 2013 Bachelor of Science (Honours) in Marine Biology, University of Technology Sydney, 2008	-

Name	Tasks	Relevant Qualifications / Training	BAM Accredited Assessor No.
		BAM Accredited Assessor Training. Muddy Boots, 2017	
Michael Davis	Document preparation, figure preparation	Bachelor of Biodiversity and Conservation. Macquarie University, 2016 BAM Accredited Assessor Training. Muddy Boots, 2017	-
Jesse Luscombe	Figure preparation	Bachelor of Marine Science. Macquarie University, 2013 Certificate III in Conservation and Land Management. TAFE NSW, 2016 BAM Accredited Assessor Training. Muddy Boots, 2018	-

2. Methodology

2.1. Review of Existing Data

Existing information on biodiversity values within the assessment area were reviewed, which included the following:

- Survey data held in the Flora Survey (BioNet) including OEH Threatened Biodiversity Data Collection; and
- Existing vegetation mapping, presented in the Hornsby Shire Biodiversity Conservation Strategy (Hornsby Shire Council).
- Biodiversity Development Assessment Report for a New Mosque at 1 Larapinta Place, Glenhaven (2019) GIS Environmental Consultants

This existing information was considered and included, where appropriate, into survey design, vegetation mapping and reporting.

2.2. Flora Survey

Flora surveys were undertaken in the subject land by Cumberland Ecology on 13 June 2019. These surveys included vegetation mapping, vegetation integrity assessment and threatened flora species surveys. Further details on each type of survey are provided below.

2.2.1. Vegetation Mapping

Vegetation mapping of the subject land was undertaken by random meander searches throughout each patch of vegetation, noting key characteristics of areas in similar broad condition states such as similar tree cover, shrub cover, ground cover, weediness or combinations of these.

2.2.2. Vegetation Integrity Assessment

Vegetation integrity assessments were undertaken in the subject land in accordance with the BAM. Surveys included establishment of a 20 x 50 m plot within which the following data was collected:

- Composition for each growth form group by counting the number of native plant species recorded for each growth form group within a 20 m x 20 m plot;
- Structure of each growth form group as the sum of all the individual projected foliage cover estimates of all native plant species recorded within each growth form group within a 20 m x 20 m plot;
- Cover of 'High Threat Exotic' weed species;
- Assessment of function attributes within a 20 m x 50 m plot, including:
    - Count of number of large trees;
    - Tree stem size classes, measured as 'diameter at breast height over bark' (DBH);
    - Regeneration based on the presence of living trees with stems <5 cm DBH;
    - The total length in metres of fallen logs over 10 cm in diameter;

- Assessment of litter cover within five 1 m x 1 m plots evenly spread within the 20 m x 50 m plot; and
- Number of trees with hollows that are visible from the ground within the 20 m x 50 m plot.

A total of four BAM plots were undertaken within the subject land, with three performed within the development site. The location of BAM plots are shown in **Figure 4**. **Table 2** summarises the plot requirements based on the size and number of vegetation zones in the subject land. The vegetation in the development site has been mapped as comprising two vegetation zones, and as such, more than the minimum number of plots have been completed for each zone in addition to plots completed throughout areas of exotic vegetation.

Table 2 Plot survey requirements

Vegetation Zone	PCT	Condition	Area (ha)	Minimum Number of Plots Required	Number of Plots Completed
1	1083	Scattered_Trees	0.25	1	1
2	1083	Moderate_Good	0.38	1	2

2.2.3. Threatened Flora Species Survey

Targeted threatened flora surveys were undertaken for species credit species that have the potential to occur within the subject land as determined by the BAM Calculator. All targeted surveys were conducted using parallel field traverses in accordance with the NSW Guide to Surveying Threatened Plants (OEH 2016). **Figure 4** (see 'survey tracks') shows the locations of the targeted threatened flora surveys undertaken within the subject land.

The following flora species were targeted during surveys:

- *Acacia gordonii*
- *Acacia pubescens*
- *Asterolasia elegans*
- *Darwinia biflora*
- *Darwinia peduncularis*
- *Dillwynia tenuifolia*
- *Epacris purpurascens* var. *purpurascens*
- *Eucalyptus* sp. *Cattai*
- *Grevillea parviflora* subsp. *parviflora*
- *Grevillea parviflora* subsp. *supplicans*
- *Kunzea rupestris*

- *Leucopogon fletcheri* subsp. *fletcheri*
- *Melaleuca groveana*
- *Micromyrtus blakelyi*
- *Pimelea curviflora* var. *curviflora*
- *Prostanthera cineolifera*
- *Pultenaea parviflora*

2.2.4. Fauna Survey Methods

Detailed survey methods are described below and the locations of fauna surveys undertaken are provided in **Figure 4**.

Table 3 below shows the fauna survey effort, including dates and staff members involved.

2.2.4.1. Habitat Assessment

Habitat assessments were undertaken in the subject land by Cumberland Ecology on 13 June 2019. This survey identified any potential habitat features considered to be suitable for usage by native fauna such as significant rocky outcrops, bush rock, fallen logs, culverts, water bodies, decorticating bark, nests and hollow-bearing trees.

2.2.5. Survey Weather Conditions

All weather condition data was sourced from the BOM from weather stations located at Parramatta. The details of the weather for the survey dates are provided below:

- Friday 13th June 2019: 11.0 – 22.4 °C, 0 mm Rain

Table 3 Survey effort

Survey Detail	Date	Effort	Personnel
Vegetation integrity assessments	13/06/2019	12 person hours	Bryan Furchert and Cecilia Eriksson
Vegetation mapping	13/06/2019	2 person hours	Bryan Furchert and Dr Rohan Mellick
Threatened flora searches	13/06/2019	4 person hours	Bryan Furchert, Cecilia Eriksson and Dr Rohan Mellick

Survey Detail	Date	Effort	Personnel
Habitat assessment	13/06/2019	3 person hours	Cecilia Eriksson

3. Landscape Features

3.1. Site Context

3.1.1. Assessment Area

As the Project is being assessed as a non-linear project, the assessment area comprises the area of land within a 1,500 m buffer around the outer boundary of the development site. The location of the assessment area is shown in **Figure 2**.

3.1.2. Native Vegetation Cover

The native vegetation cover was determined through GIS mapping. To map native vegetation cover within the subject land and assessment area, this assessment utilised the detailed vegetation mapping prepared by Cumberland Ecology during the field surveys in conjunction with existing broad scale mapping for the remnant vegetation of the Cumberland Plain (OEH 2013b). The native vegetation cover within the assessment area is shown in **Figure 2**. Native vegetation occupies approximately 405.69 ha within the assessment area, which represents 52.39% of the assessment area. Therefore, the native vegetation cover value has been assigned to the cover class of 30–70%.

3.2. Landscape Features

Landscape features identified within the subject land and assessment area are outlined below. The extent of these features within the subject land is shown in **Figure 1** and the extent within the assessment area is shown in **Figure 2**.

3.2.1. IBRA Bioregions and IBRA Subregions

The subject land and assessment area occur within the Sydney Basin Interim Biogeographic Regionalisation for Australia (IBRA) Bioregion and within the Yengo IBRA Subregion.

3.2.2. Rivers, Streams and Estuaries

The subject land and assessment area occur within the Hawkesbury/Nepean catchment. One mapped watercourse occurs within the subject land, as an unnamed 1st order stream. As mentioned previously, this is a tributary of Dooral Dooral Creek; located downstream of the subject land in a northerly direction. Dooral Dooral Creek has several associated unnamed 1st and 2nd order tributaries within the assessment area, generally occurring north of the subject land as shown in **Figure 2**. Other watercourses occurring within the assessment area include Cattai Creek and its numerous unnamed 1st and 2nd order tributaries occurring south of the subject land as shown in **Figure 2**. Both Dooral Dooral Creek and Cattai Creek occur as 3rd order watercourses along the eastern and southern extents of the subject land respectively. For the majority of their occurrence throughout the assessment area, Dooral Dooral Creek and Cattai Creek are both classified as 4th order watercourses until Dooral Dooral Creek converges into Cattai Creek along the western extent of the subject land, where Cattai Creek continues as a 5th order watercourse.

3.2.3. Important and Local Wetlands

No important wetlands listed in the Directory of Important Wetlands in Australia are present in the subject land or assessment area. The closest important wetland identified by the Directory of Important Wetlands in

Australia is Longneck Lagoon and Pitt Town Lagoon, located approximately 15 km and 16 km to the north west of the subject land respectively.

A 0.03 ha local wetland occurs within the subject land in the form of a historical quarry that has since accumulated pooling water and been colonised by a combination of native and exotic wetland plants. This local wetland is hereafter referred to as the "artificial wetland" and is shown on **Figure 1**. Other similar Local Wetlands occur in the assessment area consisting of small farm dams on rural properties.

3.2.4. Habitat Connectivity

The subject land is in an environment dominated by rural-residential land use and is surrounded by many properties of this nature. There are substantial tracts of native vegetation throughout the assessment area associated with the courses of Cattai Creek and Dooral Dooral Creek. These vegetated areas provide the majority of habitat connectivity within the assessment area. There is local connectivity between the native vegetation of the subject land and the large contiguous area of native vegetation north of the subject land.

The remaining vegetation within the assessment area exists as a matrix of predominantly cleared and semi-cleared properties. The vegetation within the subject land has established connectivity such that it occurs within a large patch of native vegetation that exceeds 100 ha in area.

3.2.5. Karsts, Caves, Crevices, Cliffs and Areas of Geological Significance

No karsts, caves, crevices, cliffs or areas of geological significance have been identified within the assessment area based on searches of available aerial imagery from NearMap.

3.2.6. Areas of Outstanding Biodiversity Value

No Areas of Outstanding Biodiversity Value have been mapped within the assessment area.

3.2.7. Mitchell Landscapes

The subject land is located in the "Blaxland Ridges" Mitchell Landscape.

3.2.8. Soil Hazard Features

No soil hazard features have been identified within the subject land based on the hydrological landscape and soil capability mapping in OEH's eSPADE and Acid Sulfate Soils Risk Mapping (2019c) (ADD ASS REF).

4. Native Vegetation

4.1. Native Vegetation Extent

The development site has been subject to detailed surveys by Cumberland Ecology for the purpose of this BDAR. The native vegetation extent within the subject land was determined through aerial photograph interpretation and field surveys. The native vegetation extent within the development site is shown in **Figure 5**. It occupies approximately 0.63 ha, which represents approximately 54% of the development site. The native vegetation extent within the development site includes two native vegetation communities in two broad condition states.

The remaining land within the development site was previously cleared for residential development. In accordance with Section 5.1.1.5 of the BAM, the areas of cleared land do not require further assessment, unless they provide habitat for species credit species.

4.2. Plant Community Types

4.2.1. Introduction

Identification of the PCTs occurring within the subject land was guided by the results of the Cumberland Ecology surveys. The data collected during surveys of the subject land was analysed in conjunction with a review of the PCTs held within the BioNet Vegetation Classification Database. Consideration was given to the following:

- Occurrence within the Yengo IBRA subregion;
- Vegetation formation;
- Alignment with TECs;
- Landscape position; and
- Upper, mid and ground strata species.

The analysis determined that the native vegetation within the subject land aligned with the following PCTs:

- 1083 - Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion

The distribution of PCTs within the subject land is shown in **Figure 6**. Detailed descriptions of these PCTs and the justification for PCT selection is provided in the sections below.

4.2.2. 1083 - Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion

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

Vegetation Class: Sydney Coastal Dry Sclerophyll Forests

Area: 0.63 ha

Percent Cleared Value: 17%

TEC Status: Not a TEC

4.2.2.1. General Description

i. Moderate-Good Condition

This condition state of PCT 1083 occurs in the north of the development site (See **Photograph 1**). The community also occurs throughout the remainder of the north and the north-east of the subject land, comprising a patch of remnant, intact vegetation with connectivity to contiguous vegetation extending outside of the subject land towards Dooral Dooral Creek. The PCT is associated with a sandstone plateau, which the site occurs on, and outcropping of sandstone and sandstone boulders are present throughout the community. An old sandstone quarry and a gully are located outside of the development site, in the centre of the subject land, and the topography of the subject land slopes, generally mildly, towards this area. Western occurrences of the PCT therefore have a north-easterly to easterly aspect while the north-eastern occurrence of the PCT has a north-westerly to westerly aspect.

Within the development site the PCT has a canopy of predominately *Eucalyptus haemastoma* (Broad-leaved Scribbly Gum). There are a small number of individuals of *Angophora bakeri* in the west, and in the south-east there is a stand of ten trees of the *Eucalyptus notabilis* x*resinifera* subsp. *resinifera* (Mountain Mahogany x Red Mahogany) (See **Appendix D**). Within the PCT, outside of the development site in the north, *Corymbia gummifera* (Red Bloodwood) also occurs in the canopy, and individuals of *Eucalyptus piperita* (Sydney Peppermint) are present in the north-east. Isolated trees of the species *Eucalyptus squamosa* (Scaly Bark) and *Corymbia eximia* (Yellow Bloodwood) occur in a degraded form of the community (as Scattered Trees as described below) in the south of the development site.

The sub-canopy of the PCT is dominated by *Allocasuarina littoralis* (Black She-oak), and *Angophora hispida* and *Acacia decurrens* occur in the layer less frequently. The shrub layer is dominated generally by *Kunzea ambigua* (Tick Bush), and *Leptospermum trinervium*, *Allocasuarina littoralis*, and *Pittosporum undulatum* are common in the layer. A number of other species are present less frequently and include *Polyscias sambucifolia* subsp. *Long leaflets* (Elderberry Panax), *Persoonia pinifolia* (Pine Leaved Geebung), *Banksia ericifolia* (Heath Banksia), *Grevillea speciosa* (Red Spider Flower), and *Dodonaea camfieldii*. Two individual of the threatened species *Darwinia biflora* are present within the shrub layer of the community in the development site.

The ground layer is sparse, with leaf litter covering a large proportion of the soil surface, and sandstone rocks also present throughout. It is generally dominated by the sedge *Cyathochaeta diandra*, with other species such as the sedge *Caustis flexuosa* (Curly Wig) and the grasses *Austrostipa pubescens* and *Anisopogon avenaceus* (Oat Speargrass) common to dominant in some areas. An array of other species are present in the ground layer less frequently, and include the graminoid *Lomandra cylindrica* (Needle Mat-rush), the forbs *Xanthosia tridentata* (Rock Xanthosia) and *Dianella prunina*, and the twiners *Billardiera scandens* (Hairy Apple Berry) and *Cassytha glabella*.

Due to the low nutrient status of the sandstone soils, exotic weed species are limited in occurrence within the community. *Ligustrum sinense* (Small-leaved Privet) is common in the south-east extent of the community, in a small area, due to past disturbance. This species, along with other exotic shrubs *Lantana camara* and *Ochna*

serrulata (Mickey Mouse Plant), has a scattered occurrence through the rest of the community. Other exotic species present, generally as isolated individuals include the grasses *Andropogon virginicus* (Whiskey Grass) and *Setaria parviflora* (Pigeon Grass), the forb *Bidens pilosa* (Cobbler's Pegs), and the twiner *Asparagus asparagoides* (Bridal Creeper).

Photograph 1 Moderate-Good Condition Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion within the subject land, including *Eucalyptus notabilis* <-> *resinifera* subsp. *Resinifera* indicated by pink tape

ii. Scattered Trees Form

This community is a degraded form of PCT 1083, consisting mostly of scattered remnant/regrowth eucalypts (See **Photograph 2**). The ground layer of this area is maintained by mowing. Some individuals of planted tree species native to NSW, though not consistent with PCT 1083 have also been included in the mapped community. The decision was made to include these species as PCT 1083 as they generally occur in close proximity to remnant/regrowth trees of the community, and as these tree species occur naturally in a variety of different vegetation communities from areas across large areas of NSW outside of the locality, mapping each tree as a separate PCT is considered to be extraneous and would make application of the BAM calculator difficult, and BAM survey plots would include large areas of adjoining communities.

Native trees present as scattered individuals in this area consistent with PCT 1083 include *Eucalyptus haemastoma,* the most common species, and *Eucalyptus squamosa* and *Corymbia eximia* which have isolated occurrences only. Planted trees not consistent with PCT1083 include the locally native *Corymbia maculata* (Spotted Gum), *Melia azedarach* (White Cedar), and *Eucalyptus crebra* (Narrow-leaved Ironbark). Non-locally native species include *Lophostemon confertus* (Brush Box), and *Angophora woodsiana*.

A native shrub layer is mostly absent from the community although there are some patches with of shrubby regrowth in the south-east and isolated occurrences of shrubs close to the base of trees where they are not mown. Native species include *Polyscias sambucifolia* subsp. Long leaflets, *Banksia spinulosa* (Hairpin Banksia), and *Lambertia formosa* (Mountain Devil). Exotic species are also present in the community, either as weeds or garden plantings. Species include *Rosa rubiginosa* (Sweet Briar), *Cestrum parqui* (Green Cestrum), and *Ochna serrulata*.

The ground layer is generally dominated by exotic grass species, but some common native species are scattered throughout, and native species can be common in some areas under trees where mowing is less intensive. Exotic grass species include *Axonopus fissifolius* (Carpet Grass), *Ehrharta erecta* (Panic Veldtgrass), and *Eragrostis curvula* (African Lovegrass). A number of other exotic species are also present in the layer, either as lawn weeds or garden plantings. Species include *Agapanthus praecox* subsp. *orientalis* (Lily of the Nile), *Hedychium gardnerianum* (Ginger Lily), *Conyza sumatrensis* (Tall Fleabane), *Plantago lanceolata* (Lamb's Tongues), and *Polycarpon tetraphyllum* (Four-leaved Allseed).

Natives in the ground layer include the grasses *Microlaena stipoides* (Weeping Grass), which is common to dominant in some small patches, *Aristida vagans* (Threeawn Grass), and *Paspalidium distans*. Other species present include the forbs *Crassula sieberiana* (Australian Stonecrop) and *Veronica plebeia* (Trailing Speedwell), and twiner *Glycine tabacina*.

Photograph 2 Scattered Trees Form of Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion within the southern portion of the subject land

4.2.2.2. Justification of PCT selection

PCTs were initially filtered using BioNet Vegetation Classification System with search criteria including IBRA Region Sydney Basin, vegetation formation Dry Sclerophyll Forest (Shrubby Sub-formation) and the key canopy species *Eucalyptus haemastoma*, *Angophora bakeri*, or *Eucalyptus squamosa* . The resulting list was narrowed down based on landform, geology and additional lower stratum species. PCT 1083 was determined to be the best fit based on the number of key indicator species present recorded within the BAM plot surveys. **Table 4** presents a justification for the selection of this PCT.

Table 4 PCT selection justification

PCT Filtering Criteria Used	PCTs Considered	Selected PCT	Selected PCT Name	Species Used for Identification
1. Canopy Species - Contains ***Eucalyptus haemastoma, Angophora bakeri,*** or ***Eucalyptus squamosa***	725, 860, 862, 883, 958, 1065, 1083, 1134, 1137, 1255, 1328, 1633, 1635, 1636, 1640, 1641, 1642, 1643,1665, 1775, 1777, 1782, 1783, 1786, 1787, 1791, 1824, 1826	1083	Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion	Upper stratum species: *Corymbia gummifera; Eucalyptus haemastoma; Corymbia eximia; Angophora bakeri; Eucalyptus piperita.*
2. Status - Approved	725, 860, 862, 883, 958, 1083, 1134, 1255, 1328, 1633, 1635, 1636, 1640, 1641, 1642, 1643, 1665, 1775, 1777, 1782, 1783, 1786, 1787, 1824, 1826			Mid-stratum species: *Acacia ulicifolia; Angophora hispida; Banksia ericifolia; Banksia spinulosa; Isopogon anemonifolius; Lambertia formosa; Leptospermum trinervium; Platysace linearifolia.*

PCT Filtering Criteria Used	PCTs Considered	Selected PCT	Selected PCT Name	Species Used for Identification
3. IBRA Region - Sydney Basin	725 ,883, 958, 1083, 1134, 1255, 1328, 1633, 1635, 1636, 1640, 1641, 1642, 1643, 1665, 1775, 1777, 1782, 1783, 1786, 1787, 1824, 1826			Ground stratum species: *Caustis flexuosa; Cyathochaeta diandra; Dampiera stricta;Entolasia stricta; Lepyrodia scariosa; Patersonia sericea; Platysace linearifolia.*
4. Formation - Dry Sclerophyll Forest (Shrubby Sub-formation)	883, 958, 1083, 1255, 1328, 1633, 1635, 1636, 1640, 1642, 1643, 1775, 1777, 1782, 1783, 1786, 1787			
5. Landscape position and Geology - Sandstone, Ridge, Plateau or Upper Slope	1083, 1255, 1328, 1642, 1643, 1782, 1783, 1787			
4. Associated Upper Stratum Species (Species in plots and elsewhere within community within lot boundary) - Highest matches (3 or more). Species: *Corymbia gummifera; Eucalyptus haemastoma ;Corymbia eximia; Angophora bakeri; Eucalyptus piperita.*	1083 (5), 1255 (3), 1328 (3), 1782 (4), 1783 (3)			
5. IBRA Sub-region: Yengo	1083, 1255, 1328, 1783			
6. Assocated Mid Stratum Species: Highest Matches (5 or more)	1083 (8), 1328 (5)			

PCT Filtering Criteria Used	PCTs Considered	Selected PCT	Selected PCT Name	Species Used for Identification
7. Associated Ground Stratum Species: Highest Match	1083 (7), 1328 (3)			

4.2.3. Threatened Ecological Communities

PCT 1083 is not associated with any threatened ecological communities listed under the BC Act or the EPBC Act.

4.2.4. Vegetation Integrity Assessment

The native vegetation identified within the development site was assigned to PCT 1083 with two vegetation zones representing the two broad condition states. A patch size was subsequently assigned for each vegetation zone. The extent of the vegetation zone and patch size class within the development site are shown in **Figure 7**.

The vegetation zone within the development site was assessed using survey plots (see **Section 2.2**) to determine the vegetation integrity score. Data collected from these plots were utilised within the BAM Calculator to determine the vegetation integrity score and are provided in **Appendix C**. A flora species list for the subject land is provided in **Appendix A**. Field data sheets and electronic copies of raw data are provided separately to this document.

Note that a single PCT in two broad condition states have been described and identified within the subject land, and both of these condition states also occur within the development site. They will both be directly impacted by the Project. Therefore, two vegetation zones were identified and utilised within the BAM Calculator.

Vegetation zone, patch size and vegetation integrity score for the development site are summarised in **Table 5**.

Table 5 Vegetation integrity of PCTs within the development site

Vegetation Zone	PCT #	PCT Name	Condition Name	Development Site Area (ha)	Patch Size Class	Vegetation Integrity Score
1	1083	Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion	Scattered_ Trees	0.25	>101 ha	49.6
2	1083	Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion	Moderate_ Good	0.38	>101 ha	73.1

5. Threatened Species

5.1. Threatened Species for Assessment

The BAM Calculator generates a list of threatened species requiring assessment utilising a number of variables. The following criteria have been utilised to predict the threatened species requiring further assessment:

- IBRA subregion: Yengo;
- Associated PCTs: 1083;
- Percent native vegetation cover in the assessment area: 52.39%;
- Patch size: >101 ha; and
- Credit type: Ecosystem and/or species.

Based on the above variables, the BAM Calculator generated a list of 32 ecosystem credit species and 63 species credit species.

5.2. Ecosystem Credit Species

Table 6 lists the predicted ecosystem credit species for the vegetation zones within the subject land. None of these species have been removed from consideration.

Table 6 Predicted Ecosystem Credit Species

Common Name	Scientific Name
Barking Owl	*Ninox connivens*
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*
Broad-headed Snake	*Hoplocephalus bungaroides*
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*
Eastern Bentwing-bat	*Miniopterus schreibersii oceanensis*
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*
Eastern Freetail-bat	*Mormopterus norfolkensis*
Eastern Osprey	*Pandion cristatus*
Gang-gang Cockatoo	*Callocephalon fimbriatum*
Glossy Black-Cockatoo	*Calyptorhynchus lathami*
Golden-tipped Bat	*Kerivoula papuensis*
Greater Broad-nosed Bat	*Scoteanax rueppellii*
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*
Grey-headed Flying-fox	*Pteropus poliocephalus*
Hooded Robin (south-eastern form)	*Melanodryas cucullata cucullata*
Koala	*Phascolarctos cinereus*
Little Bentwing-bat	*Miniopterus australis*

Common Name	Scientific Name
Little Eagle	*Hieraaetus morphnoides*
Little Lorikeet	*Glossopsitta pusilla*
Masked Owl	*Tyto novaehollandiae*
Painted Honeyeater	*Grantiella picta*
Powerful Owl	*Ninox strenua*
Regent Honeyeater	*Anthochaera phrygia*
Rosenberg's Goanna	*Varanus rosenbergi*
Scarlet Robin	*Petroica boodang*
Spotted-tailed Quoll	*Dasyurus maculatus*
Square-tailed Kite	*Lophoictinia isura*
Swift Parrot	*Lathamus discolor*
Turquoise Parrot	*Neophema pulchella*
Varied Sittella	*Daphoenositta chrysoptera*
White-bellied Sea-Eagle	*Haliaeetus leucogaster*
Yellow-bellied Glider	*Petaurus australis*
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*

5.3. Species Credit Species

5.3.1. Assessment of Habitat Constraints and Microhabitats

Table 7 below lists the species credit species predicted by the BAM Calculator and details whether the species have been further assessed based on the presence or absence of habitat constraints within the subject land. Under Section 6.4.1.13 of the BAM, further species credit species can be excluded from further assessment if an assessment of habitat constraints and microhabitats determines that the habitat within the subject land is substantially degraded such that the species credit species is unlikely to occur.

Habitat assessments of the development site were undertaken as described in **Section 2.2.4**. The habitat assessments focussed on habitat features relevant to species credit species predicted to occur. This included determining the presence/absence of the habitat constraints identified for the predicted threatened species and the condition of these habitat constraints and other microhabitats.

The Regent Honeyeater and Swift Parrot have been excluded from further assessment after confirmation from OEH that no important breeding habitat occurs within the subject land for either species. Breeding habitat for both species is limited to specific areas that are not associated with, or in the vicinity of, the subject land, therefore since the species credit species component for both species is associated with breeding habitat only, both the Regent Honeyeater and Swift Parrot were excluded from further assessment.

The initial habitat assessment survey completed on 13 June 2019 focussed on determining if habitat for any potential species credit species (or relevant breeding component for dual credit species) was substantially

degraded such that the species is unlikely to utilise the subject land or specific vegetation zone in accordance with the requirements of Step 3 (a) of Section 6.4 of the BAM.

The southern portion of the development site is predominantly cleared and is mostly comprised of scattered native trees, exotic trees, garden beds, exotic grassland and cleared areas. Despite the degraded nature of the habitat in this portion of the subject land, the scattered native trees along the Glenhaven Road frontage were observed to contain habitat features including hollows. The northern portion of the development site predominantly contains remnant native vegetation. The majority of the available threatened species habitat occurs within this area including hollow-bearing trees, rocky habitat and bird nests. Additionally, this area of vegetation is within 100m of the mapped 1st order creek and the artificial wetland within the subject land.

Based on the results of habitat surveys, a number of species were excluded from requiring further assessment as allowed under Section 6.4.1.13 of the BAM, as the habitat for these species is considered substantially degraded or otherwise unsuitable as described in **Table 7**.

5.3.2. Candidate Species for Further Assessment

The following species were identified as candidate species credit species for further assessment:

Flora:

- *Acacia gordonii*
- *Acacia pubescens*
- *Asterolasia elegans*
- *Darwinia biflora*
- *Darwinia peduncularis*
- *Dillwynia tenuifolia*
- *Epacris purpurascens* var. *purpurascens*
- *Eucalyptus sp. Cattai*
- *Grevillea parviflora* subsp. *parviflora*
- *Grevillea parviflora* subsp. *supplicans*
- *Kunzea rupestris*
- *Leucopogon fletcheri* subsp. *fletcheri*
- *Melaleuca groveana*
- *Micromyrtus blakelyi*
- *Pimelea curviflora* var. *curviflora*

- *Prostanthera cineolifera*
- *Pultenaea parviflora*
- *Tetratheca glandulosa*

Fauna:

- Bush Stone-curlew
- Large-eared Pied Bat
- Square-tailed Kite (Breeding)
- Southern Myotis
- Red-crowned Toadlet

5.3.3. Presence of Candidate Species

5.3.3.1. Darwinia biflora

Two *Darwinia biflora* individuals were recorded within the development site located within the APZ as shown in **Figure 8**. Approximately 39 other individuals were observed outside of the development site during June 2019 surveys, throughout the area of retained bushland within the northern portion of the subject land. **Photograph 3** below displays a *Darwina biflora* individual located within the subject land.

Photograph 3 *Darwinia biflora* within the subject land

5.3.3.2. *Eucalyptus* sp. Cattai

Eight trees within the APZ of the Project were formerly identified as *Eucalyptus* sp. 'Cattai' by a previous consultant (GIS Environmental Consultants 2019). However, Cumberland Ecology noted that the trees in question appeared to be taller than the upper 8m height noted for that species by Van Klaphake with at least one of the trees estimated to be >12m tall as shown in **Photograph 4** (NSW Scientific Committee 1998). Subsequently, samples were sent to the Royal Botanical Gardens for formal analysis and identification. These samples were analysed by Andrew Orme as likely to be *Eucalyptus notabilis* <-> *resinifera* subsp. *resinifera* and subsequently the individuals in question are not considered to be *Eucalyptus* sp. 'Cattai. See **Appendix D** for further details.'

5.3.4. Assumed Presence

Habitat has been assumed as being present within the development site for the following species:

- *Tetratheca glandulosa*;
- Bush Stone-curlew
- Large-eared Pied Bat
- Square-tailed Kite (Breeding)
- Southern Myotis; and

Red-crowned Toadlet

5.3.5. Species Polygons

The following species would only be expected to utilise the habitat within the Moderate-Good condition Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux vegetation within the development site. Subsequently, the species polygon for these species comprises the 1083_Moderate_Good vegetation zone:

- *Darwinia biflora*
- *Tetratheca glandulosa*;
- Bush Stone-curlew
- Red-crowned Toadlet

The following species would have the potential to utilise all the native vegetation habitat within the development site, comprising the 1083_Moderate_Good and the 1083_Scattered_Trees vegetation zones, due to their high mobility and ability to cross hostile habitat gaps:

- Large-eared Pied Bat
- Square-tailed Kite (Breeding)
- Southern Myotis

Southern Myotis habitat is considered to comprise both vegetation zones within the development site as they both contain hollow bearing trees and are within 200 m of potential foraging habitat within the artificial wetland within the subject land.

Species polygons have been created for species credit species that either occur or are assumed to be present within the development site, as shown in **Figure 9**.

Photograph 4 *Eucalyptus notabilis* <-> *resinifera subsp. Resinifera* within the development site.

Table 7 Consideration of species credit species

Scientific Name	Common Name	Habitat/Geographic Constraints	Removed from Consideration	Reason for Inclusion or Removal
Flora				
Acacia bynoeana	Bynoe's Wattle		Yes	The subject land may contain potential habitat for the species however, previous surveys within the subject land performed during the survey period did not detect the species (GIS Environmental Consultants 2019).
Acacia gordonii	*Acacia gordonii*		No	The development site is not considered to contain potential habitat for the species as the species is known to chiefly occur in the lower eastern slopes of the Blue Mountains and in the Glenorie-Maroota area (Department of the Environment 2014). Additionally there are no records of the species since 1980 within a 5km radius according to the Database of Threatened Biodiversity (OEH 2019a). However, surveys for the species were undertaken as the survey period aligns with the Project timing.
Acacia pubescens	Downy Wattle		No	The development site is not considered to contain potential habitat for the species as it does not contain associated vegetation communities referred to in the National Recovery Plan for the species such as Alluvial Woodland, Castlereagh Scribbly Gum Woodland, Cooks Rive/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest, Shale Hills Woodland, Shale Plains Woodland or Shale/Sandstone Transition Forest (NSW NPWS 2003a). Additionally, there are no records of the species since 1980 within a 5km radius according to the Database of Threatened Biodiversity (OEH 2019a). However, surveys for the species can be performed as the survey period aligns with the Project timing.
Ancistrachne maidenii	*Ancistrachne maidenii*		Yes	The development site is not considered to contain potential habitat for the species as it is known to be restricted to around St Abans, Mt White,

Scientific Name	Common Name	Habitat/Geographic Constraints	Removed from Consideration	Reason for Inclusion or Removal
				Maroota, Berowra areas and to the Shannon Creek area south-west of Grafton (DEC (NSW) 2005a).
Asterolasia elegans	*Asterolasia elegans*		No	The subject land may contain potential habitat for the species.
Callistemon linearifolius	Netted Bottle Brush		Yes	The development site may contain suitable habitat for the species. However, there is only a single record of the species since 1980 within a 5km radius according to the Database of Threatened Biodiversity (OEH 2019a). This record is located approximately 3.6 km to the south west of the development site. However, previous surveys within the subject land performed during the survey period did not detect the species (GIS Environmental Consultants 2019).
Darwinia biflora	D*arwinia biflora*		No	The development site constitutes potential habitat for the species as it is known to occur within the subject land.
Darwinia fascicularis subsp. *oligantha* population in the Baulkham Hills and Hornsby Local Government Areas	*Darwinia fascicularis* subsp. *oligantha* population in the Baulkham Hills and Hornsby Local Government Areas	Maroota area of Baulkham Hills and Hornsby LGAs	Yes	The development site is located outside of the specified geographic area as it does not occur in the Maroota area of The Hills LGA.
Darwinia peduncularis	*Darwinia peduncularis*		No	The development site is not considered to contain potential habitat for the species as it is not located within an area known to contain populations of the species. Areas known to contain populations of the species include the Blue Mountains, Brooklyn, Berowra, Galston Gorge, Hornsby, Bargo River,

Scientific Name	Common Name	Habitat/Geographic Constraints	Removed from Consideration	Reason for Inclusion or Removal
				Glen Davis, Mount Boonbourwa and Kings Tableland (NSW Scientific Committee 2004a). Additionally, there are no records of the species since 1980 within a 5km radius according to the Database of Threatened Biodiversity (OEH 2019a). However, surveys for the species were undertaken as the survey period aligns with the Project timing.
Dillwynia tenuifolia	*Dillwynia tenuifolia*		No	The development site may contain potential habitat for the species.
Epacris purpurascens var. *purpurascens*	*Epacris purpurascens* var. *purpurascens*		No	The development site may contain potential habitat for the species.
Eucalyptus fracta	Broken Back Ironbark	Shallow soils on the upper and northern escarpment of the Broken Back Range, near Cessnock	Yes	The development site is not considered to contain potential habitat for the species as it is located outside of the specified geographic area (OEH 2018a).
Eucalyptus sp. Cattai	*Eucalyptus* sp. Cattai		No	The subject land may contain potential habitat for the species.
Grevillea parviflora subsp. *parviflora*	Small-flower Grevillea		No	The development site is not considered to contain potential habitat for the species as it is only known to occur west of Prospect within the Sydney region (PlantNET 2018). Additionally, there are no records of the species since 1980 within a 5km radius according to the Database of Threatened Biodiversity (OEH 2019a). However, surveys for the species were undertaken as the survey period aligns with the Project timing.

Scientific Name	Common Name	Habitat/Geographic Constraints	Removed from Consideration	Reason for Inclusion or Removal
Grevillea parviflora subsp. *supplicans*	*Grevillea parviflora* subsp. *supplicans*		No	The development site is not considered to contain potential habitat for the species as there are no records of the species since 1980 within a 5km radius according to the Database of Threatened Biodiversity (OEH 2019a). However, surveys for the species were undertaken as the survey period aligns with the Project timing.
Hibbertia procumbens	Spreading Guinea Flower	North of Hawkesbury River and east of Boree, South of Wollombi	Yes	The development site is not considered to contain potential habitat for the species as it is located south of the Hawkesbury River (OEH 2018a). Additionally, the species is only known to be recorded at Mangrove Mountain (Plantnet 2019).
Hibbertia puberula	*Hibbertia puberula*		Yes	The development site may contain potential habitat for the species however, previous surveys within the subject land performed during the survey period did not detect the species (GIS Environmental Consultants 2019).
Hibbertia superans	*Hibbertia superans*	Ridgetops	Yes	The development site may contain potential habitat for the species however, previous surveys within the subject land performed during the correct survey period did not detect the species (GIS Environmental Consultants 2019).
Keraudrenia corollata var. *denticulata* - endangered population	*Keraudrenia corollata* var. *denticulata* in the Hawkesbury local government area	Colo River area between Lower Portland and Morans Rock and near Gees Lagoon	Yes	The development site is not considered to contain potential habitat for the species as it is outside of the specified geographic area (OEH 2018a).
Kunzea rupestris	*Kunzea rupestris*	Rocky areas Sandstone rock outcrops	No	The development site is not considered to contain potential habitat for the species as it does not occur within the Maroota, Sackville and Glenorie areas, and does not contain associated vegetation communities such as

Scientific Name	Common Name	Habitat/Geographic Constraints	Removed from Consideration	Reason for Inclusion or Removal
				Shale/Sandstone Transition Forest, Cumberland Plain Woodlands or Turpentine-Ironbark Forest (NSW Scientific Committee 2004c). Additionally, there are no records of the species since 1980 within a 5km radius according to the Database of Threatened Biodiversity (OEH 2019a). However, surveys for the species were undertaken as the survey period aligns with the Project timing.
Lasiopetalum joyceae	*Lasiopetalum joyceae*	Rocky areas Lateritic to shaley ridgetops	Yes	The development site is not considered to contain potential habitat for the species as it does not contain lateritic to shaley ridgetops, nor does it occur between Berrilee and Duffys Forest (NSW Scientific Committee 2004d). Additionally, there are no records of the species since 1980 within a 5km radius according to the Database of Threatened Biodiversity (OEH 2019a).
Leionema lamprophyllum subsp. *obovatum* - endangered population	*Leionema lamprophyllum* subsp. *obovatum* population in the Hunter Catchment	Cliffs Rocky cliff lines	Yes	The development site is not considered to contain potential habitat for the population as it is not located within the Hunter Catchment (OEH 2018a).
Leucopogon fletcheri subsp. *fletcheri*	*Leucopogon fletcheri* subsp. *fletcheri*		No	The development site may contain potential habitat for the species.
Melaleuca deanei	Deane's Paperbark		Yes	The development site is not considered to contain potential habitat for the species as it does not occur within known regions of occurrence such as the Ku-ring-gai/Berowra area or the Holsworthy/Wedderburn area (OEH 2013a). There is only a single record of the species since 1980 within a 5km radius according to the Database of Threatened Biodiversity (OEH 2019a). This record is located approximately 2.8 km north of the development site.

Scientific Name	Common Name	Habitat/Geographic Constraints	Removed from Consideration	Reason for Inclusion or Removal
				Additionally, previous surveys within the subject land during the survey period did not detect the species (GIS Environmental Consultants 2019).
Melaleuca groveana	Grove's Paperbark		No	The development site may contain potential habitat for the species.
Micromyrtus blakelyi	*Micromyrtus blakelyi*		No	The development site may contain potential habitat for the species.
Pimelea curviflora var. *curviflora*	*Pimelea curviflora* var. *curviflora*		No	The subject land may contain potential habitat for the species.
Prostanthera cineolifera	Singleton Mint Bush		No	The subject land may contain potential habitat for the species.
Olearia cordata	*Olearia cordata*		Yes	The development site is not considered to contain potential habitat for the species as it is generally restricted to the south-western Hunter Plateau, eastern Colo Plateau, and the far north-west of the Hornsby Plateau near Wisemans Ferry east of Maroota (DEC (NSW) 2005d). Additionally, there are no records of the species since 1980 within a 5km radius according to the Database of Threatened Biodiversity (OEH 2019a).
Persoonia hirsuta	Hairy Geebung		Yes	The subject land may contain potential habitat for the species. However, previous surveys within the subject land performed during the survey period did not detect the species (GIS Environmental Consultants 2019).
Pultenaea parviflora	*Pultenaea parviflora*		No	The subject land may contain potential habitat for the species.
Tetratheca glandulosa	*Tetratheca glandulosa*		No	The subject land may contain potential habitat for the species.

Scientific Name	Common Name	Habitat/Geographic Constraints	Removed from Consideration	Reason for Inclusion or Removal
Velleia perfoliata	*Velleia perfoliata*		Yes	The development site is not considered to contain potential habitat for the species as it is only known to occur within the Hawkesbury district and the upper Hunter Valley (OEH 2019e) There are no records of the species since 1980 within a 5km radius according to the Database of Threatened Biodiversity (OEH 2019a).
Fauna				
Anthochaera phrygia	Regent Honeyeater (Breeding)		Yes	The development site does not contain areas of important mapped habitat according to OEH.
Burhinus grallarius	Bush Stone-curlew	Fallen/standing dead timber including logs	No	The development site may contain potential habitat for the species. However there are no records of the species since 1980 within a 5km radius according to the Database of Threatened Biodiversity (OEH 2019a).
Callocephalon fimbriatum	Gang-gang Cockatoo (Breeding)		Yes	The development site is not considered to contain potential breeding habitat for the species as the last known breeding population in the Sydney Metropolitan Area is bounded to the Hornsby and Ku-ring-gai Local Government Areas (DEC (NSW) 2005c).
Callocephalon fimbriatum - endangered population	Gang-gang Cockatoo population in the Hornsby and Ku-ring-gai Local Government Areas	Hornsby and Ku-ring-gai Local Government Areas	Yes	The development site is outside of the specified geographic area (OEH 2018a).

Scientific Name	Common Name	Habitat/Geographic Constraints	Removed from Consideration	Reason for Inclusion or Removal
Calyptorhynchus lathami	Glossy Black-Cockatoo (Breeding)		Yes	The Glossy Black-Cockatoo is known to nest in hollows approximately 26 cm wide and up to 1.4 m deep (OEH 2019a). The development site does not contain suitable nesting habitat features.
Cercartetus nanus	Eastern Pygmy-possum		Yes	The development site is not considered to contain potential habitat for the species as it is located outside of known localities of occurrence. There are only six localities from which the species has been recorded including the Pilliga area, the New England Tablelands, Barren Grounds Nature Reserve-Budderoo National Park, Royal and Heathcote National Parks, Kioloa State Forest and the Eden area (NSW Scientific Committee 2004b). Additionally, there are no records of the species since 1980 within a 5km radius according to the Database of Threatened Biodiversity (OEH 2019a). Whilst the vegetation within the northern extent of the development site is in good condition, it is likely to be subject to edge effects associated with the existing residential development and historical clearing within the subject land and surrounding properties. This is likely to lead to increased use of the site by feral predators including cats and foxes. Additionally, camera trap surveys performed during a previous study did not detect the species (GIS Environmental Consultants 2019).
Chalinolobus dwyeri	Large-eared Pied Bat	Cliffs Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two	No	The development site may contain potential foraging habitat for the species. The development site is not considered to contain breeding habitat as no caves or sandstone overhangs occur. However, there is only a single record of the species since 1980 within a 5km radius according to the Database of Threatened Biodiversity (OEH 2019a). This record is located approximately 4.5 km to the north west of the subject land.

Scientific Name	Common Name	Habitat/Geographic Constraints	Removed from Consideration	Reason for Inclusion or Removal
		kilometres of old mines or tunnels.		
Haliaeetus leucogaster	White-bellied Sea-Eagle (Breeding)		Yes	The development site is not considered to contain potential breeding habitat for the species which are typically characterised by the presence of large areas of open water (OEH 2018e). Furthermore, large, open water bodies have not been observed to occur within 5km of the development site following analysis of aerial photography. Additionally, there are no records of the species since 1980 within a 5km radius according to the Database of Threatened Biodiversity (OEH 2019a).
Heleioporus australiacus	Giant Burrowing Frog		Yes	The development site is not considered to contain potential habitat for the species as it is known to be heavily reliant on hanging upland swamps which do not occur within the development site (Bionet 2019). Additionally, there are no records of the species since 1980 within a 5km radius according to the Database of Threatened Biodiversity (OEH 2019a).
Hieraaetus morphnoides	Little Eagle (Breeding)		Yes	The development site is not considered to contain potential breeding habitat for the species as it typically nests in tall living trees within remnant patches of vegetation (OEH 2018c).The development site is located at the edge of treed habitat and therefore the species would be unlikely to utilise these trees as breeding habitat. Additionally, there are no records of the species since 1980 within a 5km radius according to the Database of Threatened Biodiversity (OEH 2019a).
Hoplocephalus bitorquatus	Pale-headed Snake		Yes	The development site is not considered to contain potential habitat for the species as core habitat for the species is typically major riverine, floodplain habitats, as the primary food source of the species is known to be frogs (Mark Fitzgerald 2010). Whilst the subject land contains the headwaters of a

Scientific Name	Common Name	Habitat/Geographic Constraints	Removed from Consideration	Reason for Inclusion or Removal
				1st order watercourse, this habitat is not considered as a major riverine floodplain. East of the dividing range, the species is typically associated with vegetation communities dominated by *Eucalyptus crebra, Corymbia maculata, Eucalyptus tereticornis* and *Eucalyptus propinqua,* none of which occur within the development site other than a single E. *crebra* of uncertain origin (Mark Fitzgerald 2010) .Additionally, there are no records of the species since 1980 within a 5km radius according to the Database of Threatened Biodiversity (OEH 2019a).
Hoplocephalus bungaroides	Broad-headed Snake (Breeding)		Yes	The development site is not considered to contain potential habitat for the species as it does not occur within the four general areas of occurrence being the Blue Mountains, southern Sydney, north-west of the Cumberland Plan and the Nowra Hinterland (Threatened Species Scientific Committee 2014). Additionally, there are no records of the species since 1980 within a 5km radius according to the Database of Threatened Biodiversity (OEH 2019a).
Lathamus discolor	Swift Parrot (Breeding)		Yes	The development site does not contain areas of important mapped habitat according to OEH.
Litoria aurea	Green and Golden Bell Frog	Semi-permanent/ephemeral wet areas Within 1km of wet areas/Swamps Within 1km of swamp/Waterbodies Within 1km of waterbody	Yes	The development site is not considered to contain potential habitat for the species. as it is not located within the vicinity of any of the eight key populations, or any of the areas known to contain occasional records from the greater Sydney Region. The eight key populations are in Kurnell, Homebush Bay, Greenacre, Clyde/Rosehill, Merrylands, Arncliffe, St Marys and Hammondville (DEC (NSW) 2005b). Occasional records are reported from North Ryde, the Lane Cove River, at Holsworthy and at Rosebury, representing unknown populations recognised within the draft National Recovery Plan for the species (DEC (NSW) 2005b). Subsequently, the

Scientific Name	Common Name	Habitat/Geographic Constraints	Removed from Consideration	Reason for Inclusion or Removal
				development site does not occur within the vicinity of known or unknown populations. Whilst the aquatic habitats utilised by the Green and Golden Bell Frog are recognised to be highly variable, the species is known to favour terrestrial habitats with extensive grassy areas (DEC (NSW) 2005b).The potential aquatic habitat located outside of the development site, in the northern portion of the subject land is fringed with dense woodland-heath vegetation which is not considered to constitute favoured terrestrial habitat. Additionally, there are no records of the species since 1980 within a 5km radius according to the Database of Threatened Biodiversity, indicating that an unknown population does not occur within the immediate vicinity of the development site (OEH 2019a).
Litoria booroolongensis	Booroolong Frog		Yes	The development site is not considered to contain potential habitat for the species as it does not contain permanent streams, which are considered as an important aspect of habitat for the Booroolong Frog (OEH 2012b). Additionally, there are no records of the species since 1980 within a 5km radius according to the Database of Threatened Biodiversity (OEH 2019a).
Lophoictinia isura	Square-tailed Kite (Breeding)		No	The development site may contain potential habitat for the species as it contains treed habitat near watercourses within which the species may nest. It should be noted that stick nests were observed within the subject land which have the potential to belong to the Square-tailed Kit. Additionally, there are recent records of the species within approximately 2 km of the subject land dating from 2013 and 2017.

Scientific Name	Common Name	Habitat/Geographic Constraints	Removed from Consideration	Reason for Inclusion or Removal
Miniopterus australis	Little Bentwing-bat (Breeding)		Yes	The development site is not considered to contain potential breeding habitat for the species as it does not contain caves or other habitat features sufficient to support a maternity colony (OEH 2019d).
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat (Breeding)		Yes	The development site is not considered to contain potential breeding habitat for the species as it does not contain caves or other habitat features sufficient to support a maternity colony (OEH 2019b).
Myotis macropus	Southern Myotis	Hollow bearing trees Within 200 m of riparian zone Bridges, caves or artificial structures within 200 m of riparian zone	No	The development site may contain potential habitat for the as it contains hollow-bearing trees within 200 m of a waterbody with pools >3 m in diameter.
Ninox connivens	Barking Owl (Breeding)		Yes	The development site is not considered to contain potential breeding habitat for the species as it does not contain trees bearing hollows with an entrance diameter of 20-46 cm (NSW NPWS 2003b).
Ninox strenua	Powerful Owl (Breeding)		Yes	The development site is not considered to contain potential breeding habitat for the species as it does not contain trees bearing hollows with an entrance diameter of >45 cm (DEC (NSW) 2006).
Pandion cristatus	Eastern Osprey (Breeding)		Yes	The development site is not considered to contain potential habitat for the species as it is not in close proximity to foraging habitat such as lakes, rivers or the ocean (OEH 2017). Additionally, there are no records of the species

Scientific Name	Common Name	Habitat/Geographic Constraints	Removed from Consideration	Reason for Inclusion or Removal
				since 1980 within a 5km radius according to the Database of Threatened Biodiversity (OEH 2019a).
Petrogale penicillata	Brush-tailed Rock-wallaby	Land within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines	Yes	The development site is not considered to contain potential habitat for the species as it does not contain suitable refuge habitat in the form of rock faces or outcrops with large boulders, ledges and caves (DECC (NSW) 2008). Additionally, there are no records of the species since 1980 within a 5km radius according to the Database of Threatened Biodiversity (OEH 2019a).
Phascogale tapoatafa	Brush-tailed Phascogale	Hollow bearing trees	Yes	The development site is not considered to contain potential habitat for the species as there are very limited records of the species within the Sydney region with the closest occurring at Katoomba (OEH 2019a). There are no records of the species since 1980 within a 5km radius according to the Database of Threatened Biodiversity (OEH 2019a). Additionally, the species is known to be highly vulnerable to predation by foxes and cats (OEH 2012a). Whilst the vegetation within the northern extent of the development site is in good condition and contains hollow bearing trees, it is likely to be subject to edge effects associated with the existing residential development and historical clearing within the subject land and surrounding properties. This is likely to lead to increased use of the site by feral predators including cats and foxes. Additionally, camera trap surveys performed during a previous study did not detect the species (GIS Environmental Consultants 2019).
Phascolarctos cinereus	Koala (Breeding)		Yes	The development site is not considered to contain potential breeding habitat for the Koala as it does not contain any tree species listed as either primary, secondary or supplementary Koala food trees for the Sydney Metropolitan Local Land Services area (OEH 2018b)

Scientific Name	Common Name	Habitat/Geographic Constraints	Removed from Consideration	Reason for Inclusion or Removal
Pseudophryne australis	Red-crowned Toadlet		No	The development site may contain potential habitat for the species.
Pteropus poliocephalus	Grey-headed Flying-fox (Breeding)		Yes	The development site is not considered to contain potential habitat for the species as a Grey-headed Flying-fox breeding camp does not occur.
Tyto novaehollandiae	Masked Owl (Breeding)		Yes	The development site is not considered to contain potential breeding habitat for the species as it does not contain trees bearing hollows with an entrance diameter of >40 cm (OEH 2018d).
Vespadelus troughtoni	Eastern Cave Bat	Caves Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, crevices or boulder piles, or within two kilometres of old mines, tunnels, old buildings or sheds."	No	The development site is not considered to contain potential breeding habitat for the species as it is not within 100 m of suitable breeding caves, overhangs, crevices, cliffs or escarpments Additionally, there are no records of the species within a 5 km radius and only 10 records within the Yengo IBRA subregion, mostly clustered around its northern extent, according to the Database of Threatened Biodiversity (OEH 2019a). Due to the lack of records within the subject land the broader Sydney region, it is considered unlikely that active maternity caves are located within two kilometres of the development site. Therefore, the development site is unlikely to constitute foraging habitat for the species.

Table 8 Presence of species credit species

Scientific Name	Common Name	Survey Period	Surveys Undetaken	Survey Timing	SAII Entity	Present
Flora						
Acacia gordonii	*Acacia gordonii*	All Year	Threatened flora surveys	Jun-19	No	No
Acacia pubescens	Downy Wattle	All Year	Threatened flora surveys	Jun-19	No	No
Asterolasia elegans	*Asterolasia elegans*	All Year	Threatened flora surveys	Jun-19	Yes	No
Darwinia biflora	*Darwinia biflora*	Sept-Feb	Threatened flora surveys	Jun-19	No	Yes
Darwinia peduncularis	*Darwinia peduncularis*	All Year	Threatened flora surveys	Jun-19	No	No
Dillwynia tenuifolia	*Dillwynia tenuifolia*	All Year	Threatened flora surveys	Jun-19	No	No
Epacris purpurascens var. *purpurascens*	*Epacris purpurascens* var. *purpurascens*	All Year	Threatened flora surveys	Jun-19	No	No
Eucalyptus sp. *Cattai*	*Eucalyptus* sp. Cattai	All Year	Threatened flora surveys	Jun-19	No	No
Grevillea parviflora subsp. *parviflora*	Small-flower Grevillea	All Year	Threatened flora surveys	Jun-19	No	No
Grevillea parviflora subsp. *supplicans*	*Grevillea parviflora* subsp. *supplicans*	All Year	Threatened flora surveys	Jun-19	No	No
Kunzea rupestris	*Kunzea rupestris*	All Year	Threatened flora surveys	Jun-19	No	No
Leucopogon fletcheri subsp. *fletcheri*	*Leucopogon fletcheri* subsp. *fletcheri*	All Year	Threatened flora surveys	Jun-19	No	No
Melaleuca groveana	Grove's Paperbark	All Year	Threatened flora surveys	Jun-19	No	No
Micromyrtus blakelyi	*Micromyrtus blakelyi*	All Year	Threatened flora surveys	Jun-19	No	No

Scientific Name	Common Name	Survey Period	Surveys Undetaken	Survey Timing	SAII Entity	Present
Pimelea curviflora var. *curviflora*	*Pimelea curviflora* var. *curviflora*	All Year	Threatened flora surveys	Jun-19	No	No
Prostanthera cineolifera	Singleton Mint Bush	All Year	Threatened flora surveys	Jun-19	No	No
Pultenaea parviflora	*Pultenaea parviflora*	All Year	Threatened flora surveys	Jun-19	No	No
Tetratheca glandulosa	*Tetratheca glandulosa*	Jul-Nov	Not surveyed	Not surveyed	No	Assumed
Fauna						
Burhinus grallarius	Bush Stone-curlew	All Year	Not surveyed	Not surveyed	No	Assumed
Chalinolobus dwyeri	Large-eared Pied Bat	Nov-Jan	Not surveyed	Not surveyed	Yes - for breeding habitat only	Assumed
Lophoictinia isura	Square-tailed Kite (Breeding)	Sept-Jan	Not surveyed	Not surveyed	No	Assumed
Myotis macropus	Southern Myotis	Dec-Mar	Not surveyed	Not surveyed	No	Assumed
Pseudophryne australis	Red-crowned Toadlet	All Year	Not surveyed	Not surveyed	No	Assumed

5.4. Prescribed Impacts

Prescribed impacts are outlined within the NSW *Biodiversity Conservation Regulation 2017*. The project is considered to result in a number of prescribed impacts outlined in **Table 9** below.

Table 9 Prescribed impacts of the Project

Feature	Present	Feature Characteristics and Location	Potential Impact	Threatened Species or Community Using or Dependent on Feature	Section of BDAR Where Addressed
Karst, caves. Crevices, cliffs or other geologically significant feature	No	N/A	Feature not present in subject land	N/A	N/A
Rocks	Yes	The area of remnant vegetation and adjacent areas contains scattered sandstone rocks and small boulders.	Localised removal of scattered rocks and small boulders within the development envelope.	Red-crowned Toadlet	Section 6.1.2.1, 7.2.1 and 7.4.1
Human-made structure	Yes	Existing dwelling	No impacts to biodiversity are anticipated as the dwelling in question is in good condition and does not contain habitat features likely to be used by native fauna.	N/A	N/A
Non-native vegetation	Yes	Exotic trees and garden beds.	No impacts to biodiversity are anticipated as the exotic vegetation in question offers	N/A	N/A

Feature	Present	Feature Characteristics and Location	Potential Impact	Threatened Species or Community Using or Dependent on Feature	Section of BDAR Where Addressed
			limited foraging resources for native fauna.		
Connectivity of different areas of habitat that facilitates movement across a species' range	Yes	Vegetation within the development site	Cuts into existing large corridor of bushland.	Red-crowned Toadlet, Square-tailed Kite, Bush-Stone Curlew, Southern Myotis, Large-Eared Pied Bat, foraging habitat for ecosystem credit species.	Section 6.1.2.2, 7.2.2 and 7.4.2
Movement of threatened species that maintains their lifecycle	No	N/A	The Project will not impact habitat that facilitates movement that maintains any threatened species' lifecycle	N/A	N/A
Water quality, water bodies and hydrological processes	Yes	Unnamed 1st order watercourse located in the northern extent of the subject land.	Potential changes to hydrological regimes and water quality impacts as a result of impacts to vegetation and increased impervious surfaces within the development site	Red-crowned Toadlet, Square-tailed Kite, Bush-Stone Curlew, Southern Myotis, Large-Eared Pied Bat, foraging habitat for ecosystem credit species.	Section 6.1.2.3, 7.2.3 and 7.4.3
Wind turbine strikes	No	N/A	No wind farm proposed on site	N/A	N/A
Vehicle strikes	No	N/A	Traffic may moderately increase throughout the proposed carpark, however impacts to	N/A	N/A

Feature	Present	Feature Characteristics and Location	Potential Impact	Threatened Species or Community Using or Dependent on Feature	Section of BDAR Where Addressed
			biodiversity are unlikely in this area.		
Other	No	N/A	Feature not present in subject land	N/A	N/A

6. Avoid and Minimise Impacts

6.1. Avoid and Minimise Impacts

This section includes demonstration of efforts to avoid and minimise impact on biodiversity values identified within the subject land, which includes assessment of direct and indirect impacts.

6.1.1. Avoid and Minimise Direct Impacts

6.1.1.1. Project Location

The development site has been situated within the property to allow for the operational requirements of the Project while minimising impacts to areas containing biodiversity values. The development envelope has been positioned within the southern portion of the subject land to avoid impacts to remnant native vegetation where possible, including the higher quality remnant vegetation to the north and the scattered native trees along the Glenhaven Road frontage. Direct impacts have been completely avoided throughout the 0.83 ha area of Red Bloodwood - scribbly gum heathy woodland, the 0.03 ha artificial wetland and the 1st order stream which are located outside of the development site within the northern portion of the subject land. Additionally, a 0.35 ha area of Red Bloodwood - scribbly gum heathy woodland and a 0.07 ha area of scattered native trees will be partially retained throughout the APZ and incorporated into the landscaping of the Project respectively.

The development envelope is positioned over an area within the subject land containing the lowest biodiversity values, consisting predominantly of the existing dwelling, cleared areas, exotic grassland, exotic trees, garden beds and some scattered native trees, including some non-endemic native species. In doing so, the Project has considered the biodiversity values of the vegetation within the subject land and has demonstrated reasonable steps to avoid and minimise impacts based upon the Project location within the subject land.

The Project will avoid and minimise direct impacts on clearing of native vegetation and habitat by:

- Locating the construction envelope predominantly in areas where there are lower biodiversity values such as previously cleared areas;
- Selective retention of habitat features and canopy species within the APZ;
- Situating the development to avoid clearing of native vegetation where possible; and
- Locating the development in the southern section of the subject landto reduce impacts to waterways.

Table 10 indicates the area of vegetation required to be cleared or managed as an APZ as part of the Project.

6.1.1.2. Consideration of Project Design

During the 13 June 2019 surveys, two *Darwinia biflora* individuals were located within the proposed APZ. Subsequently, 5 m exclusion zones surrounding the two individuals of *Darwinia biflora* are proposed to be incorporated in the design of the Project, to be established within the APZ to avoid impacts to these individuals. The exclusions zones will be managed separately to the management actions proposed for the actual APZ, as described in detail in the Vegetation Management Plan (Cumberland Ecology 2019a).

6.1.2. Avoid and Minimise Prescribed Impacts

Measures to avoid and minimise prescribed impacts identified in **Section 5.4** are outlined below.

6.1.2.1. Rocks Associated with Habitat of Threatened Species or Ecological Communities

The majority of the rocky habitat, including higher quality habitat and habitat in close proximity to the artificial wetland and 1st order watercourse is proposed to be retained within the APZ and within the retained bushland. The areas to be impacted are considered to constitute marginal habitat for the Red-crowned Toadlet, as the areas in question are located in exposed, cleared areas or areas of exotic grassland, lacking dense vegetation and thick leaf litter typically utilised by the species.

6.1.2.2. Connectivity of Different Areas of Habitat that Facilitates Movement

Native vegetation will be removed that may facilitate movement of native fauna. This will include the removal of native and exotic trees throughout the southern portion of the development site and partial clearing of remnant native vegetation throughout the northern portion of the development site.

That notwithstanding, the project has been located and designed to retain connectivity of native vegetation throughout the development site whilst adhering to APZ specifications. Trees occurring along the Glenhaven Road and Larapinta Place frontages are proposed to be retained where possible whilst trees and shrubs will be retained in accordance with Inner Protection Area standards where possible throughout the APZ, maintaining habitat connectivity of different areas of habitat that facilitates movement of native fauna.

Furthermore, the Project has been located on the edge of a larger patch of vegetation to avoid fragmentation of vegetation and ultimately avoid impacting the existing connectivity to the greatest extent possible.

6.1.2.3. Water Quality, Water Bodies and Hydrological Processes

The construction envelope has been situated in the southern portion of the subject land to avoid direct impacts to the unnamed 1st order watercourse located at the northern edge of the subject land. As the watercourse headwaters occur within the subject land, the hydrological conditions of the subject land and surrounding properties are likely to be highly influential upon the hydrology of the watercourse. Subsequently, the construction activities associated with the Project have the potential to cause sedimentation within the subject land, potentially impacting the watercourse. The creation of additional impervious surfaces in addition to the removal of vegetation and partial clearance of vegetation within the APZ may result in altered hydrological conditions continuing to the operational phase of the Project, potentially contributing to erosion and nutrient transport into adjacent bushland and the associated watercourse.

Impacts to hydrological processes are proposed to be avoided by disallowing the disposal of wastewater to the north of the proposed car park and minimised through the construction of a 500 mm high edging wall and a Leaky Wall Nutrient Retention Wetland planted out with native wetland plants. The Nutrient Retention wetland aims to minimise impacts to water quality, water bodies and hydrological processes by improving water quality and reducing the quantity of water leaving the development site, whilst the proposed edging wall aims to prevent the unintended transport of sediment, nutrients and exotic flora propagules from exiting the development site. Ultimately, these measures aim to minimise the water quality and hydrological impacts upon vegetation to be managed within the APZ, the retained bushland further north and ultimately the 1st order stream within the subject land.

7. Impact Assessment

7.1. Assessment of Impacts to Native Vegetation and Habitat

7.1.1. Direct Impacts

The primary and direct impact resulting from the proposed development is the loss of vegetation and associated habitat within the subject land.

7.1.1.1. Impacts on Vegetation Communities

One native vegetation community; PCT 1083 occurring in two broad condition states, will be impacted as a result of the Project. Within this PCT, 0.23 ha will be completely cleared to establish the development envelope, comprising approximately 30 trees. An additional 0.42 ha area of PCT 1083 is to be partially cleared or modified to meet the APZ requirements of the Bushfire Assessment (Australian Bushfire Protection Planners PTY Limited 2019). A further 1.70 ha area of land will be impacted, comprising exotic planted vegetation, exotic grassland and cleared land.

Table 10 identifies the proposed impacts to vegetation within the development site.

Table 10 Proposed impacts to vegetation within the development site

PCT	Condition	BC Act Status	EPBC Act Status	Development Envelope (ha)	APZ (ha)	Devt Site (ha)
1083 - Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion	Scattered Trees	Not listed	Not listed	0.18	0.07	0.25
1083 - Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion	Moderate - Good	Not listed	Not listed	0.03	0.35	0.38
Exotic Planted Vegetation	-	-	-	0.13	0.00	0.13
Exotic Grassland	-	-	-	0.27	0.04	0.31
Cleared Land	-	-	-	0.08	0.02	0.10
TOTAL				**0.69**	**0.48**	**1.17**

7.1.1.2. Loss of Specific Habitat Features

The main habitat for native fauna in the subject land is in the areas of native vegetation. In addition to native vegetation, specific habitat features identified within the subject land include rocky habitat, hollow-bearing trees, stags, nests, logs and a drainage line. These habitat features are displayed in **Figure 10**

The Project will result in the loss of all habitat features within the development envelope, comprising three hollow-bearing trees and a log. Within the APZ, a further two hollow-bearing trees, a stag and two trees containing stick nests occur that will be prioritised for retention where feasible providing they can safely be preserved and comply with the Bushfire Assessment Report's guidelines relating to establishing the APZ. The remaining habitat features within the subject land will be retained. Additionally, small localised areas of rocky habitat may be disturbed within the northern portion of the development site as a result of the Project.

Overall, the removal of these specific habitat features is considered to have only minor implications for native fauna species due to the modified ecological context within which the majority of the development site occurs within, and the high mobility of the species likely to utilise these habitats. Additionally, the trees indicated for removal only contain small and medium sized hollows and do not currently provide habitat for threatened large forest owls known to occur within the locality such as the Powerful Owl.

7.1.2. Change in Vegetation Integrity Score

The changes in vegetation integrity scores as a result of clearing or modification of vegetation in the development site are documented in **Table 11** below. **Section 7.6.2** describes the management zones and their value adjustments within the BAM Calculator.

Table 11 Change in Vegetation Integrity Score

Vegetation Zone	Management Zones	Approximate Area (ha)	Current Vegetation Integrity Score	Future Vegetation Integrity Score	Change in Vegetation Integrity Zone
1083_Scattered_Trees	Development Envelope	0.18	49.6	0	-49.6
1083_Scattered_Trees	APZ	0.07	49.6	16.4	-33.1
1083_Moderate_Good	Development Envelope	0.03	73.1	0	-73.1
1083_Moderate_Good	APZ	0.35	73.1	16	-57.1

7.1.3. Indirect Impacts

The following indirect impacts to native vegetation and habitat may occur as a result of the Project:

- Inadvertent impacts on adjacent habitat or vegetation;
- Reduced viability of adjacent habitat due to edge effects;
- Reduced viability of adjacent habitat due to noise, dust or light spill; and
- Inadvertent impacts to hydrological processes.

A detailed assessment for each of the above impacts is provided in the following sections.

7.1.3.1. Inadvertent Impacts on Adjacent Habitat or Vegetation

i. Nature and Extent

The vegetation throughout the southern portion of the subject land has previously been heavily modified through the partial clearance of trees, and the complete removal of the original midstorey and ground layer vegetation. The southern portion of the subject land exists within a matrix of rural-residential land, exhibiting reduced quality and connectivity of vegetation and habitat. Inadvertent impacts on adjacent habitat or vegetation are unlikely throughout this area provided that tree protection measures are followed.

The vegetation throughout the northern portion of the subject land forms part of a large, contiguous patch of native vegetation extending outside of the subject land. The removal of a small portion of this vegetation within the construction envelope, and modification of the remaining vegetation for establishment of the APZ, encroaches into this large patch of vegetation and may slightly decrease the connectivity of the remaining vegetation and habitat available within the subject land, particularly in a north-south direction. Notwithstanding this, as the vegetation within the subject land exists on the edge of this larger patch of vegetation, the impacts as a result of the Project will not further fragment vegetation or habitat in the short or long term. Rather, the Project will only result in a small decrease in the overall size of this larger patch of vegetation. Inadvertent impacts on adjacent habitat are unlikely if the measures outlined in the associated Vegetation Management Plan (VMP) are followed (Cumberland Ecology 2019b).

ii. Duration

Any impact on adjacent habitat or vegetation is likely to be long term, commencing with greatest intensity in the construction phase and continuing throughout the operation phase of the Project.

iii. Likely Affected Threatened Entities

There is the potential for foraging habitat for the following threatened fauna species to be marginally affected by increased edge effects:

- Arboreal mammals;

- Grey-headed Flying Fox;
- Large Forest Owls;
- Microchiropteran bats;
- Red-crowned Toadlet; and
- Woodland birds.

There is the potential for habitat for the following threatened flora species to be marginally affected by increased edge effects:

- *Darwinia biflora*; and
- *Tetratheca glandulosa*.

iv. Consequences

The Project will result in the complete removal of approximately 0.18 ha of native vegetation and partial clearance within the APZ of approximately 0.42 ha of native vegetation. These areas of vegetation have differing degrees of connectivity to adjacent vegetation, with vegetation in the northern portion of the site more connected than that of the southern portion. Subsequently, impacts in these areas have the potential to cause inadvertent impacts to adjacent vegetation. However, inadvertent impacts to adjacent vegetation can be appropriately managed if tree protection measures and management actions within the VMP are followed diligently.

7.1.3.2. Reduced Viability of Adjacent Habitat Due to Edge Effects

i. Nature and Extent

Edge effects are impacts that occur at the interface between natural habitats, especially forests and disturbed or developed land (Yahner 1988). When an edge is created between woodland and a cleared area, changes to ecological processes within the vegetation can extend between 10 m and 100 m from the edge (Yahner 1988). These include microclimatic changes in light, temperature, humidity and wind, which can favour a suite of different species and therefore cause significant changes to the ecology of the patch (Lindenmayer and Fischer 2006). Edge effects can also result from the increase in noise and artificial light from a project.

The vegetation throughout the southern portion of the subject land has previously been heavily modified through the partial clearance of trees, and the complete removal of the original midstorey and ground layer vegetation. The southern portion of the subject land exists within a matrix of rural-residential land, exhibiting reduced quality and connectivity of vegetation and habitat. In its current condition, vegetation and habitat throughout this portion of the subject land is currently subject to existing edge effects as a result of historical clearance associated with road construction and the previous residential development. Subsequently, the removal of additional exotic and native trees within the development envelope and the APZ is unlikely to result in greater edge effects further than current conditions within the southern portion of the subject land.

The higher quality vegetation in the northern portion of the subject land occurs at the edge of a large patch of contiguous vegetation extending beyond the boundaries of the subject land. Subsequently, this area is currently subject to a relatively smaller degree of edge effects associated with historical clearing resulting from the existing residential development within the subject land, the residential development directly north of the subject land and the construction of Larapinta Place. This area of vegetation may be subject to increased edge effects as a result of the Project, with the establishment of the proposed APZ involving partial clearing of vegetation cutting further into the patch of vegetation, when compared to the existing scenario.

ii. Duration

Any impact on adjacent habitat or vegetation is likely to be long term, commencing in the construction phase and continuing throughout the operation phase of the Project.

iii. Likely Affected Threatened Entities

There is the potential for foraging habitat for the following threatened fauna species to be marginally affected by increased edge effects:

- Arboreal mammals;
- Grey-headed Flying Fox;
- Large Forest Owls;
- Microchiropteran bats;
- Red-crowned Toadlet; and
- Woodland birds.

There is the potential for habitat for the following threatened flora species to be marginally affected by increased edge effects:

- *Darwinia biflora;* and
- *Tetratheca glandulosa*.

iv. Consequences

The Project will result in the loss of scattered trees throughout the southern portion of the subject land and the modification and partial clearance of native vegetation throughout the northern portion of the subject land with the establishment of the proposed APZ. The southern portion of the subject and is unlikely to be further influenced by edge effects further than current conditions. However, there is the potential for the vegetation throughout the northern portion of the subject land to be marginally indirectly impacted by increased edge effects, most concentrated throughout the vegetated interface along the transition between the proposed APZ and the area of retained bushland

Potential consequences of increased edge effects throughout the northern portion of the subject land may include further colonisation of exotic flora and increased use by feral fauna throughout the retained area of

vegetation. This may result in a marginal reduction in foraging habitat quality for potentially affected fauna species and potentially reduced recruitment opportunities for affected threatened plant species. These consequences are proposed to be appropriately managed with the implementation of a vegetation management plan involving systematic and ongoing weed removal throughout the proposed APZ and the retained area of bushland.

7.1.3.3. Reduced Viability of Adjacent Habitat Due to Noise, Dust or Light Spill

i. Nature and Extent

The construction activities and ongoing operational activities associated with the Project are likely to increase the noise, dust and light above current levels within the subject land. Increases in dust, noise and light spill are likely to be at greatest intensity during the construction phase of the Project. However, the construction activities associated with the project are not expected to exceed the typical levels of noise, dust and light generated by construction projects permissible within the zoning of the subject land. The operational phase of the Project may generate marginally increased levels of noise and light due to the intended use of the subject land as a place of worship. Crowds of people, religious services and increased vehicle access of the site are anticipated to contribute to increases in noise during the operational phase of the Project. Operational increases in noise and light are likely to be a minor impact upon the biodiversity values of the subject land as most native fauna species would be expected to habituate to the periodic noise and light disturbance.

ii. Duration

Increases in noise, dust and light spill are likely to be temporary and constrained to the construction phase of the Project. The operational phase of the Project may result in a marginal increase in noise and light over the long term due to the intended land use.

iii. Likely Affected Threatened Entities

There is the potential for foraging habitat for the following threatened fauna species to be marginally affected by increased dust, noise and light:

- Arboreal mammals;
- Grey-headed Flying Fox;
- Large Forest Owls;
- Microchiropteran bats;
- Red-crowned Toadlet; and
- Woodland birds.

There is the potential for habitat for the following threatened flora species to be marginally affected by increased dust:

- *Darwinia biflora*; and
- *Tetratheca glandulosa*.

iv. Consequences

The potential increase in noise, dust and light from the proposed development is unlikely to result in significant negative consequences for any potentially affected species within the subject land. The area of vegetation is already subject to the significant levels of noise, dust and light from the traffic of Glenhaven, and the surrounding residential and semi-rural land use. The minor increase in light, noise and dust from the Project is unlikely to be significant such that it would reduce the viability of the adjacent habitats surrounding the subject land.

Additionally, a number of species actively utilising the habitat subject land are likely to be hardy urban species that can tolerate indirect impacts such as increased noise, dust and light. The adjacent vegetation has survived despite the indirect impacts that it is subject to, and considering it exists within a large patch size, this minor area of disturbance will likely have minimal impact on the viability of the adjacent habitat and vegetation in the long term.

a. Dust

Construction activities of the Project have the ability to generate dust, which may result in negative consequences on the remaining ecological values of the subject land. Dust pollution can lead to a decrease in habitat quality which has the potential to extend the area of impact beyond the area directly disturbed by the Project. With regard to the remaining habitats within the subject land, dust generated by the Project may impact native woody vegetation, resulting in the loss of health of individuals along the edge of the development site. In turn, this may result in potential impacts to foraging resources for native fauna within the APZ and retained area of vegetation. However, these impacts are unlikely to result in significant negative consequences to the biodiversity values of the subject land, as the majority of the vegetation surrounding the development envelope offers low biodiversity values.

b. Noise

Noise can affect animal physiology and behaviour, and if it becomes an ongoing stress, it can be injurious to an animal's energy budget, reproductive success and long-term survival. This may lead to habitat loss through avoidance and retreat away from favourable habitats (AMEC 2005). It is likely that most native fauna species will habituate to the periodic noise disturbance associated with the construction and operational phases of the project (AMEC 2005). Additionally, substantial increases in noise are likely to be temporary and largely constrained to during the construction phase of the Project. Subsequently, the impacts from noise emissions are likely to be localised and are not likely to have a significant, long-term, impact on native fauna populations.

c. Light

The Project has the potential to increase the level of artificial light in the natural environment. Increased light levels may adversely impact wildlife by direct glare, chronic or periodic increased illumination and temporary unexpected fluctuations in light levels (Saleh 2007, Longcore and Rich 2010). Research into impacts from altered lighting indicates that it can trigger behavioural and physiological responses. Additionally, substantial increases in light are likely to be temporary and largely constrained to during the construction phase of the Project. The ongoing increase in light associated with the operational phase of the project is likely to be localised and is unlikely to result in significant, long-term negative consequences on native fauna populations.

7.1.3.4. Inadvertent Impacts to Hydrological Processes

i. Nature and Extent

The location and design of the Project has been situated so that it avoids direct impacts upon the unnamed watercourse and the artificial wetland located within the northern portion of the subject land. Nevertheless, there is the potential for the Project to result in inadvertent alterations to hydrological processes within the subject land. This may result from the complete clearance of vegetation within the development envelope, the partial clearance of vegetation within the APZ and the projected increase of impervious surfaces within the subject land. All of these factors may result in changes to overland flow regimes within the subject land.

ii. Duration

Impacts to hydrological processes are expected to primarily be short term and constrained to the construction phase of the Project, however changes to vegetation and impervious surfaces may result in longer term changes to hydrological regimes.

iii. Likely Affected Threatened Entities

There is the potential for foraging habitat for the following threatened fauna species to be marginally affected by inadvertent impacts to hydrological processes:

- Arboreal mammals;
- Grey-headed Flying Fox;
- Large Forest Owls;
- Microchiropteran bats;
- Red-crowned Toadlet; and
- Woodland birds.

There is the potential for habitat for the following threatened flora species to be marginally affected by inadvertent impacts to hydrological processes

- *Darwinia biflora*; and
- *Tetratheca glandulosa*.

iv. Consequences

The potential changes to hydrological processes are unlikely to result in negative consequences for the potentially affected entities as they would likely only utilise the watercourse habitat as part of a broader foraging range. Any change to the hydrology of the subject land is likely to be extremely minor and is unlikely to substantially alter the vegetation and associated habitat such that it would become unsuitable for use by potentially affected species. These potential impacts are proposed to be avoided and mitigated with the

construction of a 500 mm high edging wall and a Leaky Wall Nutrient Retention Wetland planted out with native wetland plants in addition to disallowing the disposal of wastewater to the north of the proposed car park.

7.2. Assessment of Prescribed Impacts

The following prescribed impacts are potentially relevant to the proposal:

- Rocky Habitat;
- Connectivity of different areas of habitat that facilitates movement; and
- Water quality, water bodies and hydrological processes.

These are discussed in detail in subsequent sections.

7.2.1. Rocks Associated with Habitat of Threatened Species or Ecological Communities

The subject land contains areas of scattered sandstone rocks and small boulders. Whist the majority of the rocks are proposed to be retained within the APZ and the retained bushland, there is potential for localised impacts to areas containing rocks within the northern portion of the development site within the proposed Leaky wall wetland and adjacent to proposed turfed areas. Rocky areas adjacent to ephemeral watercourses may comprise potential refuge habitat for the Red-Crowned Toadlet. However, the areas to be impacted are considered to constitute marginal habitat for the Red-crowned Toadlet, as the areas in question are located in exposed, cleared areas or areas of exotic grassland, lacking dense vegetation and thick leaf litter typically utilised by the species.

7.2.2. Connectivity of Different Areas of Habitat that Facilitates Movement

The Project is likely to result in a marginal decrease in connectivity of different areas of habitat that facilitates movement of native fauna resulting from the complete clearance of vegetation within the development envelope and the partial clearance of vegetation within the APZ.

However, it is considered unlikely that native fauna would be solely reliant on the degraded and exposed habitat within the southern portion of the subject land for movement between different areas of habitat, especially regarding non-mobile or sedentary species. This area of vegetation has already been fragmented from different areas of habitat due to the construction of Glenhaven Road, Larapinta Place and the adjacent residential developments. Vegetation in this area of the subject land may act as "stepping stone habitat" for highly mobile or aerial fauna, providing north-south connectivity to the higher quality habitat in the northern portion of the subject land and into contiguous habitat extending beyond the subject land. The project will not isolate or further fragment any areas of habitat for native fauna substantially further that current conditions in the southern portion of the subject land, instead only reducing the available area of habitat in areas containing scattered trees.

The area of higher quality vegetation throughout the northern portion of the subject land offers the greatest degree of habitat connectivity, both in a north-south and an east-west direction. The extent of impacts

throughout this area are relatively reduced, with only partial clearance of vegetation anticipated throughout the APZ, established at the edge of higher quality treed habitat.

7.2.3. Water Quality, Water Bodies and Hydrological Processes

Whilst the development envelope has been situated to avoid direct impacts to the unnamed 1st order watercourse and the artificial wetland within the subject land, the project has the potential to result in impacts to water quality, water bodies and hydrological processes. Earthworks during the construction phase of the project may result in localised erosion and subsequent sedimentation which can smother adjacent retained vegetation and result in negative consequences upon water quality and water bodies. Smothering can reduce regeneration of groundcover species and eroded material may contain weed propagules and nutrients. Subsequent movement of this material into the retained vegetation can facilitate the spread of weeds potentially resulting in negative changes to community composition. Mitigation measures during the construction phase of the Project will be implemented to reduce the risk of sedimentation and runoff that would affect the water quality of the watercourse within the subject land. Additionally, changes to hydrological regimes may result from the complete clearance of vegetation within the development envelope, the partial clearance of vegetation within the APZ and the projected increase of impervious surfaces within the subject land. These factors may result in changes to overland flow regimes within the subject land and may facilitate the transport of sediment and nutrients. However, changes to the hydrological processes of the subject land are likely to be minor and is unlikely to substantially alter the vegetation and associated habitat such that its biodiversity value would be reduced.

7.3. Mitigation Measures for Impacts to Native Vegetation and Habitat

A range of mitigation measures have been developed for this project to mitigate the impacts that are unable to be avoided using the measures outlined previously. These include a range of measures to be undertaken before and during construction to limit the impact of construction, enhance the APZ vegetation and measures to manage weed control. Additionally, the remaining vegetation within the development site will be managed under a Vegetation Management Plan (Cumberland Ecology 2019b), which covers the management of the APZ as well as the exclusion zone surrounding the individuals of *Darwinia biflora* identified as part of the preparation of the BDAR.

A summary of the mitigation measures proposed for the Project are included in **Table 12** below, whilst each the proposed mitigation measures are discussed in more detail below.

Table 12 Mitigation Measures Summary

Mitigation Measure	Proposed Techniques	Timing	Frequency	Responsibility	Risk of Failure	Risk and Consequences of residual impacts
Construction mitigation measures for impacts to native vegetation and habitat						
Timing of construction works	Removal of habitat trees will be undertaken after a pre-clearance inspection by a qualified ecologist and will also be supervised by this qualified ecologist	Construction	Once	Contractor	Moderate	Unnecessary damage to trees to be retained; and Increased and unnecessary mortality of native fauna
Delineation of clearing areas	Areas to be cleared will be flagged and clearly delineated by temporary fencing to ensure that no areas intended for conservation will be inadvertently cleared during the construction process	Construction	Once	Contractor	High	Unnecessary damage to trees to be retained
Pre-clearance survey	Pre-clearance surveys will be conducted in all areas of vegetation or rocky habitat that are required to be cleared or altered. Pre-clearing surveys will be undertaken ahead of clearing, to limit fauna injury and mortality and to identify habitat features to be relocated.	Construction	Once	Contractor	High	Unnecessary damage to trees to be retained; and Increased and unnecessary mortality of native fauna
Weed management	Appropriate weed control activities will be undertaken in accordance with all state, regional and local weed management plans	Construction/ monitoring period of VMP	Consistent with VMP	Contractor	High	Spread of weeds throughout the subject land and surrounding areas

Mitigation Measure	Proposed Techniques	Timing	Frequency	Responsibility	Risk of Failure	Risk and Consequences of residual impacts
Sedimentation control	Construction activities will be undertaken in accordance with "The Blue Book" (Landcom 2004). These include implementation of the following measures: • Installation of sediment control fences; • Covering soil stockpiles; and • Avoiding soil disturbance prior to heavy rainfall	Construction	Throughout construction period	Contractor	High	Sedimentation into nearby wetlands and drainage lines
Mitigation measures for prescribed impacts						
Measures for rocks associated with habitat	The majority of rocky habitat is proposed to be retained within the APZ; Rocks to be impacted within the development envelope to be moved to suitable locations within the APZ or the area of retained bushland where feasible under the guidance of a suitably qualified and experienced ecologist; and Pre-clearance measures are proposed for rocky habitat to avoid impacts to native fauna species during construction	Construction	Once	Contractor	Moderate	Unnecessary removal of rocky habitat earmarked to be retained; and Increased and unnecessary mortality of native fauna

Mitigation Measure	Proposed Techniques	Timing	Frequency	Responsibility	Risk of Failure	Risk and Consequences of residual impacts
Measures for the connectivity of habitat that facilitates movement	Majority of scattered native trees within the development site will be retained; Understory planting is proposed for the landscaped areas of the development envelope; and Retained vegetation within the APZ will be managed under a VMP	Construction	Throughout the life of the VMP	Contractor	Moderate	Reduced connectivity within the subject land over time
Measures for water quality, water bodies and hydrological processes	Construction of a 500 mm high edging wall and a Leaky Wall Nutrient Retention Wetland planted out with native wetland plants in addition to disallowing the disposal of wastewater to the north of the proposed car park	Construction	Once	Contractor	High	Unintended transport of sediment, nutrients and exotic flora propagules into water bodies within and surrounding the subject land

7.3.1. Construction Mitigation Measures

7.3.1.1. Timing of Construction Works

In order to minimise impacts to threatened fauna species that may utilise the hollow-bearing trees and rocky habitat within the development site, removal of these will be undertaken after a pre-clearance inspection by a qualified ecologist and all hollow-bearing tree removal and rocky habitat disturbance will be supervised by an appropriately qualified and experienced ecologist.

7.3.1.2. Delineation of Clearing Areas

Areas that require clearance will be flagged and clearly delineated by temporary fencing to ensure that no areas intended for conservation will be inadvertently cleared during the construction process. No machinery will be parked on areas beyond the temporary fencing and no access will be allowed during construction. Ancillary facilities such as stockpile sites, site compounds and construction zones will not be located beyond the limits of clearing.

7.3.1.3. Pre-clearance Surveys

In order to avoid impacts to fauna species during construction, pre-clearance surveys will be conducted in all areas of vegetation or rocky habitat that are required to be cleared or altered. Pre-clearing surveys will be undertaken ahead of clearing, to limit fauna injury and mortality and to identify habitat features to be relocated. Pre-clearance surveys will be conducted by suitably qualified and experienced ecologists, and all fauna found during these surveys will be encouraged to move on or relocated by the ecologists in areas of similar habitat nearby that will not be impacted.

Pre-clearing surveys will be undertaken by a suitably qualified ecologist. Pre-clearing surveys will include:

- Demarcation of key habitat features, such as hollow-bearing trees;
- Checking trees for the presence of bird nests and arboreal mammals, such as possums, and bats, prior to felling;
- Checking rocks and boulders for the presence of native fauna such as amphibians, reptiles and invertebrates prior to earthworks or relocation and
- Animals found to be occupying trees and habitat will be safely removed before the clearing of trees and relocated into nearby wooded habitat.

To minimise impacts to native fauna species, clearing will be undertaken in the following two-stage process under the supervision of a suitably qualified ecologist:

- The initial phase of clearing will involve clearing around identified habitat features and leaving the features overnight; and
- The second stage will involve clearing of the habitat features left overnight followed by an inspection.

An ecologist will investigate all felled trees for the presence of hollows not detected prior to clearing. Inspections will be undertaken of these hollows for native fauna.

An ecologist will be present while clearing to rescue animals injured during the clearance operation. Provisions will be made to protect any native fauna during clearing activities by the following means:

- All staff working on the vegetation clearing will be briefed about the possible fauna present and should avoid injuring any present;
- Animals disturbed or dislodged during the clearance but not injured will be assisted to move to adjacent bushland or other specified locations; and
- If animals are injured during the vegetation clearance, appropriate steps will be taken to humanely treat the animal (either taken to the nearest veterinary clinic for treatment, or if the animal is unlikely to survive, it will be humanely euthanized).

Provision of a report following the completion of clearing works will be provided detailing the total number and species of individuals recorded and details of their release/health.

7.3.1.4. Weed Management

In order to minimise the spread of weeds throughout the subject land and spread of weeds present in the subject land to areas outside of it, appropriate weed control activities will be undertaken in accordance with all state, regional and local weed management plans. The subject land lies within the Greater Sydney Local Land Services Area and is subject to the Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022 (LLS: Greater Sydney 2017) under the NSW *Biosecurity Act 2015*.

The *Biosecurity Act 2015* and regulations provide specific legal requirements for state level priority weeds and high risk activities, as provided in the Appendices of the North West Regional Strategic Weed Management Plan. In order to comply with the objectives of the Greater Sydney Regional Strategic Weed Management Plan, it is recommended the following measures be implemented as part of a management plan for the subject land.

i. Prevention

Appropriate construction site hygiene measures will be implemented to prevent entry of new weeds to the area such as the use of wash bays.

ii. Eradication

Initial weed management will be carried out over the development site according to best-practice methods under the direction of a suitably qualified bush regenerator. The targeted species will be those listed under Appendices 1 and 2 of the Greater Sydney Regional Strategic Weed Management Plan. Initial weed treatment will include eliminating woody species and targeting large dominant infestations of exotic herbs. This may be achieved via a combination of manual weed removal and herbicide use.

Best-practice bush regeneration should undertake measures to avoid adverse impacts to retained vegetation within the development site, including not over clearing (remove only targeted species), employment of minimal disturbance techniques to avoid soil and surrounding vegetation disturbance, and replacement of disturbed mulch/leaf-litter.

iii. Containment

Follow-up monitoring and maintenance should be undertaken in areas of the development site that have received past primary weeding treatments in the following months, to contain any re-emergence of weed species.

iv. Minimisation

Minimisation of weed species that cannot be effectively controlled on the site, such as exotic grasses, will be prevented from further spread through construction and operational phase site hygiene procedures.

7.3.1.5. Sedimentation Control Measures

The Project may result in erosion and transport of sediments as a result of soil disturbance during construction. In order to prevent this impact, construction activities will be undertaken in accordance with "The Blue Book" (Landcom 2004). These include implementation of the following measures:

- Installation of sediment control fences;
- Covering soil stockpiles; and
- Avoiding soil disturbance prior to heavy rainfall

7.4. Mitigation Measures for Prescribed Impacts

7.4.1. Rocks Associated with Habitat of Threatened Species or Ecological Communities

As described in **Section 6.1.2.1.**, the majority of the rocky habitat, including higher quality habitat is proposed to be retained within the APZ, whilst rocky habitat in close proximity to the artificial wetland and 1st order watercourse is proposed to be retained within the retained bushland outside of the development site. Additionally, it is recommended that selected rocks or boulders to be impacted within the development site be moved to suitable locations within the APZ or the area of retained bushland where feasible under the guidance of a suitably qualified and experienced ecologist. Pre-clearance measures are proposed for rocky habitat to avoid impacts to native fauna species during construction as outlined in **Section 7.4.1.1**.

7.4.2. Connectivity of Different Areas of Habitat that Facilitates Movement

The majority of scattered native trees along the Glenhaven Road frontage are proposed to be retained. In addition to the retention of scattered native trees, understorey planting is proposed along the southern, eastern and western boundaries of the subject land, extending north to the area of remnant native vegetation and surrounding the proposed carpark.

Proposed understorey plantings and general landscape plantings surrounding and within the development envelope will heavily feature native species, potentially contributing to the restoration of habitat connectivity within the subject land in the longer term. Native tree species proposed to be planted throughout the development site include *Ceratopetalum gummiferum* (Christmas Bush), *Cupaniopsis anacardioides* (Tuckeroo), *Tristaniopsis laurina*'Luscious'(Water Gum cultivar) and *Waterhousia floribunda* (Weeping Lilly Pily). Native shrub and ground cover species proposed to be planted throughout the development site include *Acacia linifolia* (Flax Leafed Wattle), *Acmena smithii* 'Allyn Magic' (Lilly Pilly), *Austromyrtus tenuifolia* (Narrow Leaf

Myrtle), *Carpobrotus glaucescens* (Pig Face), *Grevillea linearifolia* (White Spider Flower), *Grevillea rosmarinifolia* (Rosemary Grevillea), *Hibbertia scandens* (Snake Vine), *Indigofera australis* (Native Indigo), *Leptospermum polygalifolium* 'Tickled Pink' (Tea Tree cultivar), *Lomandra fluviatilis* 'Shara' (Spiny Head Matt Rush cultivar), *Philotheca myoporoides* (Wax Flower), *Westringia fruticosa* (Coastal Rosemary), *Zieria smithii* (Sandfly Zieria). The establishment of native plantings in replacement of exotic grasslands and exotic trees, in accordance with APZ requirements would be anticipated to restore a degree of habitat connectivity throughout the subject land in the long term, partially mitigating the potential loss of habitat connectivity as a result of the Project.

The retained vegetation throughout the proposed APZ (VMP Area) is proposed to be managed under the guidance of a VMP (Cumberland Ecology 2019b). The purpose of this VMP is to guide the management of the vegetation to be retained and enhanced within the subject land. The primary focus of the VMP is the ongoing management of the vegetation present in the VMP area to preserve and increase the ecological values of the subject land over time and to mitigate the residual impacts of the Project. The VMP also provides detailed specifications for management actions to be undertaken in the development site to minimise the impacts of vegetation clearance and changes to the hydrological conditions of the development site. This includes specifications for fencing of clearing areas, pre-clearance surveys and clearance supervision. Furthermore, vegetation retention within the APZ will be maximised whilst adhering to bushfire management requirements to ensure the habitat retained provides for the continued movement of native species throughout the landscape.

7.4.3. Water Quality, Water Bodies and Hydrological Processes

Potential impacts to water quality, water bodies and hydrological processes are proposed to be mitigated with the construction of a 500 mm high edging wall and a Leaky Wall Nutrient Retention Wetland planted out with native wetland plants in addition to disallowing the disposal of wastewater to the north of the proposed car park.

The Leaky Wall Nutrient Retention Wetland is proposed to be located in the north-eastern corner of the development site. The Leaky Wall Nutrient Retention Wetland is being constructed to collect water from the carpark area, the landscaped area and roof water collected from the first flow bypass. Furthermore, the Nutrient Retention wetland is proposed to retain water for a limited period (in the order of a few days) after rain events to allow the native wetlands plants to absorb nutrients prior to the water leaking downhill into adjacent bushland, mitigating impacts associated with nutrient export.

The Nutrient Retention wetland aims to minimise impacts to water quality, water bodies and hydrological processes by improving water quality and reducing the quantity of water leaving the development site during the operational phase of the Project. The proposed edging wall aims to prevent the unintended transport of sediment, nutrients and exotic flora propagules from exiting the development site. In addition to these proposed mitigation measures, management of the APZ must prioritise retention of trees and geological features that reduce the risk of erosion and subsequent sedimentation of the watercourse. Additionally, the management actions set out in the VMP for the Project aim to manage any residual impacts associated with the transport of nutrients from within the development site into the APZ during and after construction. Weeds will be systematically managed throughout this area.

7.5. Adaptive Management of Uncertain Impacts

The project is considered unlikely to result in any uncertain impacts that require adaptive management as listed in Section 9.4.2 of the BAM.

7.6. Assessment Thresholds

The unavoidable impacts of the project have been considered and a determination made of the assessment thresholds. The following sections outline the assessment thresholds and their relevance to the project.

7.6.1. Impacts to Potential Serious and Irreversible Impact Entities

The project is considered unlikely to result in impacts to Potential Serious and Irreversible Impact (SAII) Entities. Only a single SAII is considered to have potential, non-breeding habitat within the development site; namely the Large Eared Pied Bat. The Large Eared Pied Bat is an SAII entity for breeding habitat only. As the project will not involve impacts to potential breeding habitat, no impacts to SAII entities are anticipated and subsequently, this assessment threshold has not been exceeded due to the Project.

7.6.2. Impacts that Require an Offset

7.6.2.1. Native Vegetation

In accordance with the BAM, the project requires offsets for the clearing of native vegetation as the following criteria is met:

- A vegetation zone that has a vegetation integrity score of ≥17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or is representative of a vulnerable ecological community.

i. Vegetation Management Zones

Two vegetation management zones have been defined for calculating the offset requirement based on the predicted management of the vegetation within each zone. These are detailed below:

- Development Envelope: the area occupied by the construction footprint for the Project and associated landscaping where complete removal of vegetation will occur; and
- APZ: the area occupied by the bushfire APZ where selective clearing will occur to meet the RFS guidelines as outlined in the Bushfire report by Australian Bushfire Protection Planners Pty Limited, including a reduction of tree canopy cover to 15% or less.

The management of the APZ will require a reduction in canopy cover and some shrub and ground layer species; however, these areas would not be subject to complete clearing and would therefore not result in a future vegetation integrity score of 0. As such, the scores for the vegetation zone composition, structure, and function have been adjusted in each management zone to reflect the predicted future values. The areas within each zone and the adjustments applied in the calculator are provided in **Table 13.**

Table 13 APZ Management zone adjustments used in the BAM calculator

Attribute	APZ multiplier
Zone Composition	
Tree	0.25
Shrub	0.25
Grass & Grass like	0.5
Forb	0.5
Fern	0.5
Other	0.5
Zone Structure	
Tree	0.15
Shrub	0.2
Grass & Grass like	0.5
Forb	0.5
Fern	0.5
Other	0.5
Zone Function	
Number of large trees	0.25
Litter Cover	0.25
Coarse woody debris	0
Stem size class	0.5
Regeneration stems	Absent
High threat weed cover	0

ii. Credit Liability

The PCT and associated vegetation zones requiring offsets, and the number of ecosystem credits required for each zone, are documented in **Table 14**. These areas are mapped in **Figure 11.**

Table 14 Summary of impacts to native vegetation requiring an offset

Vegetation Zone	TEC	Development Site (ha)	Development Envelope (ha)	APZ (ha)	Credits Required
1083_Scattered_Trees	Not a TEC	0.25	0.18	0.07	4
1083_Moderate_Good	Not a TEC	0.38	0.03	0.35	8

7.6.3. Impacts that do not require an Offset

All areas identified as Exotic Grassland and Exotic Planted Vegetation within the development site do not require an offset. These areas comprise approximately 0.44 ha, as shown on **Figure 12**.

7.6.4. Impacts that do not require Further Assessment

All areas identified as 'Cleared' that occur within the development site do not require an offset. These areas comprise approximately 0.10 ha, as shown on **Figure 13**.

7.7. Summary of Offset Credits Required

A credit report from the BAM calculator has been included in **Appendix C**.

The ecosystem credit requirement for the project is summarised in **Table 15**, whilst the 'like for like' offsetting options for the ecosystem credits are provided in **Table 16**.

Five species credits have been assessed as requiring an offset. The species credit requirement for the project is summarised in **Table 17**, whilst the 'like for like' offsetting options for the ecosystem credits are provided in **Table 18.** A credit report from the BAM calculator has been included in **Appendix C.**

Table 15 Summary of ecosystem credit liability

Vegetation Zone	TEC	Approximate Area (ha)	Vegetation Integrity Change	Credits Required
1083_Scattered_Trees	No	0.3	45	4
1083_Moderate_Good	No	0.4	58.4	8
Total	**-**	**0.7**	**-**	**12**

Table 16 Like for like options for PCTs

Original PCT to be offset	Any PCT in the below class	And in any of below trading groups	Containing HBT	In the below IBRA subregions
1083	Sydney Coastal Dry Sclerophyll Forests (including PCT's 1083, 1138, 1156, 1181, 1183, 1250, 1253, 1619, 1620, 1621, 1623, 1624, 1625, 1627, 1632, 1636, 1638, 1642, 1643, 1681, 1776, 1777, 1778, 1780, 1782, 1783, 1785, 1786, 1787)	Sydney Coastal Dry Sclerophyll Forests - < 50% cleared group (including Tier 7 or higher).	Yes	Yengo, Cumberland, Hunter, Kerrabee, Pittwater, Wollemi and Wyong. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.

Table 17 Summary of species credit liability

Species	Approximate Area (ha)	Credits Required
Burhinus grallarius / Bush Stone-curlew	0.4	11
Chalinolobus dwyeri / Large-eared Pied Bat	0.6	25
Darwinia biflora	0.4	11
Lophoictinia isura / Square-tailed Kite	0.6	12
Myotis macropus / Southern Myotis	0.6	17
Pseudophryne australis / Red-crowned Toadlet	0.4	8
Tetratheca glandulosa	0.4	11
Total	**-**	**95**

Table 18 Like for like options for species credits

Species	In the below IBRA subregions
Burhinus grallarius / Bush Stone-curlew	Any in NSW
Chalinolobus dwyeri / Large-eared Pied Bat	Any in NSW
Darwinia biflora	Any in NSW
Lophoictinia isura / Square-tailed Kite	Any in NSW
Myotis macropus / Southern Myotis	Any in NSW
Pseudophryne australis / Red-crowned Toadlet	Any in NSW
Tetratheca glandulosa	Any in NSW

8. Conclusion

The Project involves the construction of a mosque and associated infrastructure (the development envelope) and an APZ within the development site. An assessment was undertaken to examine the impacts of the Project on the biodiversity values of the subject land. This BDAR has been prepared to document the findings of an ecological investigation undertaken within the subject land in accordance with the BAM.

The biodiversity values of the southern portion of the subject land are limited, due to historical vegetation clearance and land use as a residential property. One plant community type (1083) has been identified within the subject land in two broad condition states consisting of good quality remnant bushland and lower quality scattered native trees including planted non-endemic species. Other areas of the subject land are occupied by an artificial wetland, exotic woody vegetation, exotic grassland and cleared areas. The subject land contains several fauna habitat features including 11 hollow-bearing trees, one log, one upright stag, two stick nests, one bowerbird nest, areas of rocky habitat, the artificial wetland and a 1st order ephemeral watercourse. There is connectivity between the native vegetation within the northern portion of the subject land and larger tracts of contiguous native vegetation extending beyond the subject land and into adjacent properties.

Measures to avoid and minimise impacts to the biodiversity values of the subject land have been implemented and included consideration of the project location and, design. The development envelope is positioned over an area within the subject land containing the lowest biodiversity values, consisting predominantly of the existing dwelling, cleared areas, exotic grassland, exotic trees, garden beds and some scattered native trees, including some non-endemic native species. In doing so, the Project has considered the biodiversity values of the vegetation within the subject land and has demonstrated reasonable steps to avoid and minimise impacts based upon the Project location within the subject land.

Nevertheless, the Project will result in some residual impacts to biodiversity including the complete clearance of approximately 0.03 ha of Red Bloodwood - scribbly gum heathy woodland and 0.07 ha of scattered native trees within the development envelope. The remaining native vegetation within the development site will be subject to partial clearance to accommodate the establishment of an APZ, comprising 0.35 ha of Red Bloodwood - scribbly gum heathy woodland and 0.07 ha of scattered native trees. Subsequently, at least three habitat trees, a log and a small area of rocky habitat will be removed. Potential indirect impacts of the Project include inadvertent impacts on hydrological processes and adjacent habitat, and prescribed impacts such as rocky habitat, habitat removal that facilitates movement of native fauna and prescribed impacts on hydrological processes have been considered. A suite of mitigation measures has been proposed to minimise the direct, indirect and prescribed impacts of the Project, such as construction mitigation measures, tree protection measures, weed management, pre-clearance surveys and management of the retained vegetation and APZ under a Vegetation Management Plan.

As the Project includes the removal and modification of areas of native vegetation, offsets are required in the form of ecosystem credits and species credits. This assessment indicated that the removal or modification of the native vegetation within the subject land requires a total of 12 ecosystem credits, comprising PCT 1083 and a total of 95 species credits for *Darwinia biflora*, the Square-tailed Kite, the Southern Myotis, the Large-Eared Pied Bat, the Bush-Stone Curlew, the Red-crowned Toadlet and *Tetratheca glandulosa*. With the implementation of the proposed mitigation measures and the purchase of biodiversity credits described

previously, it is considered that the impacts of this project on biodiversity will be minimal and can be appropriately managed.

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APPENDIX A :
BAM Plot Data

Table 19 BAM Plot Data

Family	Exotic	Scientific Name	Common Name	BC Act Status	EPBC Act Status	High Threat Exotic	BAM Growth Form Group	Q1		Q2		Q3		Q4	
								Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
Alliaceae	*	*Agapanthus praecox subsp. orientalis*				#N/A	#N/A	0.2	4						
Anthericaceae	*	*Chlorophytum comosum*	Spider Plant			YES	#N/A	0.25	10						
Apiaceae		*Platysace ericoides*				#N/A	Shrub (SG)					0.1	1		
Apiaceae		*Platysace linearifolia*				#N/A	Shrub (SG)					0.1	1		
Apiaceae		*Xanthosia tridentata*	Rock Xanthosia			#N/A	Forb (FG)					0.2	1	0.1	1
Araceae	*	*Monstera deliciosa*	Fruit Salad Plant			#N/A	#N/A	0.5	1						
Araliaceae		*Polyscias sambucifolia* subsp. *sambucifolia*				#N/A	Shrub (SG)			1	10	0.2	3	0.2	2
Araucariaceae	*	*Araucaria heterophylla*	Norfolk Island Pine			#N/A	#N/A	0.5	1						
Asparagaceae	*	*Asparagus aethiopicus*	Asparagus Fern			YES	#N/A	0.2	10						
Asparagaceae	*	*Asparagus asparagoides*	Bridal Creeper			YES	#N/A	0.25	20	0.1	2	0.1	2		
Asteraceae	*	*Bidens pilosa*	Cobbler's Pegs			YES	#N/A	0.1	1	0.1	10	0.1	10		
Asteraceae	*	*Conyza sumatrensis*	Tall fleabane			#N/A	#N/A	0.2	20	0.1	2				

Family	Exotic	Scientific Name	Common Name	BC Act Status	EPBC Act Status	High Threat Exotic	BAM Growth Form Group	Q1		Q2		Q3		Q4	
								Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
Asteraceae	*	*Hypochaeris microcephala var. albiflora*	White Flatweed			#N/A	#N/A	0.1	2						
Asteraceae	*	*Hypochaeris radicata*	Catsear			#N/A	#N/A	0.1	20						
Asteraceae		*Ozothamnus diosmifolius*	White Dogwood			#N/A	Shrub (SG)	0.25	5			3	20	0.2	3
Asteraceae	*	*Soliva sessilis*	Bindyi			#N/A	#N/A	0.1	200						
Bromeliaceae	*	*Aechmea gamosepala*				#N/A	#N/A	1	30						
Caryophyllaceae	*	*Polycarpon tetraphyllum*	Four-leaved Allseed			#N/A	#N/A	0.1	200						
Casuarinaceae		*Allocasuarina littoralis*	Black She-Oak			#N/A	Tree (TG)	4	1	15	20	30	60	20	50
Commelinaceae		*Commelina cyanea*	Native Wandering Jew			#N/A	Forb (FG)	0.1	5						
Crassulaceae		*Crassula sieberiana*	Australian Stonecrop			#N/A	Forb (FG)	0.1	1						
Cyperaceae		*Caustis flexuosa*	Curly Wig	P		#N/A	Grass & grasslike (GG)			15	500			1	20
Cyperaceae		*Caustis pentandra*	Thick Twist Rush	P		#N/A	Grass & grasslike (GG)							5	100
Cyperaceae		*Cyathochaeta diandra*				#N/A	Grass & grasslike (GG)	0.2	20	30	2000	5	200	10	500
Cyperaceae		*Gahnia clarkei*	Tall Saw-sedge			#N/A	Grass & grasslike (GG)			0.5	5				
Cyperaceae		*Lepidosperma laterale*				#N/A	Grass & grasslike (GG)					0.2	10	0.1	10

Family	Exotic	Scientific Name	Common Name	BC Act Status	EPBC Act Status	High Threat Exotic	BAM Growth Form Group	Q1		Q2		Q3		Q4	
								Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
Cyperaceae		*Schoenus apogon*	Fluke Bogrush			#N/A	Grass & grasslike (GG)					0.1	10		
Dennstaedtiaceae		*Pteridium esculentum*	Bracken			#N/A	Fern (EG)			0.25	5				
Ericaceae		*Epacris longiflora*	Fuchsia Heath			#N/A	Shrub (SG)			5	50	0.5	10		
Ericaceae		*Epacris pulchella*	Wallum Heath			#N/A	Shrub (SG)			3	20	0.2	5	0.2	5
Ericaceae		*Leucopogon juniperinus*	Prickly Beard-heath			#N/A	Shrub (SG)			0.2	2	0.2	5	0.5	5
Ericaceae		*Leucopogon microphyllus*				#N/A	Shrub (SG)			0.1	1			0.3	5
Ericaceae		*Leucopogon muticus*	Blunt Beard-heath			#N/A	Shrub (SG)	0.1	2	1	10	0.5	4		
Ericaceae		*Woollsia pungens*				#N/A	Shrub (SG)			1	20			4	20
Euphorbiaceae		*Micrantheum ericoides*				#N/A	Shrub (SG)			0.3	20				
Fabaceae (Faboideae)		*Dillwynia elegans*				#N/A	Shrub (SG)					0.1	1		
Fabaceae (Faboideae)		*Glycine microphylla*	Small-leaf Glycine			#N/A	Other (OG)	0.1	10						
Fabaceae (Faboideae)		*Glycine tabacina*	Variable Glycine			#N/A	Other (OG)	0.1	20						
Fabaceae (Faboideae)		*Hovea linearis*				#N/A	Forb (FG)			0.1	1				
Fabaceae (Faboideae)	*	*Lotus uliginosus*	Birds-foot Trefoil			#N/A	#N/A	0.1	50						

Family	Exotic	Scientific Name	Common Name	BC Act Status	EPBC Act Status	High Exotic	BAM Growth Form Group	Q1		Q2		Q3		Q4	
								Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
Fabaceae (Mimosoideae)		*Acacia decurrens*	Black Wattle			#N/A	Tree (TG)	0.1	2	2	3	5	4	1	4
Fabaceae (Mimosoideae)		*Acacia podalyriifolia*	Queensland Silver Wattle			#N/A	Shrub (SG)	0.75	1						
Goodeniaceae		*Dampiera stricta*				#N/A	Forb (FG)							0.1	1
Hyacinthaceae	*	*Ornithogalum longibracteatum*	Pregnant Onion			#N/A	#N/A	0.2	3						
Iridaceae	*	*Gladiolus undulatus*	Wild Gladiolus			#N/A	#N/A	0.2	20						
Iridaceae		*Patersonia sericea*	Silky Purple-Flag			#N/A	Forb (FG)			0.1	1				
Lamiaceae	*	*Plectranthus verticillatus*				#N/A	#N/A	1	100						
Lauraceae		*Cassytha glabella*				#N/A	Other (OG)					0.1	10	0.1	10
Lauraceae		*Cassytha pubescens*	Downy Dodder-laurel			#N/A	Other (OG)			0.1	5				
Lindsaeaceae		*Lindsaea linearis*	Screw Fern			#N/A	Fern (EG)			0.1	2				
Lindsaeaceae		*Lindsaea microphylla*	Lacy Wedge Fern			#N/A	Fern (EG)			0.1	1	0.1	1	0.1	4
Lomandraceae		*Lomandra cylindrica*				#N/A	Grass & grasslike (GG)							0.25	50
Lomandraceae		*Lomandra gracilis*				#N/A	Grass & grasslike (GG)			0.1	2				
Lomandraceae		*Lomandra gracilis*				#N/A	Grass & grasslike (GG)					0.2	10		

Family	Exotic	Scientific Name	Common Name	BC Act Status	EPBC Act Status	High Threat Exotic	BAM Growth Form Group	Q1		Q2		Q3		Q4	
								Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
Malvaceae		*Lasiopetalum ferrugineum*				#N/A	Shrub (SG)			2	20	1	10		
Myrtaceae		*Angophora bakeri*	Narrow-leaved Apple			#N/A	Tree (TG)					2	1		
Myrtaceae		*Angophora hispida*	Dwarf Apple			#N/A	Tree (TG)					10	14	5	20
Myrtaceae		*Angophora woodsiana*				#N/A	Tree (TG)	3	1						
Myrtaceae		*Calytrix tetragona*	Common Fringe-myrtle			#N/A	Shrub (SG)					0.2	1		
Myrtaceae		*Calytrix tetragona*	Common Fringe-myrtle			#N/A	Shrub (SG)					0.2	3	0.5	10
Myrtaceae	*	*Corymbia citriodora*	Lemon-scented Gum			#N/A	#N/A	0.1	1						
Myrtaceae		*Corymbia maculata*	Spotted Gum			#N/A	Tree (TG)	10	1						
Myrtaceae		*Darwinia biflora*		V,P	V	#N/A	Shrub (SG)							0.5	11
Myrtaceae		Eucalyptus *notabilis* <-> *resinifera* subsp. *resinifera* intergrade				#N/A	Tree (TG)			30	10				
Myrtaceae		*Eucalyptus crebra*	Narrow-leaved Ironbark			#N/A	Tree (TG)	1	1						
Myrtaceae		*Eucalyptus haemastoma*	Broad-leaved Scribbly Gum			#N/A	Tree (TG)	20	6			10	1	15	3

Family	Exotic	Scientific Name	Common Name	BC Act Status	EPBC Act Status	High Exotic	BAM Growth Form Group	Q1		Q2		Q3		Q4	
								Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
Myrtaceae		*Eucalyptus squamosa*	Scaly Bark			#N/A	Tree (TG)	4	1						
Myrtaceae		*Kunzea ambigua*	Tick Bush	P		#N/A	Shrub (SG)			20	30	5	20	5	20
Myrtaceae		*Leptospermum arachnoides*				#N/A	Shrub (SG)					0.2	1	0.1	2
Myrtaceae		*Leptospermum polygalifolium* subsp. *polygalifolium*				#N/A	Shrub (SG)							0.1	1
Myrtaceae		*Leptospermum trinervium*	Slender Tea-tree			#N/A	Shrub (SG)			2	20	3	10	5	30
Myrtaceae		*Lophostemon confertus*	Brush Box			#N/A	Tree (TG)	4	1						
Ochnaceae	*	*Ochna serrulata*	Mickey Mouse Plant			YES	#N/A	0.3	4	0.3	5				
Oleaceae	*	*Ligustrum sinense*	Small-leaved Privet			YES	#N/A			0.3	3	0.2	3		
Orchidaceae		*Dendrobium speciosum*	Rock Lily	P		#N/A	Forb (FG)	0.25	1						
Orchidaceae	*	*Epidendrum ibaguense*				#N/A	#N/A	0.5	10						
Oxalidaceae		*Oxalis perennans*				#N/A	Forb (FG)	0.1	10						
Phormiaceae		*Dianella caerulea var. producta*				#N/A	Forb (FG)	0.2	3	0.3	20	0.2	10	0.5	20

Family	Exotic	Scientific Name	Common Name	BC Act Status	EPBC Act Status	High Threat Exotic	BAM Growth Form	Q1		Q2		Q3		Q4	
								Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
Phormiaceae		*Dianella prunina*				#N/A	Forb (FG)					0.3	3	0.1	1
Phyllanthaceae		*Glochidion ferdinandi*	Cheese Tree			#N/A	Tree (TG)			0.2	3				
Phyllanthaceae		*Glochidion ferdinandi*	Cheese Tree			#N/A	Tree (TG)							0.1	1
Pinaceae	*	*Pinus elliottii*	Slash Pine			YES	#N/A	5	2						
Pittosporaceae		*Billardiera scandens*	Hairy Apple Berry			#N/A	Other (OG)			0.2	50	0.1	50	0.1	20
Pittosporaceae		*Pittosporum undulatum*	Sweet Pittosporum			#N/A	Shrub (SG)	0.5	2	2	10	0.25	4	3	20
Plantaginaceae	*	*Plantago lanceolata*	Lamb's Tongues			#N/A	#N/A	0.1	10						
Plantaginaceae		*Veronica plebeia*	Trailing Speedwell			#N/A	Forb (FG)	0.25	200					0.1	2
Poaceae	*	*Andropogon virginicus*	Whisky Grass			YES	#N/A					0.25	10		
Poaceae		*Anisopogon avenaceus*	Oat Speargrass			#N/A	Grass & grasslike (GG)					0.5	20	10	1000
Poaceae		*Aristida vagans*	Threeawn Speargrass			#N/A	Grass & grasslike (GG)	0.25	30			0.5	50		
Poaceae		*Austrostipa puberula*				#N/A	Grass & grasslike (GG)					5	200		
Poaceae	*	*Axonopus fissifolius*	Narrow-leafed Carpet Grass			YES	#N/A	20	2000						
Poaceae		*Cymbopogon refractus*	Barbed Wire Grass			#N/A	Grass & grasslike (GG)					0.25	20		

Family	Exotic	Scientific Name	Common Name	BC Act Status	EPBC Act Status	High Threat Exotic	BAM Growth Form Group	Q1		Q2		Q3		Q4	
								Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
Poaceae		*Cynodon dactylon*	Common Couch			#N/A	Grass & grasslike (GG)	5	100						
Poaceae		*Echinopogon ovatus*	Forest Hedgehog Grass			#N/A	Grass & grasslike (GG)					0.1	5		
Poaceae	*	*Ehrharta erecta*	Panic Veldtgrass			YES	#N/A	0.25	30						
Poaceae		*Entolasia marginata*	Bordered Panic			#N/A	Grass & grasslike (GG)			1	100			1	100
Poaceae		*Entolasia stricta*	Wiry Panic			#N/A	Grass & grasslike (GG)	5	500			1	100	5	500
Poaceae	*	*Eragrostis curvula*	African Lovegrass			YES	#N/A	1	20						
Poaceae		*Eragrostis leptocarpa*	Drooping Lovegrass			#N/A	Grass & grasslike (GG)	0.1	10						
Poaceae		*Microlaena stipoides*	Weeping Grass			#N/A	Grass & grasslike (GG)	60	6000			5	500		
Poaceae		*Oplismenus aemulus*				#N/A	Grass & grasslike (GG)					0.25	30		
Poaceae		*Panicum simile*	Two-colour Panic			#N/A	Grass & grasslike (GG)					0.1	10		
Poaceae		*Paspalidium distans*				#N/A	Grass & grasslike (GG)	0.1	20						
Poaceae		*Rytidosperma tenuius*	A Wallaby Grass			#N/A	Grass & grasslike (GG)	0.1	5			0.1	3		
Poaceae	*	*Setaria parviflora*				#N/A	#N/A					0.1	1		
Polygonaceae	*	*Acetosa sagittata*	Rambling Dock			YES	#N/A	0.1	10						

Family	Exotic	Scientific Name	Common Name	BC Act Status	EPBC Act Status	High Threat Exotic	BAM Growth Form Group	Q1		Q2		Q3		Q4	
								Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
Proteaceae		*Banksia ericifolia*	Heath-leaved Banksia			#N/A	Shrub (SG)			2	3			0.5	2
Proteaceae		*Banksia oblongifolia*	Fern-leaved Banksia			#N/A	Shrub (SG)					0.5	2		
Proteaceae		*Banksia spinulosa*	Hairpin Banksia	P		#N/A	Shrub (SG)	0.2	1						
Proteaceae		*Grevillea speciosa*	Red Spider Flower			#N/A	Shrub (SG)			0.75	5	0.1	1	0.3	4
Proteaceae		*Isopogon anemonifolius*	Broad-leaf Drumsticks	P		#N/A	Shrub (SG)							0.2	2
Proteaceae		*Isopogon anethifolius*	Narrow-leaf Drumsticks	P		#N/A	Shrub (SG)					0.25	1		
Proteaceae		*Lambertia formosa*	Mountain Devil			#N/A	Shrub (SG)	0.2	1	0.3	3	0.5	3	0.2	2
Proteaceae		*Lomatia silaifolia*	Crinkle Bush	P		#N/A	Shrub (SG)					0.2	1		
Proteaceae		*Persoonia lanceolata*	Lance Leaf Geebung	P		#N/A	Shrub (SG)							0.5	2
Proteaceae		*Persoonia linearis*	Narrow-leaved Geebung	P		#N/A	Shrub (SG)	0.2	0						
Proteaceae		*Persoonia pinifolia*	Pine-leaved Geebung	P		#N/A	Shrub (SG)			1	3	0.2	1	0.5	2
Pteridaceae		*Cheilanthes sieberi*	Rock Fern			#N/A	Fern (EG)					0.1	10		
Restionaceae		*Lepyrodia scariosa*				#N/A	Grass & grasslike (GG)			1	50				
Rosaceae	*	*Rosa rubiginosa*	Sweet Briar			YES	#N/A	0.2	2						

Family	Exotic	Scientific Name	Common Name	BC Act Status	EPBC Act Status	High Exotic	BAM Growth Form Group	Q1		Q2		Q3		Q4	
								Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
Rubiaceae		*Opercularia aspera*	Coarse Stinkweed			#N/A	Forb (FG)			0.1	1	0.1	3	0.2	10
Rubiaceae		*Pomax umbellata*	Pomax			#N/A	Forb (FG)	0.1	10						
Rutaceae		*Boronia ledifolia*	Sydney Boronia	P		#N/A	Shrub (SG)			0.3	5	0.1	1		
Sapindaceae		*Dodonaea camfieldii*				#N/A	Shrub (SG)					0.5	20		
Smilacaceae		*Smilax glyciphylla*	Sweet Sarsparilla			#N/A	Other (OG)			0.1	1				
Solanaceae	*	*Cestrum parqui*	Green Cestrum			YES	#N/A	0.2	1						
Verbenaceae	*	*Lantana camara*	Lantana			YES	#N/A			0.56	5	0.2	2		
Xanthorrhoeaceae		*Xanthorrhoea media*		P		#N/A	Other (OG)	0.25	4	0.1	1	0.1	1	0.5	3
Zingiberaceae	*	*Hedychium gardnerianum*	Ginger Lily			#N/A	#N/A	0.2	1						

Key: P = Protected, V = Vulnerable, E = Endangered, CE = Critically Endangered

APPENDIX B :
Fauna Species List

Table 20 Fauna Species List

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Detection
Trichoglossus moluccanus	Rainbow Lorikeet	Not listed	Not listed	Incidental
Cacatua galerita	Sulphur-crested Cockatoo	Not listed	Not listed	Incidental
Anthochaera chrysoptera	Little Wattlebird	Not listed	Not listed	Incidental
Manorina melanocephala	Noisy Miner	Not listed	Not listed	Incidental
Corvus coronoides	Australian Raven	Not listed	Not listed	Incidental
Acridotheres tristis	Common Myna	Not listed	Not listed	Incidental
Dacelo novaeguineae	Laughing Kookaburra	Not listed	Not listed	Incidental
Meliphaga lewinii	Lewin's Honeyeater	Not listed	Not listed	Incidental
Geopelia humeralis	Bar-shouldered Dove	Not listed	Not listed	Incidental
Cractixus tibicen	Australian Magpie	Not listed	Not listed	Incidental

APPENDIX C :
Credit Report

BAM Credit Summary Report

Proposal Details

Assessment Id

00016390/BAAS17027/19/00016391

Proposal Name

18010 Impact

BAM data last updated *

12/06/2019

Assessor Name

Report Created

30/06/2019

BAM Data version *

11

Assessor Number

* 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.

Revision No

1

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

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion								
1	1083_Scattered_Trees01	45.0	0.3	0.25	High Sensitivity to Potential Gain	1.50		4

2	1083_Moderate_Good	58.4	0.4	0.25	High Sensitivity to Potential Gain	1.50		8
							Subtotal	**12**
							Total	**12**

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Potential SAII	Species credits
Burhinus grallarius / Bush Stone-curlew (Fauna)						
1083_Moderate_Good	58.4	0.38	0.25	2	False	11
					Subtotal	**11**
Chalinolobus dwyeri / Large-eared Pied Bat (Fauna)						
1083_Scattered_Trees01	45.0	0.25	0.25	3	True	8
1083_Moderate_Good	58.4	0.38	0.25	3	True	17
					Subtotal	**25**
Darwinia biflora / Darwinia biflora (Flora)						
1083_Moderate_Good	58.4	0.38	0.25	2	False	11
					Subtotal	**11**

Lophoictinia isura / Square-tailed Kite (Fauna)						
1083_Scattered_Trees01	45.0	0.25	0.25	1.5	N/A	4
1083_Moderate_Good	58.4	0.38	0.25	1.5	N/A	8
					Subtotal	**12**
Myotis macropus / Southern Myotis (Fauna)						
1083_Scattered_Trees01	45.0	0.25	0.25	2	False	6
1083_Moderate_Good	58.4	0.38	0.25	2	False	11
					Subtotal	**17**
Pseudophryne australis / Red-crowned Toadlet (Fauna)						
1083_Moderate_Good	58.4	0.38	0.25	1.5	False	8
					Subtotal	**8**
Tetratheca glandulosa / Tetratheca glandulosa (Flora)						
1083_Moderate_Good	58.4	0.38	0.25	2	False	11
					Subtotal	**11**

Biodiversity payment summary report

Assessment Id	Payment data version	Revision number	Report created
00016390/BAAS17027/19/00016391	57	1	30/06/2019

Assessor Name	Assessor Number	Proposal Name
		18010 Impact

PCT list

Include	PCT common name	Credits
Yes	**1083 -** Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion	12

Species list

Include	Species	Credits
Yes	***Burhinus grallarius*** (Bush Stone-curlew)	11
Yes	***Chalinolobus dwyeri*** (Large-eared Pied Bat)	25
Yes	***Darwinia biflora*** (Darwinia biflora)	11
Yes	***Lophoictinia isura*** (Square-tailed Kite)	12
Yes	***Myotis macropus*** (Southern Myotis)	17
Yes	***Pseudophryne australis*** (Red-crowned Toadlet)	8
Yes	***Tetratheca glandulosa*** (Tetratheca glandulosa)	11

Biodiversity payment summary report

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

IBRA sub region	PCT common name	Baseline price	Dynamic coefficient	Market coefficient	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Yengo	**1083 -** Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion **Note: This PCT has trades recorded**	$2,752.39	0.71782200	2.32666494	19.99%	$20.00	1.0000	$3,639.95	12	$43,679.37

Subtotal (excl. GST)	**$43,679.37**
GST	**$4,367.94**
Total ecosystem credits (incl. GST)	**$48,047.31**

Species credits for threatened species

Species profile ID	Species	Threat status	Price per credit	Risk premium	Administrative cost	No. of species credits	Final credits price
10113	***Burhinus grallarius*** (Bush Stone-curlew)	Endangered	$506.66	19.9900%	$20.00	11	$6,907.35
10157	***Chalinolobus dwyeri*** (Large-eared Pied Bat)	Vulnerable	$725.00	19.9900%	$20.00	25	$22,248.19
10202	***Darwinia biflora*** (Darwinia biflora)	Vulnerable	$156.05	19.9900%	$20.00	11	$2,279.69

Biodiversity payment summary report

10495	***Lophoictinia isura*** (Square-tailed Kite)	Vulnerable	$506.66	19.9900%	$20.00	12	$7,535.30
10549	***Myotis macropus*** (Southern Myotis)	Vulnerable	$725.00	19.9900%	$20.00	17	$15,128.77
10692	***Pseudophryne australis*** (Red-crowned Toadlet)	Vulnerable	$506.66	19.9900%	$20.00	8	$5,023.53
10798	***Tetratheca glandulosa*** (Tetratheca glandulosa)	Vulnerable	$158.64	19.9900%	$20.00	11	$2,313.87
						Subtotal (excl. GST)	**$61,436.70**
						GST	**$6,143.67**
				Total species credits (incl. GST)			**$67,580.37**
						Grand total	**$115,627.68**

APPENDIX D :

National Herbarium of NSW, Eucalyptus spp. Identification Letter

The Royal
BOTANIC GARDENS
& Domain Trust

National Herbarium of New South Wales

Bryan FURCHERT
Cumberland Ecology
PO Box 2474
Carlingford Court, NSW 2118

BIS Enquiry No: 21070
Botanical.Is@rbgsyd.nsw.gov.au
Ph. No: (02) 9231 8111
Date: 21 June 2019

Dear Bryan,

Re: *Eucalyptus* sp. Cattai

I have compared your specimen with material of *Eucalyptus* sp. Cattai (Gregson s.n., 28 Aug 1954), however your specimen is not a good match. In particular, the fruits of your specimen are broader and more sperical when compared with those of E. sp. Cattai specimens. Your specimen is a better match for the specimens we have identified as E. *notabilis* <-> *resinifera* subsp. *resinifera* intergrade.

This taxon is currently being researched. There are differing opinions regarding the status of this taxon, and some experts believe that it is not distinct and is best placed as an intergrade between E. *notabilis* and E. *scias* subsp. *scias* (D.Nicolle, Classification of the eucalypts (Angophora, Corymbia and Eucalyptus, 2019)

I have kept your specimen for the herbarium collection.

Thank you for your enquiry.

Yours sincerely

Andrew Orme
Identification Technical Officer
Botanical Information Service

FIGURES

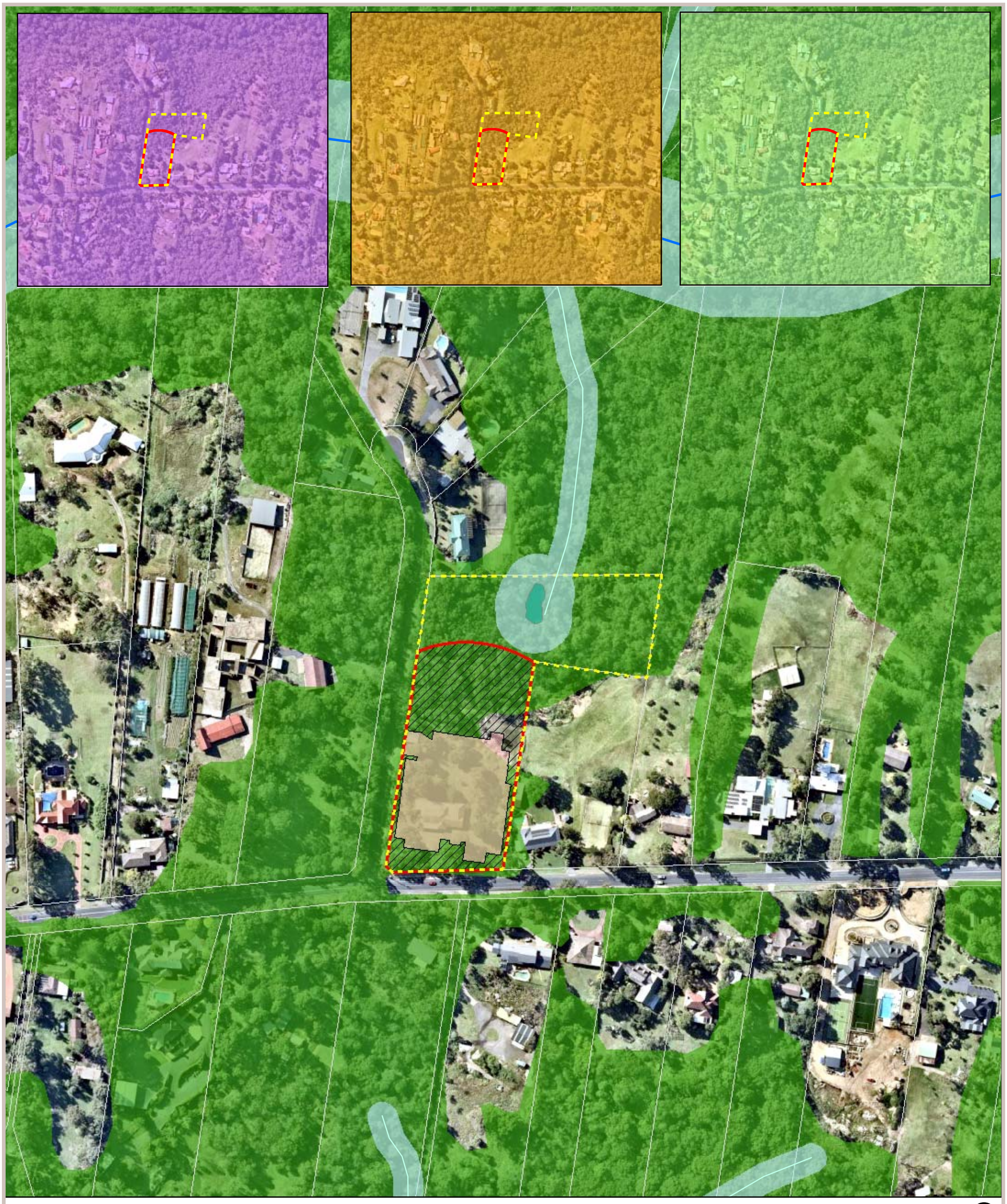

Figure 1. Site map

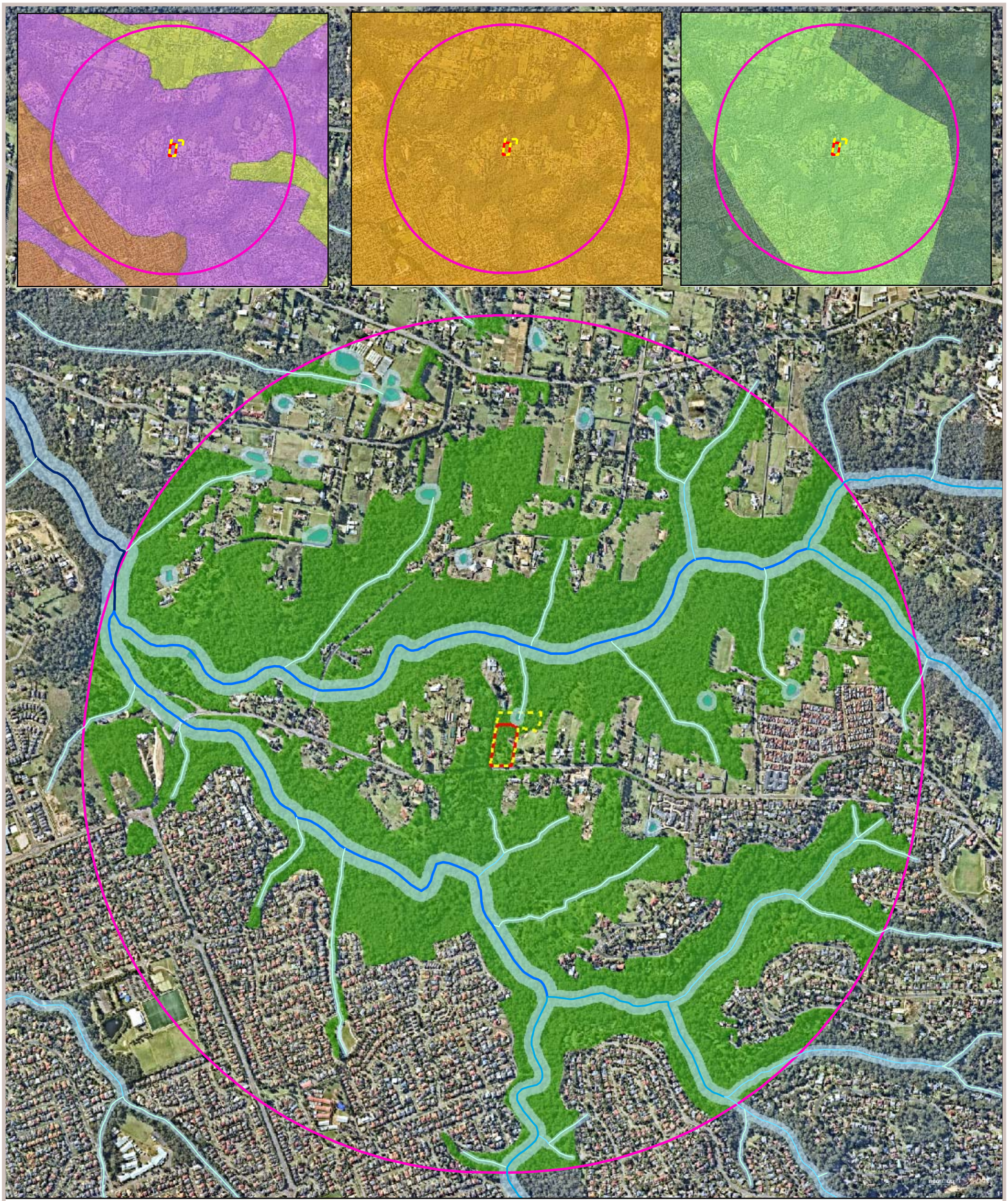

Figure 2. Location map

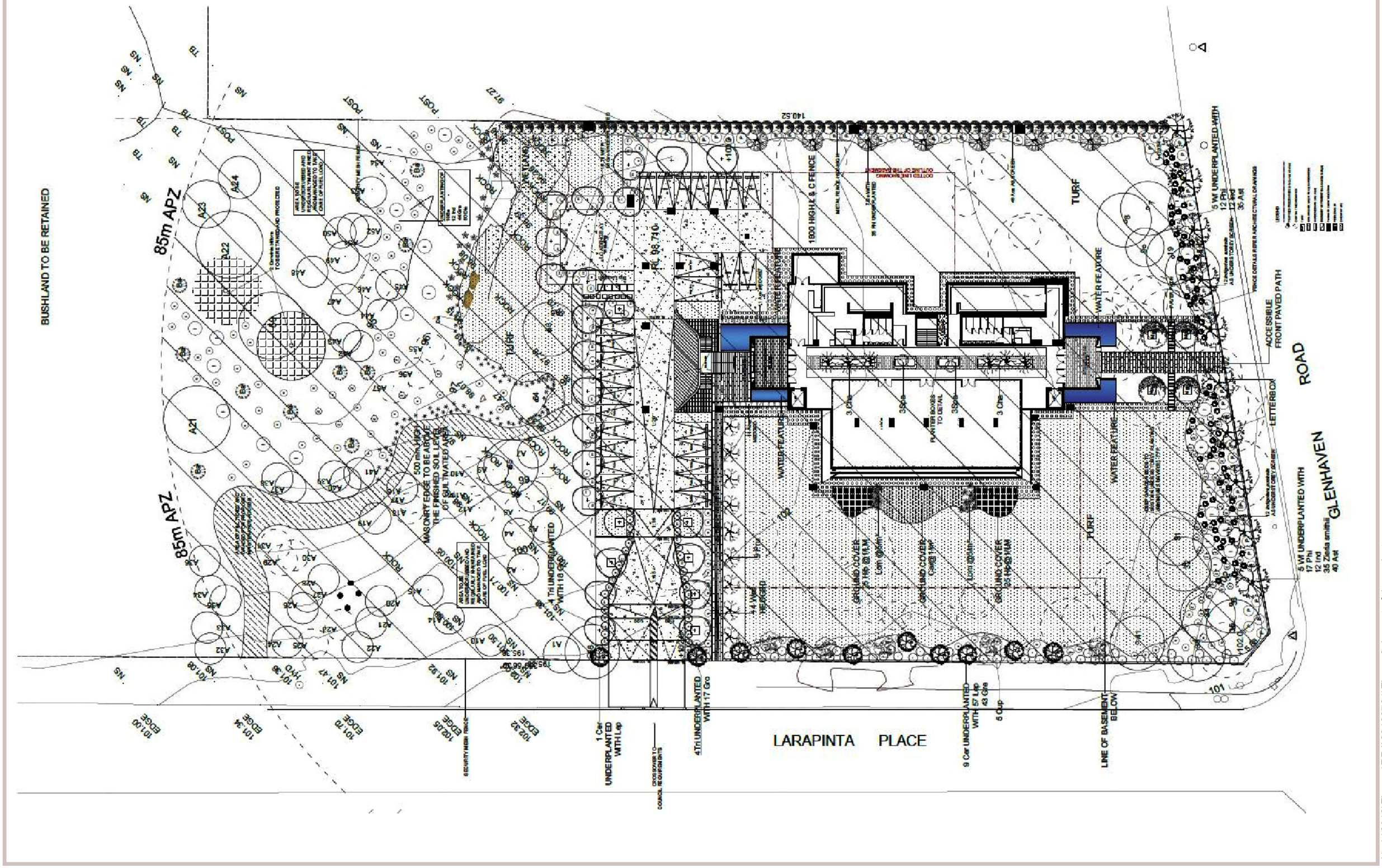

Figure 3. Layout of the project

Image Source: Earth Matters Consulting 2019

I:\...\18010\Figures\RP1\20190701\Figure 3. Layout of the project

Legend

Development Site

Subject Land

Flora Survey Locations

BAM Plot

Survey Tracks

Plant Community Type

1083 - Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2019
Dated: 20190407

Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
The Hills Shire LGA

cumberland ecology

0 30 m

I:\...\18010\Figures\RP1\20190701\Figure 4. Survey locations

Figure 4. Survey locations

Legend

Development Site

Subject Land

Native Vegetation Extent

Native

Exotic

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2019
Dated: 20190407

Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
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cumberland ecology

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I:\...\18010\Figures\RP1\20190626\Figure 5. Native vegetation extent

Figure 5. Native vegetation extent

Legend

Development Site

Subject Land

Plant Community Type

1083 - Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2019
Dated: 20190407

Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
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I:\...\18010\Figures\RP1\20190626\Figure 6. Plant community types

Figure 6. Plant community types

Legend

- Development Site
- Subject Land

Vegetation Zone

- 1083_Moderate_Good
- 1083_Scattered_Trees

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2019
Dated: 20190407

Data Source:
NSW Government Spatial Services
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I:\...\18010\Figures\RP1\20190626\Figure 7. Vegetation zones

Figure 7. Vegetation zones

Figure 8. Threatened species within the subject land

Legend

Development Site

Subject Land

Species Polygon

Large-eared Pied Bat, Square-tailed Kite (breeding) and Southern Myotis

Darwinia biflora, Tetratheca glandulosa, Bush Stone-curlew and Red-crowned Toadlet

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
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Data Source:
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I:\...\18010\Figures\RP1\20190701\Figure 9. Species polygons

Figure 8. Species polygons

Legend

Development Site

Subject Land

Habitat Feature

Hollow-bearing Tree

Stag

Log

Stick Nest

Bowerbird Nest

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2019
Dated: 20190407

Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
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I:\...\18010\Figures\RP1\20190626\Figure 10. Habitat features_subject land

Figure 10. Habitat features of the subject land

Legend

Development Site

Subject Land

Impacts that Require an Offset

1083_Moderate_Good

1083_Scattered_Trees

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2019
Dated: 20190407

Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
The Hills Shire LGA

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I:\...\18010\Figures\RP1\20190626\Figure 11. Impacts that require an offset

Figure 11. Impacts that require an offset

Legend

Development Site

Subject Land

Impacts that do not Require an Offset

Exotic Planted Vegetation

Exotic Grassland

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2019
Dated: 20190407

Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
The Hills Shire LGA

cumberland ecology

0 30 m

I:\...\18010\Figures\RP1\20190626\Figure 12. Impacts that do not require an offset

Figure 12. Impacts that do not require an offset

Legend

Development Site

Subject Land

Areas not Requiring Further Assessment

Cleared Land

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2019
Dated: 20190407

Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
The Hills Shire LGA

cumberland ecology

0 30 m

I:\...\18010\Figures\RP1\20190626\Figure 13. Location of areas not requiring further assessment

Figure 13. Location of areas not requiring further assessment