QUARRY RD DURAL

Flora and Fauna Assessment

For:

Thelem Consulting Pty Ltd

June 2018

Final Report

PO Box 2474
Carlingford Court 2118

Report No. 17241RP1

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 recommendations 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.

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Approved by: Dr David Robertson

Position: Director

Signed: David Robertson

Date: *21 June, 2018*

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Glossary of Terms

AHD	Australian Height Datum
AOBV	Area of Outstanding Biodiversity Value
BAM	Biodiversity Assessment Method
BC Act	NSW *Biodiversity Conservation Act 2016*
BC Regulation	NSW *Biodiversity Conservation Regulation 2017*
BOS	Biodiversity Offsets Scheme
CEEC	Critically Endangered Ecological Community
DBH	Diameter at Breast Height
DoEE	Commonwealth Department of the Environment and Energy
EEC	Endangered Ecological Community
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
GPS	Geographic Information System
IPA	Inner Protection Area
LGA	Local Government Area
Locality	The area within a 10 km radius of the centre of the subject site
MNES	'Matters of National Environmental Significance' that are listed under the EPBC Act
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
The Project	The aged care facility project
Subject site	The area subject to the ecological investigation within this report
Subject Site	The area directly impacted by the Project
TEC	'Threatened Ecological Community' that are listed under the BC Act or EPBC Act
VIS	Vegetation Information System

Executive Summary

S1 Introduction

Cumberland Ecology was commissioned by Thelem Consulting to undertake a Flora and Fauna Assessment (FFA) for the proposed aged care facility project (the 'Project'). The Project involves the construction and operation of an aged care facility comprising three eight storey buildings. This FFA will support development application under Part 4 of the New South Wales (NSW) *Environmental Planning and Assessment Act 1979* (EP&A Act).

The Project does not trigger the BOS and therefore a general FFA is provided. The purpose of this FFA is to document the findings of ecological investigations completed across the subject site and to assess the impacts of the Project on the biodiversity values present. Biodiversity values considered include threatened species and ecological communities protected under the NSW *Biodiversity Conservation Act 2016* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

S2 Methodology

S2.1 Literature Review

A review of relevant ecological literature was undertaken as part of this ecological assessment to evaluate the flora and fauna values associated with the subject site including relevant broad scale vegetation and soil landscape mapping.

S2.2 Database Analysis

Database analysis was conducted for the locality using the OEH BioNet Atlas (OEH 2018b) and the DoEE Protected Matters Search Tool (DoEE 2018). The locality is defined as the area within a 10 km radius of the subject site.

S2.3 Flora Survey

Flora surveys were undertaken by Cumberland Ecology on 6 April and 13 April 2018. Surveys included:

- Vegetation mapping, with reference to previous broad-scale mapping relevant to the subject site;
- Plot-based floristic survey, in accordance with the Biodiversity Assessment Method (BAM); and
- Threatened species searches, targeting species known to occur in the locality.

Where relevant, the locally defined map units were matched with the equivalent Plant Community Types (PCTs). Plant communities were also assessed against the listings of threatened ecological communities (TECs) listed under the BC Act and EPBC Act.

S2.4 Fauna Survey

Fauna surveys were undertaken by Cumberland Ecology on 6 April 2018. Surveys included:

- General habitat assessment;
- Hollow-bearing tree assessment;
- Targeted Dural Woodland Snail surveys, and
- Incidental observations.

S3 Results

S3.1 Introduction

Vegetation within the subject site includes remnant bushland, isolated native trees, planted vegetation and cleared areas. The subject site has had a history of clearing relating to past use as a hobby farm which has resulted in the degradation and clearing of the vast majority of native vegetation. In addition to the clearing of native vegetation, previous land uses have removed or modified the fauna habitats within the subject site.

S3.2 Vegetation Communities

Two native plant communities have been mapped as occurring within the subject site. The remainder of the subject site consists of planted Urban Native/Exotic vegetation or other vegetation dominated by exotic species. **Table S.1** lists the vegetation communities occurring within the subject site and their area of occupancy.

Table S.1.1 Areas of vegetation communities within the subject site

Vegetation Community	PCT	BC Act Status	EPBC Act Status	Subject site (ha)
Sydney Turpentine-Ironbark Forest	1281	EEC	-*	0.11
Blackbutt Gully Forest	1841	-	-	0.18
Urban Native/Exotic	-	-	-	0.40
Exotic Vegetation	-	-	-	0.10
Exotic Dominated Grassland	-	-	-	2.28
Total				**3.07**

BC Act / EPBC Act Status: EEC = Endangered Ecological Community

**Although an equivalent TEC is listed under the EPBC Act, the vegetation within the subject site does not meet the condition or size criteria for it to constitute the TEC.*

S3.3 Flora

Over 100 flora species were recorded within the subject site during field surveys, including 42 native species and 66 exotic species. Of the native species recorded in the subject site, the most frequently recorded plant families include the Fabaceae (7) Poaceae (4) and Myrtaceae (4) and Cyperaceae (4) families. Of the exotic species recorded in the subject site, the most frequently recorded plant families include Poaceae (16), Asteraceae (12) and Fabaceae (9).

The floral assemblage across the subject site is a reflection of the previous and current land uses which have resulted in a highly disturbed landscape with patches of remnant trees fringed by remnant bushland.

Of the exotic species recorded within the subject site, *Asparagus aethiopicus* (Ground Asparagus), *Asparagus asparagoides* (Bridal Creeper), *Anredera cordifolia* (Madeira Vine), *Lantana camara* (Lantana), *Senecio madagascariensis* (Fireweed), *Eragrostis curvula* (African Lovegrass) and *Rubus fruticosus* sp. agg. (Blackberry complex) are listed as a State Priority Weed under the Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022 (LLS: Greater Sydney 2017, OEH 2018a). Additionally, 26 exotic species recorded from the subject site are classified as High Threat Exotics under the BAM.

No threatened flora species were recorded during surveys. Database analysis indicates that several threatened flora species have been recorded from the locality, however, threatened species are not considered to have potential to occur in the subject site due to the degraded nature of suitable habitat.

S3.4 Fauna

The majority of the subject site is comprised of exotic grassland which has limited value for native fauna species. The treed areas and the small drainage line within the subject site provide some limited habitat for native fauna species; however these habitats are highly modified.

Habitat features recorded within the subject site include:

- Log piles and woody debris;
- Hollow-bearing trees and stags;
- Nectar-producing trees; and
- Riparian environments.

Seventeen (17) vertebrate fauna species have been recorded from the subject site during surveys. The disturbed nature of a majority of the subject site is likely to limit the types and abundance of fauna species occurring. Introduced species were not recorded during field surveys.

No threatened fauna species were recorded within the subject site during surveys. An analysis of the likelihood of occurrence within the subject site for all threatened fauna species recorded within the locality or that have the potential to occur due to the presence of suitable habitat was performed. Of the 48 threatened and migratory species known or predicted to occur within the locality, a total of 11 have been assessed as potentially occurring within the subject site.

S4 Impact Assessment

S4.1 Introduction

The ecological impacts of the Project are largely related to the direct disturbance of vegetation and associated habitat loss, represented by the removal of a small area of native vegetation. Secondary impacts due to indirect impacts are also relevant to the Project and have been considered.

S4.2 Direct Impacts

The primary impact associated with the Project is the removal of vegetation. The primary plant community impacted by the Project is Exotic Grassland (2.22 ha). Only a very minor amount of native vegetation will be completely cleared by the Project (0.12 ha) whilst a moderate area of native vegetation will be partially cleared during the creation of the Asset Protection Zone (APZ) (~0.17 ha). Impact areas are shown in **Table S.1.2.**

In addition to the clearance of vegetation communities, the Project includes the removal of hollow-bearing trees. A total of three living trees and one large stag containing potential habitat such as hollows, fissures and decorticating bark occur within the subject site. All of these trees fall within the proposed APZ and may potentially be removed.

Table S.1.2 Impacts to vegetation communities within the subject site

Plant Community	PCT	BC Act Status	EPBC Act Status	Removed within subject site (ha)	Managed as APZ within subject site (ha)	Total area impacted or modified (ha)
Sydney Turpentine-Ironbark Forest	1281	EEC	-*	0.07	0.04	0.11
Blackbutt Gully Forest	1841	-	-	0.03	0.14	0.18
Urban Native/Exotic	-	-	-	0.28	0.12	0.40
Exotic Vegetation	-	-	-	0.06	0.05	0.10
Exotic Dominated Grassland	-	-	-	2.22	0.06	2.28
Total				2.66	0.41	3.07

BC Act / EPBC Act Status: EEC = Endangered Ecological Community

** Although an equivalent TEC is listed under the EPBC Act, the vegetation within the subject site does not meet the condition criteria for it to constitute the TEC.*

S4.3 Indirect Impacts

The Project will result in some indirect impacts on the ecological values of remaining vegetation and habitat within the subject site, including fragmentation, edge effects and alteration to hydrological regimes. Additionally, a number of construction and operational impacts, such as those relating to dust, noise, light and erosion, may also impact the remaining vegetation and habitat.

S5 Mitigation Measures

Mitigation measures proposed for the Project include:

- Inductions;
- Access restrictions;
- Erosion, sedimentation and pollution control;
- Pre-clearing and clearing surveys;
- Landscaping;
- Weed control measures; and
- General construction and operational measures.

S6 Conclusion

The proposed development footprint and associated APZ comprises a total of 3.10 ha of land, of which most (2.22 ha) comprises Exotic Dominated Grassland. The Project will result in impacts to two native vegetation communities, including scattered trees of the BC Act listed Sydney Turpentine-Ironbark Forest (~0.06 ha to be cleared, ~0.04 ha to be partially cleared within the APZ) and Blackbutt Gully Forest (~0.03 ha to be cleared, ~0.14 ha to be partially cleared within the APZ). These vegetation communities comprise limited potential habitat for threatened fauna species.

The ecological investigation undertaken for this assessment indicates that the anticipated impacts to threatened ecological communities and threatened species habitat are manageable and will not result in significant impacts. Notwithstanding this, a suite of mitigation measures are proposed to minimise the impacts on biodiversity values within the subject site.

Chapter 1

Introduction

Cumberland Ecology was commissioned by Thelem Consulting to undertake a Flora and Fauna Assessment (FFA) for the proposed aged care facility project (the 'Project'). The Project involves the construction and operation of an aged care facility comprising three eight storey buildings. This FFA will support development application under Part 4 of the New South Wales (NSW) *Environmental Planning and Assessment Act 1979* (EP&A Act).

1.1 Purpose

The purpose of this report is to document the findings of ecological investigations completed across the subject site, which comprises Lot 2A DP 158064 and Lot 1 DP 230172 (see **Figure 1.1**). Biodiversity values considered include threatened species and ecological communities protected under the NSW *Biodiversity Conservation Act 2016* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The main objective of this report is to determine whether the Project is likely to significantly affect threatened biodiversity values and to outline how the Project plans to mitigate those impacts.

Specifically, the objectives of this FFA are to:

- Document the reasons why the Biodiversity Offsets Scheme under the BC Act applies does not apply to the Project;
- Describe and map vegetation communities of the subject site, identifying threatened ecological communities (TECs) listed under the BC Act and/or the EPBC Act;
- Identify and map the location of threatened flora and fauna species (if present);
- Assess the likelihood as to whether threatened flora and fauna species could occur within the subject site;
- Describe the types and extent of potential impacts arising from the Project; and
- Where relevant, recommend mitigation measures to reduce the impacts of the proposed development on biodiversity values.

1.2 Project Description

In summary, development approval is sought for the following:

- Preparatory demolition of existing structures, vegetation removal and excavation work;
- Construction of a residential aged care facility with a capacity of 74 beds;
- Construction of eight (8), three (3) storey buildings containing 158 self-care housing units;
- Basement level car parking accommodating approximately 365 car spaces;
- Provision of access to and within the Project site;
- Ancillary facilities;
- Clearance and thinning of vegetation within an Asset Protection Zone (APZ);
- Associated landscaping and public domain works; and
- Extension and augmentation of physical infrastructure utilities as required.

The layout of the Project is shown in **Figure 1.2**. The subject site covers an area of 3.10 ha, which incorporates the area directly impacted by the Project.

1.3 Background

1.3.1 Location

The Project is wholly located within the Hornsby Shire Local Government Area (LGA). The subject site is located approximately 25km from the Sydney CBD. The subject site is approximately 1 km north of Dural Nature Reserve and approximately 1 km west of the Berowra Valley National Park. **Figure 1.1** illustrates the immediate locality of the subject site. The subject site is bounded to the south by Quarry Road, by a wholesale nursery to the east, by agricultural and semi-rural land to the west and by Vineys Road to the north.

1.3.2 Landform

Within the subject site, the land is sloping from both the northern boundary and the southern boundary towards the centre of the subject site. Topographic highs occur along the southern boundary and the northern boundary at 208 m and 206 m Australian Height Datum (AHD) respectively, sloping down to a topographic low in the centre of the subject site associated with the drainage line at 190 m AHD.

1.3.3 Vegetation

Vegetation within the subject site includes remnant canopy trees, planted vegetation and cleared areas. The subject site has had a history of use as a hobby farm which has resulted in the degradation and clearing of the vast majority of the native vegetation within the subject site. Remnant canopy remaining within the subject site is dominated by *Eucalyptus pilularis* (Blackbutt), with occasional occurrences of *Angophora costata* (Smooth-barked Apple) and *Syncarpia glomulifera* (Turpentine). Planted areas within the subject site include the remnants of a pine plantation, exotic grasslands and garden vegetation.

1.3.4 Hydrology

The subject site intersects a single minor surface drainage system, a tributary of Tunks Creek flowing in an easterly direction. Tunks Creek flows in a north-easterly direction into Berowra Creek which eventually flows into the Hawkesbury River.

1.3.5 Zoning and Land Use

The subject site is zoned as RU2 – Rural Landscape under the *Hornsby Local Environmental Plan 2013*. The subject site has been used as a hobby farm, with similar agricultural land use occurring in the wider area. The property was tenanted at the time of survey. Other land uses in the surrounding area include the nursery and green house complex adjacent to the site, a retail/commercial complex to the south-east, agricultural land to the north and north-west and native bushland to the north-east of the site.

1.4 Relevant Legislation

1.4.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) is the overarching planning legislation in NSW. This act provides for the creation of planning instruments that guide land use. The EP&A Act also provides for the protection of the environment, including the protection and conservation of native animals and plants. This includes threatened species, communities, habitat and processes as listed under the BC Act and *Fisheries Management Act 1994*.

1.4.2 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the Commonwealth Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places – defined in the EPBC Act as Matters of National Environmental Significance (MNES). Under the EPBC Act, any action (which includes a development, project or activity) that is considered likely to have a significant impact on MNES (including nationally listed threatened ecological communities and species, and listed migratory species) must be referred to the Australian Government Minister for the Environment (the Minister). The purpose of the referral is to allow a decision

to be made about whether an action requires approval on a Commonwealth level. If an action is declared a "controlled action", then Commonwealth approval is required.

1.4.3 NSW Biodiversity Conservation Act 2016 (BC Act)

The BC Act is the key piece of legislation in NSW relating to the protection and management of biodiversity and threatened species. The purpose of the BC Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development. The BC Act is supported by a number of regulations, including the *Biodiversity Conservation Regulation 2017* (BC Regulation).

The BC Act requires consideration of whether a development or an activity is likely to significantly affect threatened species. For Part 4 local developments, projects that significantly affect threatened species trigger the Biodiversity Offsets Scheme (BOS). The BOS is intended to simplify biodiversity assessment and improve biodiversity outcomes by creating consistent assessment requirements to measure the likely biodiversity loss of development proposals and gains in biodiversity value achieved at offset sites through active management. The BOS requires an assessment following the Biodiversity Assessment Methodology (BAM) by an accredited BAM assessor and the preparation of a Biodiversity Development Assessment Report.

1.5 Assessment of Entry into the Biodiversity Offsets Scheme

To determine the type of assessment required for the Project it is necessary to determine whether the Project triggers the BOS. For the Project to trigger the BOS, it would need to be considered as likely to significantly affect threatened species, which could occur as follows:

- It is likely to significantly affect threatened species or ecological communities, or their habitats, according to the test of significance in Section 7.3 of the BC Act; or
- It exceeds the biodiversity offsets scheme entry thresholds; or
- It is carried out in a declared area of outstanding biodiversity value (AOBV).

These three criteria are assessed in detail below. The results indicated that the Project does not trigger the BOS and therefore a general FFA is provided.

1.5.1 Test of Significance

A test of significance in accordance with Section 7.3 of the BC Act was undertaken for all threatened communities and species known, or considered likely, to occur within the subject site (see **Appendix F**). None of these communities or species are considered to be significantly affected by the Project and therefore the BOS is not triggered by this mechanism.

1.5.2 Biodiversity Offsets Scheme Threshold

A development can exceed the BOS threshold if it is or involves:

- The clearing of native vegetation of an area above a prescribed threshold based on the minimum lot size; or
- The clearing of native vegetation, or other prescribed action, on land included on the Biodiversity Values Map.

An assessment of these two components is provided below. The Project does not exceed either of these thresholds and therefore the BOS is not triggered by this mechanism.

i. Area Threshold

The Project occurs on Lot 2A DP 158064 and Lot 1 DP 230172, which are zoned as RU1 – Rural Landscape, under the *Hornsby Local Environmental Plan 2013*. The minimum lot size associated with the lots is specified to be 2 ha as shown on the Hornsby Shire Lot Size Map – Sheet LSZ_009 (Hornsby Shire Council 2013). Subsequently, the area threshold would be exceeded if the development involved the clearing of 0.5 ha or more. The Project involves impacts to approximately 0.37 ha of native vegetation within the subject site (including scattered native shrubs throughout planted areas), the BOS is not triggered by this mechanism.

ii. Biodiversity Values Map

The subject site, which is the location of the development footprint and area subject to clearing, does not occur on land mapped on the Biodiversity Values Map (see **Figure 1.3**). Therefore, the BOS is not triggered by this mechanism.

1.5.3 Declared Area of Outstanding Biodiversity Value

The BC Act currently lists the following AOBVs:

- Gould's Petrel habitat;
- Little Penguin population in Sydney's North Harbour habitat;
- Mitchell's Rainforest Snail in Stotts Island Nature Reserve; and
- Wollemi Pine habitat.

The Project is not located within the above AOBVs and therefore the BOS is not triggered by this mechanism.

Legend

Subject Site

Image Source:
Image © NearMap 2018
Dated: 18-01-2018

Coordinate System: MGA Zone 56 (GDA 94)

cumberland ecology

0 25 50 75 100 m

I:\...\17241\Figures\RP1\20180424\Figure 1.1. Locality_subject site

Figure 1.1. Locality of the subject site

Figure 1.2. Layout of the Project

Image Source: Marchese Partners 2018

I:\...\17241\Figures\RP1\20180619\Figure 1.2. Layout of the Project

Figure 1.3. Biodiversity Values Map

Chapter 2

Methodology

2.1 Literature Review

A review of relevant ecological literature was undertaken as part of this ecological assessment to evaluate the flora and fauna values associated with the subject site. The information collected during the literature review guided the field surveys undertaken for this ecological assessment. Information within the literature reviewed was also utilised in determining the likelihood of threatened species occurring within the subject site and assessing the potential impacts of the Project.

2.2 Database Analysis

A number of databases were utilised during the preparation of this FFA. Key databases reviewed for this FFA include:

- Vegetation classification:
  - Bionet Vegetation Classification Data Collection;
- Species records/occurrences:
  - OEH BioNet Atlas (OEH 2018b);
  - Commonwealth Department of the Environment and Energy (DoEE) Protected Matters Search Tool (DoEE 2018);
- Species profiles:
  - OEH Threatened Species Profile Database; and
  - DoEE Species Profile and Threat Database.

Database analysis was conducted for the locality using the OEH BioNet Atlas (OEH 2018b) and the DoEE Protected Matters Search Tool (DoEE 2018). The locality is defined as the area within a 10 km radius of the border of the subject site. The BioNet Atlas search facility was used to generate records of threatened flora and fauna species and populations listed under the BC Act and/or EPBC Act within the locality. The abundance, distribution and age of records generated within the search areas provided supplementary information for the

assessment of likelihood of occurrence of those threatened species within the subject site. The Protected Matters Search Tool generated a list of potentially occurring MNES listed under the EPBC Act within the locality of the subject site.

2.3 Flora Survey

Flora surveys were undertaken by Cumberland Ecology on 6 April and 13 April 2018. Surveys included vegetation mapping, plot-based vegetation survey and threatened flora surveys. The survey design was guided by the following:

- NSW Government (2017): Biodiversity Assessment Method; and
- NSW Government (2016): NSW Guide to Surveying Threatened Plants.

The locations of all flora survey sites are shown in **Figure 2.1**.

2.3.1 Vegetation Mapping

Previous broad-scale mapping of the Cumberland Plain by the NSW National Parks and Wildlife Service (NSW NPWS 2002) and the Hornsby LGA by Hornsby Shire Council (OEH 2013b) were accessed (2010)prior to the survey in in order to determine vegetation communities that could occur within the subject site. The vegetation within the subject site was ground-truthed by Cumberland Ecology to examine and verify the mapping including the condition and extent of the different vegetation communities. Where vegetation community boundaries were found to differ from the existing mapping, records were made of proposed new boundaries using a hand-held Global Positioning System (GPS) and mark-up of aerial photographs. The data collected was analysed and the resultant information was synthesised using a Geographic Information System to create a spatial database to produce a vegetation map of the subject site.

2.3.2 Plot-based Floristic Survey

Plot-based floristic surveys were undertaken within the subject site Five floristic plot surveys were surveyed. Surveys followed the BAM and included establishment of a 20 m 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 20m 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 steams <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.

All vascular plants recorded or collected were identified using keys and nomenclature provided in PlantNET (Botanic Gardens Trust 2018).

2.3.3 Threatened Species Searches

Targeted surveys were conducted within potential habitat and additional threatened flora surveys were undertaken in conjunction with collection of floristic plot data. Surveys were targeted towards threatened species known to occur in the locality of the subject site. Surveys involved foot traverses, and where threatened flora species were observed, the location was recorded with a hand-held GPS.

2.3.4 Data Analysis

i. Plant Community Types

The primary nomenclature used within this report is locally defined map units that were determined following field investigations within the subject site. Where relevant, the locally defined map units were matched with the equivalent Plant Community Types (PCTs).

Identification of the PCTs occurring within the subject site was guided by the findings of the plot-based floristic survey. The data collected during surveys of the subject site was analysed in conjunction with a review of the PCTs held within the Bionet Vegetation Classification Data Collection. Consideration was given to the following:

➢ Occurrence within the Sydney Basin Interim Biogeographic Regionalisation for Australia subregion and Hawkesbury Nepean management area;

➢ Vegetation formation;

➢ Alignment with TECs;

➢ Landscape position;

➢ Associated upper stratum species; and

➢ Upper, mid and ground strata species.

Where locally defined map units were not readily able to be matched to PCTs, best-fit communities were selected, or noted as unassigned if comprised of planted or exotic vegetation.

ii. Classification of Threatened Ecological Communities

Following review of potentially occurring TECs, the vegetation communities identified within the subject site were examined against the listings of TECs under the BC Act and EPBC Act.

For TECs listed under the BC Act, vegetation communities were examined against the final determinations for potentially occurring TECs. A component of this analysis was to compare the species listed from the locally defined communities with the species lists provided in the final determinations. Additional information such as location and biophysical aspects of each final determination were also taken into account in the assessment.

For TECs listed under the EPBC Act, vegetation communities were examined against the DoEE Species Profile and Threats Database and any associated documentation, such as listing advice and policy statements.

2.3.5 Limitations

Flora of the locality is well known based upon a sizeable database of past records and various published reports. The field survey undertaken by Cumberland Ecology added to this existing database and has helped to provide an indication of the likelihood that various species occur, or are likely to occur within the subject site. The data obtained from database assessment and surveys of the subject site furnished an appropriate level of information to support this assessment.

It is considered that the flora species of conservation value have been adequately targeted within the subject site to enable this FFA to be prepared. A range of threatened flora is known to occur in the locality, however based on ground conditions, a number of these are unlikely to occur in the subject site.

The area values presented within this report are approximate and are derived from a combination of aerial photo-interpretation, field based mapping and data extrapolation. This approach is considered to be appropriate and provides adequate and reliable information for this FFA.

2.4 Fauna Survey

Fauna surveys were undertaken by Cumberland Ecology on 6 April and 13 April 2018. Surveys included general habitat assessment, hollow-bearing tree assessment, bird census, microbat surveys and incidental observations. The survey design was guided by the following:

- NSW Government (2017): Biodiversity Assessment Method; and

- DEC (NSW) (2004):Threatened Biodiversity Survey and Assessment Guidelines for Development and Activities (Working Draft).

The locations of all fauna survey sites are shown in **Figure 2.2**.

2.4.1 General Habitat Assessment

A general fauna habitat assessment was undertaken within the subject site during field surveys. This assessment included consideration of important indicators of habitat conditions and complexity as well as the occurrence of micro-habitats such as tree hollows, fallen logs and riparian areas. An assessment of the structural complexity of the vegetation, the age structure of the remnant vegetation and the nature and extent of human disturbance was also undertaken. Notes were taken on specific habitat features that may be utilised by threatened fauna species known to occur in the locality.

In addition to the general habitat assessment, fauna habitat data was also collected within the floristic plots, which included the number of trees and their DBH, the number of trees with hollows and, the total length of logs and composition of the ground stratum.

2.4.2 Hollow-bearing Tree Assessment

Remnant native vegetation and some areas of planted vegetation were surveyed to determine the presence of hollows. All trees that were observed to contain a hollow visible from the ground were recorded with a hand-held GPS, including both living and dead trees.

2.4.3 Dural Woodland Snail Surveys

An ecologist undertook targeted Dural Woodland Snail surveys over a period of four hours on 6 April 2018. A random meander survey was initially performed throughout the subject site to identify areas of potential habitat. The Dural Woodland Snail is known to shelter under rocks, inside curled up bark, beneath leaves, and light woody debris but can also be observed resting in exposed areas (OEH 2017b). Areas of accumulated litter surrounding exposed sandstone and at the bases of trees were searched for approximately two minutes per point with the locations recorded on a hand-held GPS.

2.4.4 Incidental Observations

Visual observation and call identification of diurnal birds was carried out throughout the subject site during the survey period. Diurnal birds were also identified and recorded as they were encountered throughout the subject site.

Any incidental vertebrate fauna species that was observed, heard calling, or otherwise detected on the basis of tracks or signs were recorded and listed in the total species list for the subject site.

2.4.5 Limitations

Fauna of the locality is well known based upon a sizeable database of past records and various published reports. The field survey undertaken by Cumberland Ecology added to

this existing database and has helped to provide an indication of the likelihood that various species occur, or are likely to occur within the subject site. The data obtained from database assessment and surveys of the subject site furnished an appropriate level of information to support this assessment.

Data obtained from the fauna surveys are a "snapshot" in time and illustrate the fauna that were active during the time of the surveys. The data produced by the surveys is intended to be indicative of the types of species that could occur and not an absolute census of all vertebrate fauna species occurring within the subject site. It is likely that if continued field sampling was undertaken within the subject site, additional species could be identified.

The field surveys were supplemented by literature review, database analysis and a fauna habitat assessment. The combination of these techniques is considered appropriate for assessing the habitat values of the site for threatened fauna within the subject site.

2.5 Weather Conditions

Weather conditions during flora and fauna surveys were generally appropriate for detection of a variety of flora and fauna. A summary of the weather conditions during the survey period are shown in **Table 2.1**.

Table 2.1 Weather conditions during the survey period

Date	Minimum Temperature (C)	Maximum Temperature (C)	Rainfall (mm)
06/04/2018	19.6	26.9	0
13/04/2018	22.7	32.6	0

Legend

Subject Site

Fauna Surveys

Dural Land Snail

Flora Surveys

Random Meander Survey

Flora Plot Locations

Image Source:
Biodiversity Values Map 2018
© State of New South Wales

Coordinate System: MGA Zone 56 (GDA 94)

cumberland ecology

0 10 20 30 40 m

I:\...\17241\Figures\RP1\20180424\Figure 2.1. Survey locations_subject site

Figure 2.1. Survey locations within the subject site

cumberland ecology

Chapter 3

Results

3.1 Introduction

Vegetation within the subject site includes remnant canopy, planted vegetation and cleared areas. The subject site has been used as a hobby farm which has resulted in the degradation and clearing of the vast majority of native vegetation. In addition to the clearing of native vegetation, previous land uses have removed or modified the fauna habitats within the subject site. The eastern patch of vegetation within the subject site is well connected to contiguous vegetation outside of the subject site along the eastern most boundary. The remaining native vegetation within the subject site comprise isolated patches of trees with little connectivity to contiguous habitat.

3.2 Vegetation Communities

Two (2) native plant communities have been mapped as occurring within the subject site. The remainder of the subject site consists of planted Urban Native/Exotic vegetation or other vegetation dominated by exotic species. **Table 3.1** lists the vegetation communities occurring within the subject site and their area of occupancy. Summary descriptions of the communities are provided below and their distribution within the subject site is shown in **Figure 3.1**.

Table 3.1 Areas of vegetation communities within the subject site

Vegetation Community	PCT	BC Act Status	EPBC Act Status	Subject site (ha)
Sydney Turpentine-Ironbark Forest	1281	EEC	-*	0.11
Blackbutt Gully Forest	1841	-	-	0.18
Urban Native/Exotic	-	-	-	0.40
Exotic Vegetation	-	-	-	0.10
Exotic Dominated Grassland	-	-	-	2.28
Total				**3.07**

BC Act / EPBC Act Status: EEC = Endangered Ecological Community

**Although an equivalent CEEC is listed under the EPBC Act, the vegetation within the subject site does not meet the condition or size criteria for it to constitute the CEEC as detailed below.*

3.2.1 Sydney Turpentine-Ironbark Forest

BC Act Status: Endangered Ecological Community

EPBC Act Status: Critically Endangered Ecological Community

PCT: 1281

Scattered elements of the Sydney Turpentine-Ironbark Forest (STIF) occur throughout the subject site as small, highly degraded, isolated patches of trees with a cleared understorey. The canopy within these patches is dominated by a combination of species including *Syncarpia glomulifera* (Turpentine), *Angophora costata* (Smooth-barked Apple), and *Eucalyptus punctata* (Grey Gum). A single remnant *Eucalyptus saligna* (Sydney Blue Gum) is located in the centre of the subject site, and is also consistent with this community.

The community lacks a shrub layer for the most part. The single *Eucalyptus saligna* (Sydney Blue Gum) is flanked by *Acacia implexa* (Hickory Wattle) individuals of varying maturity. Prevalent exotic occur adjacent to the scattered native canopy trees including *Ligustrum sinense* (Small-leaved Privet), *Ligustrum lucidum* (Large-leaved Privet), *Olea europaea* subsp. *cuspidata* (African Olive), *Ochna serrulata* (Mickey Mouse Plant) and *Solanum mauritianum* (Wild Tobacco Bush).

The ground layer throughout the patches of STIF has been predominantly cleared and replaced with exotic plantings and weeds. Very few native species are present which generally only occur as scattered forbs, grasses and vines. Native species recorded throughout the community within the subject site include *Geranium solanderi* (Native Geranium), *Wahlenbergia gracilis* (Sprawling Bluebell), *Portulaca oleracea* (Pigweed), *Microlaena stipoides* (Weeping Grass), *Oplismenus aemulus* (Australian Basket Grass), *Glycine tabacina* (Variable Glycine), *Cayratia clematidea* (Native Grape), *Carex inversa* (Knob Sedge) and *Cyperus gracilis* (Slender Flat-sedge). *Cenchrus clandestinus* (Kikuyu Grass) is the dominant exotic species throughout the ground layer of the community. Other notable exotic ground layer species recorded include *Senecio madagascariensis* (Fireweed), *Paspalum dilatatum* (Paspalum), *Asparagus asparagoides* (Bridal Creeper), *Araujia sericifera* (Moth Vine), *Acetosella vulgaris* (Sheep Sorrel), *Conyza* sp. (Fleabane), *Sonchus* sp. (Sowthistles) and *Rubus fruticosus* sp. agg. (Blackberry).

i. BC Act Listing

A number of scattered trees throughout the subject site are consistent with the Sydney Turpentine-Ironbark Forest Endangered Ecological Community listing under the BC Act as described in the final determination (NSW Scientific Committee 2011).

Paragraph 4 of the final determination states:

> *Characteristic tree species in the STIF are Syncarpia glomulifera, Eucalyptus globoidea, Eucalyptus resinifera, Eucalyptus paniculata, Angophora costata and Angophora floribunda.*

The scattered canopy trees within the subject site are characteristic species of STIF including *Syncarpia glomulifera* (Turpentine) and *Angophora costata* (Smooth-barked Apple). Whilst the shrub layer is predominantly cleared, characteristic shrubs of STIF occur including *Acacia implexa* (Hickory Wattle) and *Pittosporum undulatum* (Sweet Pittosporum). Although the ground layer is largely exotic in composition, characteristic ground layer species such as *Oplismenus aemulus* (Australian Basket Grass) and *Microlaena stipoides* (Weeping Grass) occur with a scattered distribution.

Paragraph 3 of the final determination states:

> *The structure of the community was originally forest, but may now exist as woodland or as remnant trees.*

Using a precautionary approach, remnant trees comprising STIF characteristic species (and other species known to occur within the community such as *Eucalyptus saligna*) within the flat areas of the subject site have been mapped as the BC Act listing of the EEC.

ii. EPBC Act Listing

The community within the subject site does not conform to the CEEC as listed under the EPBC Act. The Approved Conservation Advice (Threatened Species Scientific Committee 2005) for the EPBC listed community states that occurrences must be in good condition to be considered as part of the nationally listed ecological community.

Good condition has been defined within the document as conforming to the following criteria:

- The vegetation has some characteristic components from all structural layers (tree canopy, small tree/shrub midstorey, and understorey);
- The tree canopy cover is greater than 10%; and
- The patch size is greater than one hectare

Additionally, patches with a tree canopy cover of less than 10% are also included in the ecological community if:

- The patch of the ecological community is greater than one hectare in size; and
- It is part of a remnant of native vegetation that is 5 hectares or more in area.

Four patches of Sydney Turpentine-Ironbark Forest have been mapped as occurring within the subject site; including one patch that likely extend outside of the subject site. None of these patches are greater than 1 ha in area, and as these patches occur as remnant trees

above mown lawn they lack characteristic components from all structural layers. As such, the Sydney Turpentine-Ironbark Forest mapped as occurring within the subject site is not considered to conform to the EPBC Act listing of the community.

Photograph 3.1 Sydney Turpentine-Ironbark Forest within the northern extent of the subject site

3.2.2 Blackbutt Gully Forest

BC Act Status: Not listed

EPBC Act Status: Not listed

PCT: 1841

This community represents the majority of the native vegetation within the subject site. This patch is situated within the eastern extent of the subject site and follows the course of the small drainage line that flows into Tunks Creek, adjoining to contiguous vegetation outside of the subject site. The canopy within the patch is dominated by *Eucalyptus pilularis* (Blackbutt), *Angophora costata* (Smooth-barked Apple) and *Syncarpia glomulifera* (Turpentine).

The community contains a highly degraded shrub layer dominated by exotic species, however native species were observed to be persisting. Native shrubs observed throughout this patch include *Acacia implexa* (Hickory Wattle), *Pittosporum undulatum* (Sweet Pittosporum), *Persoonia linearis* (Narrow-leaved Geebung) and *Leucopogon juniperinus* (Prickly Beard-heath). Prevalent exotic shrubs throughout the patch include *Ligustrum*

sinense (Small-leaved Privet), *Lantana camara* (Lantana) and *Ochna serrulata* (Mickey Mouse Plant).

The community contains a highly degraded ground layer dominated by exotic species, however native species were observed to be persisting. Native ground layer species observed throughout this patch include *Hibbertia aspera* (Rough Guinea Flower), *Pratia purpurascens* (Whiteroot), *Dianella caerulea* var. *producta* (Blue Flax-Lily), *Entolasia marginata* (Bordered Panic), *Microlaena stipoides* (Weeping Grass), *Oplismenus aemulus* (Australian Basket Grass) and *Glycine microphylla* (Small-leaf Glycine). Exotic ground cover species observed within the patch include *Zantedeschia aethiopica* (Arum Lily), *Asparagus aethiopicus* (Asparagus Fern), *Ageratina adenophora* (Crofton weed), *Tradescantia fluminensis* (Wandering Jew) and *Ehrharta erecta* (Panic Veldtgrass). A number of exotic vines were observed including *Rubus fruticosus* sp. agg. (Blackberry), *Lonicera japonica* (Japanese Honeysuckle) and *Anredera cordifolia* (Madeira Vine).

i. Hornsby Shire Council Locally Significant Community

The community throughout the subject site is consistent with the Blackbutt Fully Forest Locally Significant Community as described in the Native Vegetation Communities of Hornsby Shire Council (Smith and Smith 2010), based upon floristic data and position within the landscape.

The community description in the Native Vegetation Communities of Hornsby Shire Council states the following:

Description: Tall open-forest in which the main tree species are Eucalyptus pilularis (Blackbutt), Angophora costata (Sydney Red Gum) and Syncarpia glomulifera (Turpentine).

Distribution and habitat in survey area: Gullies on Hawkesbury Sandstone with a shale influence (from shale lenses in the sandstone or from proximity to Wianamatta Group shales)

Conservation significance: Recognised as a locally significant community in the Hornsby Shire Biodiversity Conservation Strategy (Hornsby Shire Council 2006). Although it is a common community in Hornsby Shire, it is uncommon and poorly conserved outside the Shire. For example, only small areas occur in Ku-ring-gai Chase National Park (Thomas and Benson 1985a). Locally Significant Community.

ii. Relationship to other communities

This community shares a number of species with other wet sclerophyll forests found on Narrabeen and Hawkesbury sandstone geology and is known to grade into the BC Act/EPBC Act Listed STIF community. Sydney Turpentine-Ironbark Forest is known to transition into Blackbutt Gully Forest and related communities on sites situated within or near sandstone gullies (OEH 2016).

During site inspections, numerous sandstone outcrops were noted through the area mapped as Blackbutt Gully Forest, occurring within a gully associated with the minor drainage line that runs through the subject site. Additionally, the soil within this area was noted to be

conspicuously sandy in composition, contrasting to the more shale influenced soils surrounding the patches of remnant STIF trees within the northern portion of the site. Based upon the position of the landscape, the conspicuous sandstone outcrops, the sandy soils observed and the results of floristic analysis, this patch of vegetation has been excluded from being classified as STIF or other related TECs.

Photograph 3.2 Blackbutt Gully Forest within the eastern extent of the subject site

Photograph 3.3 Sandy soils observed throughout the Blackbutt Gully Forest Community

Photograph 3.4 Large Eucalyptus tereticornis in the centre of the site

3.2.3 Urban Native/Exotic

BC Act Status: Not listed

EPBC Act Status: Not listed

PCT: Not assigned

Patches of planted native and exotic vegetation occurs throughout the subject site, primarily occurring around the residential dwellings in the northern and southern areas of the site and along the boundaries. These plantings include *Pinus* sp. (Pines), *Cedrus* sp. (Cedars), *Jacaranda mimosifolia* (Jacaranda) and *Syzygium australe* (Brush Cherry).

The boundary planting along the southern boundary is comprised of *Pinus* sp. with an exotic understorey of *Ligustrum sinense* and herbaceous and grassy weeds. The planted native vegetation within the subject site does not comprise a naturally occurring PCT.

A large *Eucalyptus tereticornis* (Forest Red Gum) is located in the centre of the subject site. The origin of this specimen is somewhat unclear as it is the only specimen of the species on site. It is not a species that generally occurs in STIF or Blackbutt Gully Forest. The subject site has many planted native and exotic trees so it may potentially have been planted. Also, as soils have been moved and modified, seed of this species may have been imported onto the site from another community within the broader locality.

Photograph 3.5 Planted Urban Native/Exotic Vegetation within the subject site

3.2.4 Exotic Vegetation

BC Act Status: Not listed

EPBC Act Status: Not listed

PCT: Not assigned

This community occurs throughout the subject site comprised of patches of exotic vegetation that are unlikely to have been planted with very few occurrences of native species. This community is dominated by exotic trees and shrubs including *Solanum mauritianum* (Wild Tobacco Bush), *Ligustrum sinense* (Small-leaved Privet). Exotic ground cover species observed within the community include *Zantedeschia aethiopica* (Arum Lily), *Asparagus aethiopicus* (Asparagus Fern), *Ageratina adenophora* (Crofton weed), *Tradescantia fluminensis* (Wandering Jew) and *Ehrharta erecta* (Panic Veldtgrass). A number of exotic

vines were observed including *Rubus fruticosus* sp. agg. (Blackberry), *Lonicera japonica* (Japanese Honeysuckle) and *Anredera cordifolia* (Madeira Vine).

Photograph 3.6 Exotic Vegetation along the drainage line within the subject site

3.2.5 Exotic Dominated Grassland

BC Act Status: Not listed

EPBC Act Status: Not listed

PCT: Not assigned

This community occurs throughout the subject site comprised of grasslands that have been cultivated for pastoral use and have very few occurrences of native species. The composition of the community is similar to the description of the ground layer of the STIF community above. Native groundcover species occurring within the exotic grassland include *Einadia hastata* (Berry Saltbush) and *Oxalis perennans* (Oxalis). The dominant exotic species throughout the community is *Cenchrus clandestinus* (Kikuyu) with other prominent species including *Setaria parviflora, Paspalum dilatatum* (Paspalum) and *Sida rhombifolia* (Paddy's Lucerne).

Photograph 3.7 Exotic Dominated Grassland within the subject site

3.3 Flora

3.3.1 General Species

Over 100 flora species were recorded within the subject site during field surveys, including 42 native species and 66 exotic species. Of the native species recorded in the subject site, the most frequently recorded plant families include the Fabaceae (7) Poaceae (4) and Myrtaceae (4) and Cyperaceae (4) families. Of the exotic species recorded in the subject site, the most frequently recorded plant families include Poaceae (16), Asteraceae (12) and Fabaceae (9).

The floral assemblage across the subject site is a reflection of the previous and current land uses which have resulted in a highly disturbed landscape with patches of remnant trees fringed by remnant bushland. A total species list for the subject site is provided in **Appendix B**.

Of the exotic species recorded within the subject site, *Asparagus aethiopicus* (Ground Asparagus), *Asparagus asparagoides* (Bridal Creeper), *Anredera cordifolia* (Madeira Vine), *Lantana camara* (Lantana), *Senecio madagascariensis* (Fireweed), *Eragrostis curvula* (African Lovegrass) and *Rubus fruticosus* sp. agg. (Blackberry complex) are listed as a State Priority Weed under the Greater Sydney Regional Strategic Weed Management Plan 2017 –

2022 (LLS: Greater Sydney 2017). Additionally, 26 exotic species recorded from the subject site are classified as High Threat Exotics under the BAM as shown in **Appendix A**.

3.3.2 Threatened Species

No threatened flora species were recorded during surveys. Database analysis indicates that several threatened flora species have been recorded from the locality, however, none of these species are considered to have potential to occur in the subject site due to the degraded nature of suitable habitat. **Appendix B** analyses the likelihood of occurrence within the subject site for each threatened flora species recorded within the locality.

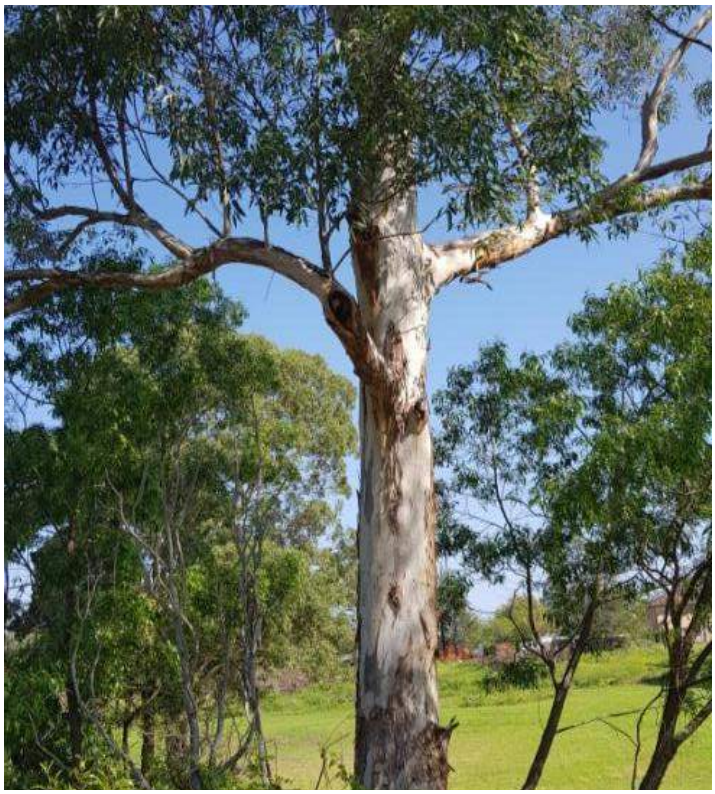
3.4 Fauna

3.4.1 Fauna Habitat

The majority of the subject site is comprised of exotic grassland which has limited value for native fauna species. The treed areas and the small drainage line within the subject site provide some limited habitat for native fauna species; however these habitats are highly modified.

Habitat features recorded within the subject site include:

- Log piles and woody debris – shelter habitat for amphibians, reptiles and terrestrial mammals. These features were confined to exotic grassland areas adjacent to a stand of pine trees;
- Hollow-bearing trees and stags – providing shelter and breeding habitat for a range of reptiles, birds, arboreal mammals and microchiropteran bats (microbats). A total of four hollow-bearing trees have been recorded within the subject site, comprising three living trees and one stag. **Figure 3.2** shows the locations of habitat trees within the subject site;
- Nectar-producing trees – foraging habitat for insects, blossom-dependant birds, arboreal mammals and megachiropteran bats (Flying-foxes) These features were confined to forested areas and areas where remnant canopy trees occur above an exotic dominated ground layer; and
- Riparian environments – suitable for fauna species dependent on these habitats such as birds, some amphibians and reptiles. Temporary pools within the drainage line are present within the subject site.



Photograph 3.8 Hollow-bearing tree in the centre of the subject site

Photograph 3.9 Log pile located within Exotic Dominated Grassland within the southern extent of the subject site

3.4.2 General Species

Seventeen (17) vertebrate fauna species have been recorded from the subject site during surveys. A total species list for the subject site is provided in **Appendix D**. The disturbed nature of a majority of the subject site is likely to limit the types and abundance of fauna species occurring. Introduced fauna species were not recorded during field surveys. The grassland and treed areas within the subject site would be expected to be frequented by introduced feral mammals including the European Rabbit (*Oryctolagus cuniculus*), the Domestic Cat (*Felis catus*) and Foxes (*Vulpes vulpes*). The grassland and treed areas within the subject site would additionally be expected to be frequented by introduced feral birds including the Indian Myna (*Acridotheres tristis*), Common Blackbirds (*Turdus merula*) and the Common Starling (*Sturnus vulgaris*).

3.4.3 Threatened Species

No threatened fauna species were recorded within the subject site during surveys. An analysis of the likelihood of occurrence within the subject site for all threatened fauna species recorded within the locality or that have the potential to occur due to the presence of suitable habitat is provided in **Appendix E**. Of the 48 threatened and migratory species known or predicted to occur within the locality, a total of 11 have been assessed as potentially occurring within the subject site. **Table 3.2** list the potentially occurring threatened species and a description of these species is provided below.

Table 3.2 Potentially Occurring Threatened Fauna Species

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status
Aves				
Cacatuidae	*Callocephalon fimbriatum*	Gang-gang Cockatoo	V	-
Psittaculidae	*Glossopsitta pusilla*	Little Lorikeet	V	-
Psittaculidae	*Lathamus discolour*	Swift Parrot	E	CE
Strigidae	*Ninox strenua*	Powerful Owl	V	-
Tytonidae	*Tyto novaehollandiae*	Masked Owl	V	-
Mammalia				
Molossidae	*Mormopterus norfolkensis*	Eastern Freetail-bat	V	-
Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying Fox	V	V
Vespertilionidae	*Chalinolobus dwyeri*	Large-eared Pied Bat	V	V
Vespertilionidae	*Falsistrellus tasmaniensis*	Eastern False Pipistrelle	V	-
Vespertilionidae	*Southern Myotis*	Southern Myotis	V	-
Vespertilionidae	*Miniopterus schreibersii oceanensis*	Eastern Bentwing-bat	V	-
Vespertilionidae	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V	-
Gastropoda				

Table 3.2 Potentially Occurring Threatened Fauna Species

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status
Camaenidae	*Pommerhelix duralensis*	Dural Woodland Snail	E	E

BC Act / EPBC Act Status: V = Vulnerable, E = Endangered, CE = Critically Endangered

i. Gang-gang Cockatoo

The Gang-gang Cockatoo (*Callocephalon fimbriatum*) is listed as Vulnerable under the BC Act, The species inhabits eucalypt open forests and woodlands with an *Acacia* understorey (NSW Scientific Committee 2008). In summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests (OEH 2015). In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas, and often found in urban areas (NSW Scientific Committee 2005, OEH 2015). It feeds on seeds obtained in trees and shrubs, particularly eucalypts and acacias, and is also known to feed on seeds of introduced trees and shrubs as well as insect larvae (NSW Scientific Committee 2008). This species nests in hollows in the trunks, limbs or dead spouts of tall living trees, especially eucalypts, often near water (NSW Scientific Committee 2008). The Gang-gang Cockatoo is distributed from southern Victoria through south- and central-eastern NSW (OEH 2015). In NSW the Gang-gang Cockatoo is restricted to the south-eastern coast and highlands, from the lower Hunter and northern Blue Mountains to the south-western slopes (NSW Scientific Committee 2008).

The BioNet Atlas holds 62 records of the Gang-gang Cockatoo within the locality with dates ranging from 1981-2014. It is expected that this species could forage within the native woody vegetation of the subject site. The foraging habitat within the subject site is considered likely to form part of a wider foraging range for the species. Whilst hollow-bearing trees are present within the subject site, it is unlikely that this species breeds within the subject site due to the small size of observed hollows and the disturbed nature of the habitat.

ii. Parrots

Two threatened parrot species have the potential to occur within the subject site. These are:

- Little Lorikeet (*Glossopsitta pusilla*) (BC Act: Vulnerable, EPBC Act: Not listed); (preferred habitat is open forests and woodlands, small hollows are used for nesting); and
- Swift Parrot (*Lathamus discolour*) (BC Act: Endangered, EPBC Act: Critically Endangered); (preferred habitat is along the coast of South-eastern Australia where Eucalypts are flowering or there are lerp infestations, they nest in Tasmania).

The BioNet Atlas holds 13 records of the Little Lorikeet and 14 records of the Swift Parrot within the locality with dates ranging from 1982-2014. It is expected that these species could forage within the native woody vegetation of the subject site. The foraging habitat within the subject site is considered likely to form part of a wider foraging range for the species. Whilst hollow-bearing trees are present within the subject site, it is unlikely that the Little Lorikeet species breeds within the subject site due to the disturbed nature of the habitat. The Swift Parrot is only known to breed in Tasmania.

iii. Nocturnal Raptors

Two threatened Owl species have the potential to occur within the subject site. These are:

- Powerful Owl (*Ninox strenua*), (BC Act: Vulnerable, EPBC Act: Not listed); (Preferred habitat: Woodland, open sclerophyll forest, tall open wet forest and rainforest, nests in large hollows); and

- Masked Owl (*Tyto novaehollandiae*), (BC Act: Vulnerable, EPBC Act: Not listed); (Preferred habitat: Open understorey, with a mosaic of sparse and dense ground cover within forests and forest edges. Nests in large hollows).

The BioNet Atlas holds 391 records of the Powerful Owl and 13 records of the Masked Owl within the locality with dates ranging from 1980-2018. It is expected that the species could forage within the native woody vegetation of the subject site. The foraging habitat within the subject site is considered likely to form part of a wider foraging range for the species. Whilst hollow-bearing trees are present within the subject site, it is unlikely that these species breeds within the subject site due the small size of the hollows and the disturbed nature of the habitat.

iv. Microchiropteran Bats

Two threatened Microchiropteran bat species have the potential to occur within the subject site. These are:

- Eastern Freetail-bat (*Mormopterus norfolkensis*) (BC Act: Vulnerable, EPBC Act: Not listed); (preferred habitat is dry sclerophyll forest, woodland, swamp forest);

- Large-eared Pied Bat (*Chalinolobus dwyeri*) (BC Act: Vulnerable, EPBC Act: Vulnerable); (preferred habitat is sandstone escarpments and fertile woodland vallies);

- Eastern False Pipistrelle Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) (BC Act: Vulnerable, EPBC Act: Not listed); (preferred habitat is wet sclerophyll forest);

- Southern Myotis (*Myotis macropus*) (BC Act: Vulnerable, EPBC Act: Not listed); (preferred habitat is forested areas with caves for roosting);

- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) (BC Act: Vulnerable, EPBC Act: Not listed); (preferred habitat is forested areas); and

- Greater Broad-nosed Bat (*Scoteanax rueppelli*) (BC Act: Vulnerable, EPBC Act: Not listed); (preferred habitat is tall wet forest).

The BioNet Atlas holds 44 records of the Eastern Freetail-bat, two records of the Large-eared Pied Bat, 19 records of the Eastern False Pipistrelle, 23 records of the Southern Myotis, 110 records of the Eastern Bentwing-bat and 22 records of the Greater Broad-nosed Bat within the locality. It is expected that this species could forage within the native woody vegetation of the subject site. The foraging habitat within the subject site is considered likely to form part of a wider foraging range for the species. The Eastern False Pipistrelle, Eastern Freetail-bat, Greater Broad-nosed bat species has the potential to utilise tree hollows, decorticating bark or the derelict structures within the subject site as roosting sites. The Southern Myotis, Large-eared Pied Bat and Eastern Bentwing-bat are primarily cave dwelling bats and have the potential to roost in derelict structures within the subject site.

v. Grey-headed Flying Fox

The Grey-headed Flying-fox (*Pteropus poliocephalus*) is listed as Vulnerable under the BC Act. The species inhabits subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops (OEH 2013a). The primary food source is blossom from eucalypts (genera *Eucalyptus*, *Corymbia* and *Angophora*), melaleucas and banksias, and in some areas it also utilises a wide range of rainforest fruits (DoE 2014). As none of the vegetation communities used by this species produces continuous foraging resources throughout the year, it has adopted complex migration traits in response to ephemeral and patchy food resources (DoE 2014). Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy (OEH 2013a). The Grey-headed Flying-fox is generally found within 200 km of the eastern coast of Australia, from Bundaberg in Queensland to Melbourne in Victoria (OEH 2013a).

The BioNet Atlas holds 134 records of the Grey-headed Flying-fox within the locality from 1981-2017. It is expected that this species could forage within the native woody vegetation of the subject site. The foraging habitat within the subject site is considered likely to form part of a wider foraging range for the species. This species is not likely to roost or breed in the subject site as no camps were observed within the subject site during surveys.

vi. Dural Woodland Snail

The Dural Woodland Snail (*Pommerhelix duralensis*) is lised as Endangered under the BC Act and Endangered under the EPBC Act. The distribution of the species is thought to be throughout the shale-sandstone transitional landscapes of north-western Sydney; however a degree of uncertainty exists regarding the true range of the species. The Dural Woodland Snail is a medium sized snail with a dark born or black semi-translucent, near spherical shell. Mature individuals are approximately 10-23mm in weight and 14-23mm in width. The hyphae and fruiting bodies of native fungi are known as the species primary source of food supplemented by detritus. The species is known to be sedentary with limited migration and dispersal rates. The Dural Landscape favours sheltering under rocks or inside curled bark but is known to be found resting in open areas on exposed rock or litter and is not known to burrow (OEH 2017b).

The BioNet Atlas holds 31 records of the Dural Woodland Snail within the locality from 2008-2017. It is expected that the native woody vegetation of the subject site may provide refuge and foraging habitat, particularly within the Blackbutt Gully Forest community due to its connectivity to contiguous habitat outside of the subject site.

Figure 3.1. Vegetation communities within the subject site

Legend

Study Area

Habitat Features

Tunks Creek Tributary

Log Pile

Habitat Tree

Coordinate System: MGA Zone 56 (GDA 94)

cumberland ecology

0 10 20 30 40 m

I:\...\17241\Figures\RP1\20180619\Figure 3.2. Habitat Features_subject site

Figure 3.2. Habitat Features within the subject site

Chapter 4

Impact Assessment

4.1 Introduction

This chapter considers the ecological impacts of the Project on the biodiversity values within the subject site. The ecological impacts of the Project are largely related to the direct disturbance of vegetation and associated habitat loss, represented by the removal and modification of a small area of native vegetation. Secondary impacts due to potential indirect impacts are also relevant to the Project and are discussed.

4.2 Direct Impacts

4.2.1 Vegetation Removal

Table 4.1 provides a summary of the areas of each plant community within the subject site and **Figure 4.1** shows their distribution. The full extent of native vegetation within the subject site is anticipated to be directly impacted by the project.

The primary vegetation community impacted by the Project is Exotic Grassland (2.28 ha) with ~2.22 ha to be cleared and ~0.06 ha falling within the APZ. STIF will be impacted within the subject site with the clearing of ~0.07 ha, with the remaining ~0.04 ha to be partially cleared with retention of remnant trees within the APZ. Blackbutt Gully Forest will be impacted within the subject site with the clearing of ~0.03 ha, with the remaining ~0.14 ha to be partially cleared within the APZ with the potential retention of scattered trees where possible. The Urban Native/Exotic community will be impacted with the clearing of approximately ~0.28 ha with the remaining ~0.12 ha falling within the APZ, including large native trees. Approximately ~0.06 ha of the area containing exotic vegetation will be cleared with the remaining ~0.05 ha to be partially cleared within the APZ.

i. Asset Protection Zone Impacts

The retained vegetation within the subject site is to be managed as an inner protection area (IPA). This will involve the clearance of vegetation to meet IPA requirements resulting in a canopy cover percentage of <15%, removal of all trees within 2 m of roof lines and removal of flammable vegetation under trees and within 10 m of buildings.

The primary vegetation community to be impacted by creation of the APZ is the Blackbutt Gully Forest (~0.14 ha) which is anticipated to be partially cleared and underscrubbed with

the retention of isolated trees and shrubs where possible whilst adhering to the applicable APZ standards. Whilst the retained elements of STIF within the subject site fall within the APZ (~0.04 ha), the remaining trees to be retained are to be unaltered as a result of creation of the APZ. The community currently presents as isolated trees without connectivity to hazardous, flammable vegetation.

Table 4.1 Impacts to vegetation communities within the subject site

Plant Community	PCT	BC Act Status	EPBC Act Status	Removed within subject site (ha)	Managed as APZ within subject site (ha)	Total area to be impacted or modified (ha)
Sydney Turpentine-Ironbark Forest	1281	EEC	-*	0.07	0.04	0.11
Blackbutt Gully Forest	1841	-	-	0.03	0.14	0.18
Urban Native/Exotic	-	-	-	0.28	0.12	0.40
Exotic Vegetation	-	-	-	0.06	0.05	0.10
Exotic Dominated Grassland	-	-	-	2.22	0.06	2.28
Total				2.66	0.41	3.07

BC Act / EPBC Act Status: EEC = Endangered Ecological Community

** Although an equivalent TEC is listed under the EPBC Act, the vegetation within the subject site does not meet the condition criteria for it to constitute the TEC.*

4.3 Indirect Impacts

The Project will result in some indirect impacts on the ecological values of remaining vegetation and habitat within the subject site, including fragmentation, edge effects and alteration to hydrological regimes.

Additionally, a number of construction and operational impacts, such as those relating to dust, noise, light and erosion, may also impact the remaining vegetation and habitat. Indirect impacts relevant to the Project are considered in more detail below. Whilst it is acknowledged that indirect impacts will occur as a result of the Project, such impacts cannot be mapped or accurately calculated in advance.

4.3.1 Fragmentation

Fragmentation is the process where habitats that were once continuous become divided into separate fragments isolated from each other by non-forest land (Primack 1993, Fahrig 2003, Lindenmayer and Fischer 2006). Habitat fragmentation affects biodiversity by reducing the amount of available habitat for some species to occupy due to increased distances between

habitat patches. Plants and other sessile organisms are usually directly removed, while mobile animals (especially birds and mammals) retreat into other remnant patches of habitat (Lindenmayer and Fischer 2006). The displacement of mobile fauna can reduce the survivorship of species in the case where there are limited areas of sufficiently large habitat within dispersal distance to retreat to.

The Project is not considered likely to significantly increase fragmentation within the subject site. The majority of the area within the subject site has previously been cleared of treed vegetation through past agricultural practices. The removal of vegetation as a result of the Project may marginally increase fragmentation between small patches of vegetation within the subject site. The removal of isolated trees throughout the subject site will result in increased habitat fragmentation between the extensive area of habitat extending beyond the subject site and the habitat within the subject site. The Project may reduce the potential for immobile fauna to utilise the habitat within the subject site.

4.3.2 Edge Effects

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 Project is not considered to result in significant edge effects within the subject site. Due to the fragmented nature of the vegetation and habitats within the subject site, removal of a small area of native woody vegetation is unlikely to result in edge effects where it adjoins agricultural land or planted vegetation. Clearing of vegetation along the boundary of the Blackbutt Gully Forest may result in increased edge effects to the Blackbutt Gully Forest extending beyond the lot boundary.

4.3.3 Alteration to Hydrological Regimes

'Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands' is identified as a key threatening process under the BC Act. Stony Creek and its tributaries occur within the subject site. Whilst no clearing of these drainage lines and associated riparian buffers is proposed, clearing of land adjacent to these areas has the potential to result in indirect impacts. Potential impacts identified within the determination of this key threatening process (NSW Scientific Committee 2002) that are relevant to the Project include:

- Riparian zone degradation through altered flow patterns;
- Increased habitat for invasive species; and
- Loss or disruption of ecological function.

Such impacts are already present with the subject site due to clearing and agricultural land use. Whilst the Project has the potential to indirectly impact hydrological flow regimes, the resultant impacts are unlikely to be exacerbated beyond current conditions.

4.3.4 Construction Impacts

A number of indirect impacts relevant to the construction phase of the Project have the potential to impact the remaining ecological values of the subject site, such as those relating to dust, noise, light and erosion.

i. Dust

Construction activities have the ability to generate dust, which may impact on the remaining ecological values of the subject site in a number of ways. 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 site, dust generated by the Project could impact vegetation within native woody vegetation, reducing health of some species along the edge of the subject site. It could also impact upon potential foraging resources for wildlife.

ii. 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. There are other potential impacts that include habitat loss through avoidance, reduced reproductive success and a retreat away from favourable habitats (AMEC 2005). It is likely that most animal species will habituate to the periodic noise disturbance (AMEC 2005), and the construction and operational phases of the Project are likely to cause temporary disturbance only to fauna. Furthermore, the impacts from noise emissions are likely to be localised and are not likely to have a significant, long-term, impact on wildlife populations.

iii. 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.

While the construction phases of the Project will have some effect on the surrounding woodland environment, the impacts from light pollution are likely to remain close to the disturbance, with only limited glare into the surrounding natural vegetation. It is likely that most fauna species would habituate to the periodic disturbance and light pollution from the Project is unlikely to have a significant or long-term impact on any fauna species.

iv. Erosion

During the construction phase of the Project the retained vegetation can be impacted by sedimentation and erosion. Filling of the subject site to increase the height of the development is likely to increase potential erosion. Eroded sediment can smother retained vegetation if appropriate control measures are not implemented. Smothering can reduce regeneration of groundcover species and enter waterways. Sediment and eroded material can also contain weed matter and nutrients, and movement of this material into the retained vegetation can facilitate the spread of weeds. Increased weed invasion can result in changes to community composition.

4.4 Impacts to Threatened Ecological Communities

4.4.1 Sydney Turpentine-Ironbark Forest

Scattered elements of STIF occur within the subject site, and has been conservatively assessed to conform to the BC Act listed Sydney Turpentine-Ironbark Forest EEC. This community occupies 0.11 ha of the study site. A number of scattered canopy trees as associated scattered native groundcover species will be cleared by the Project comprising a ~0.07 ha area as shown in **Table 4.1**. The following five trees are anticipated to be removed:

- One *Angophora costata* (Smooth Barked Apple) individual;
- Two *Syncarpia glomulifera* (Turpentine) individual;
- One *Eucayptus saligna* (Sydney Blue Gum) individual; and
- One unidentified *Eucalyptus* (*Eucalyptus* sp.)

The remaining ~0.4 ha area of scattered STIF trees within the subject site falls within the APZ. The remaining elements of this community are anticipated to be unaltered as a result of creation of the APZ as the community currently presents as isolated trees without connectivity to hazardous, flammable vegetation.

The remaining three canopy trees of the community are anticipated to be retained and incorporated into the landscaping of the subject site.

Potential indirect impacts to this community include:

- Weed invasion;
- Run-off, erosion and sedimentation; and
- Modification of microhabitat features resulting from long and short-term edge effects (eg. Changes in light filtration)

Such impacts are already present within the subject site to a high degree due to clearing and past agricultural land use. Previous land uses has resulted in the significant modification of

the composition and distribution of the community within the subject site such that the community presents as isolated patches of trees with a ground layer dominated by exotic grasses and forbs. Given the land use history of the subject site and current condition of the community, it is unlikely that the community would respond to assisted natural regeneration.

4.4.2 Vegetation Removal

The project has the potential to result in a number of direct and indirect impacts to the habitat of potentially occurring threatened fauna species within the subject site. In addition to the direct removal and modification of vegetation within the subject site, potential indirect impacts to fauna habitat include:

- Habitat disturbance during the construction phase of the project (e.g. changes in noise);
- Runoff, erosion and sedimentation;
- Increased pollution;
- Hydrological changes resulting in altered fauna habitats; and
- Modification of microhabitat features resulting from long and short-term edge effects (e.g. changes in light filtration).

A number of these impacts are already present with the subject site due to clearing and agricultural land use. The potential changes to the retained habitat resulting from indirect impacts are expected to be localised and overall are not considered to cause a substantial change in the broader habitat of the potentially occurring threatened fauna species.

Previous land uses has resulted in the modification of the habitat of the assessed threatened bird species within the subject site. The foraging habitat within the elements of STIF vegetation community comprises remnant trees above a cleared understorey. The foraging habitat within the Blackbutt Gully Forest offers relatively greater habitat values as native understorey persists despite heavy invasion of exotics.

A total of ~0.79 ha of woody vegetation (both native and exotic) occurs within the subject site which constitutes foraging habitat for the assessed threatened bird and bat species. Of this extent, a total of ~0.44 ha of this woody vegetation will be cleared within the subject site (approximately 56%). An additional ~0.34 ha is anticipated to be partially cleared during creation of the APZ (approximately 0.44%) This is not anticipated to result in significant impacts to threatened fauna species due to the degraded nature of the habitat to be removed. Due to the modified and fragmented nature of the habitat within the subject site, the potentially occurring threatened species are unlikely to rely upon the habitat within the subject site.

4.4.3 Habitat Feature Removal

In addition to the clearance of vegetation communities, the Project includes the removal of hollow-bearing trees. A total of three living trees and one large stag containing potential

habitat such as hollows, fissures and decorticating bark occur within the subject site. All of habitat trees fall within the proposed APZ and may potentially be removed.

Figure 4.1. Extent of impacts within the subject site

Chapter 5

Avoidance, Mitigation and Compensatory Measures

5.1 Introduction

The purpose of this chapter is to outline the mitigation measures proposed to ameliorate the impacts of the Project on biodiversity values. As demonstrated in previous chapters, that despite the subject site being highly modified, it provides some habitat for threatened entities. As a result, there is a need to implement measures to minimise impacts to these entities.

5.2 Mitigation Measures

5.2.1 Inductions

Site inductions are to be given by the civil contractor to ensure all site workers and visitors are aware of ecological issues associated with the subject site and the locations of any no access areas.

5.2.2 Access Restrictions

To avoid unnecessary removal or damage to native vegetation to be retained adjacent to the subject site, the clearing area should be clearly demarcated and signed to ensure no vegetation beyond these boundaries is removed. Clearing works and equipment should be excluded from areas outside the clearing area.

5.2.3 Erosion, Sedimentation and Pollution Control

Potential impacts to flora and fauna occurring in the construction and operation phases of the Project that can be managed include: run-off, sedimentation, erosion and pollution. To reduce sedimentation on the construction site, erosion control measures should be implemented. This includes minimising the amount of exposed soils on the site at any given time. All soil stockpiles should be adequately covered when not in use to prevent erosion from heavy rainfall.

Sediment fences should be established around the perimeter of the development area to prevent the impacts of sedimentation on any adjoining vegetation. During development, precautions should be taken to ensure that no pollution, such as petrochemical substances

or water containing suspended solids, escapes the construction site. Pollution traps and efficient removal of pollution to an off-site location would help to minimise pollution impacts.

5.2.4 Pre-clearing and Clearing Surveys

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

- Demarcation of key habitat features such as hollow-bearing trees and fallen logs; and
- Provision of a report following the completion of a pre-clearing survey, detailing the location and type of each habitat feature.

To minimise impacts to native fauna species, clearing is to 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.

Provisions will be made to protect any immobile native fauna during clearing activities by the following means:

- All persons 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 should be assisted to move to the adjacent bushland; and
- If animals are injured during the vegetation clearance, appropriate steps will be taken to humanely treat the animal.

5.2.5 Landscaping

For any landscaping works to be undertaken within the subject site, where possible, it is recommended that native plant species endemic to the area be incorporated into the landscape plan for the subject site. All native re-plantings should be sourced from local nurseries or come from seed sourced from the property.

5.2.6 Weed Control Measures

Priority weed species occurring within the subject site should be managed in order to prevent further spread. As such, it is recommended that all vegetation removed from the subject site should be disposed of appropriately as identified in the Regional Strategic Weed Management Plan.

5.2.7 General Construction and Operational Measures

A number of general construction and operation measures will be implemented for the Project, in accordance with best practice guidelines. These include:

- Dust minimisation – reduces the indirect impacts on vegetation condition and the habitat quality for all native species;
- Noise minimisation – reduces the indirect impacts on fauna species in habitat surrounding the subject site; and
- Lighting management – reduces the indirect impacts on fauna species in habitat surrounding the subject site.

Chapter 6

Conclusion

The Project involves the construction and operation of an aged care facility. An assessment was undertaken to examine the impacts of the Project on the biodiversity values of the subject site. The Project does not trigger the BOS under the BC Act and therefore this FFA has been prepared to document the findings of an ecological investigation undertaken within the subject site.

The proposed development footprint and associated APZ comprises a total of ~3.07 ha of land, of which most (~2.28 ha) comprises Exotic Dominated Grassland. The Project will result in impacts to two native vegetation communities, including scattered trees of the BC Act listed Sydney Turpentine-Ironbark Forest (0.07 ha to be cleared, ~0.04 ha to be partially cleared within the APZ) and Blackbutt Gully Forest (~0.03 ha to be cleared, ~0.14 ha to be partially cleared within the APZ). These vegetation communities comprise limited potential habitat for threatened fauna species.

The ecological investigation undertaken for this assessment indicates that the anticipated impacts to threatened ecological communities and threatened species habitat are manageable and will not result in significant impacts. Notwithstanding this, a suite of mitigation measures are proposed to minimise the impacts on biodiversity values within the subject site.

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Appendix A

Flora Species List

Table A.1 Flora species list

Growth Form	Family	Scientific Name	Common Name	Native/Exotic	Q1		Q2		Q3		Q4		Q5		RMS1
					C	A	C	A	C	A	C	A	C	A	
D	Poaceae	*Cenchrus clandestinus*	Kikuyu Grass	HTE	0.25	20	80	5000	70	5000			90	9000	
E	Chenopodiaceae	*Chenopodium album*	Fat Hen	E							2	100			
E	Dennstaedtiaceae	*Hypolepis muelleri*	Harsh Ground Fern	N											X
F	Acanthaceae	*Pseuderanthemum variabile*	Pastel Flower	N											
F	Alliaceae	*Nothoscordum gracile*	Onion Weed	E			0.1	1					0.1	2	
F	Apiaceae	*Centella asiatica*	Indian Pennywort	N											X
F	Araceae	*Zantedeschia aethiopica*	Arum Lily	E	1	20									
F	Asparagaceae	*Asparagus aethiopicus*	Asparagus Fern	HTE	0.1	4	0.1	1							
F	Asteraceae	*Ageratina adenophora*	Crofton Weed	HTE	5	100	0.1	1							
F	Asteraceae	*Bidens pilosa*	Cobbler's Pegs	HTE							0.1	5			
F	Asteraceae	*Cirsium vulgare*	Spear Thistle	E							0.2	10			
F	Asteraceae	*Conyza bonariensis*	Flaxleaf Fleabane	E					0.2	20					
F	Asteraceae	*Conyza sumatrensis*	Tall fleabane	E			0.1	10	0.25	20			0.1	1	
F	Asteraceae	*Hypochaeris radicata*	Catsear	E			0.1	20	0.1	10	0.1	20	0.25	50	
F	Asteraceae	*Senecio madagascariensis*	Fireweed	HTE					0.2	20			0.1	2	
F	Asteraceae	*Sonchus asper*	Prickly Sowthistle	E					0.1	1					
F	Asteraceae	*Sonchus oleraceus*	Common Sowthistle	E			0.2	50	0.1	20	0.1	3	0.1	2	
F	Asteraceae	*Tagetes minuta*	Stinking Roger	E							1	50			
F	Asteraceae	*Taraxacum officinale*	Dandelion	E			0.1	20	0.1	10	0.2	10	0.1	2	
F	Brassicaceae	*Brassica fruticulosa*	Twiggy Turnip	E			0.1	1							
F	Brassicaceae	*Cardamine hirsuta*	Common Bittercress	E			0.1	5							
F	Campanulaceae	*Wahlenbergia gracilenta*	Annual Bluebell	N					0.1	5					
F	Cannaceae	*Canna indica*	Tous-les-mois Arrowroot	HTE	3	20									
F	Caryophyllaceae	*Paronychia brasiliana*	Chilean Whitlow Wort	E			0.1	50	0.5	1000					
F	Caryophyllaceae	*Stellaria media*	Common Chickweed	E			0.1	20	0.1	20					
F	Chenopodiaceae	*Einadia hastata*	Berry Saltbush	N							0.1	1			
F	Commelinaceae	*Tradescantia fluminensis*	Wandering Jew	HTE	5	500									
F	Dilleniaceae	*Hibbertia aspera*	Rough Guinea Flower	N	0.75	5									
F	Fabaceae (Faboideae)	*Lotus uliginosus*	Birds-foot Trefoil	E			0.1	50	0.1	10	0.2	50	0.1	20	
F	Fabaceae (Faboideae)	*Medicago arabica*	Spotted Burr Medic	E			0.1	20							
F	Fabaceae (Faboideae)	*Medicago polymorpha*	Burr Medic	E					0.1	2					
F	Fabaceae (Faboideae)	*Trifolium repens*	White Clover	E									0.25	200	
F	Fabaceae (Faboideae)	*Vicia sativa*	Common vetch	E							1	100			
F	Geraniaceae	*Geranium solanderi*	Native Geranium	N			0.1	1							
F	Lobeliaceae	*Pratia purpurascens*	Whiteroot	N	0.1	50									
F	Malvaceae	*Modiola caroliniana*	Red-flowered Mallow	E			0.2	20	0.1	10	1	100			
F	Malvaceae	*Sida rhombifolia*	Paddy's Lucerne	E			1	100	1	100	30	3000	0.1	2	X
F	Onagraceae	*Ludwigia peruviana*		HTE											X
F	Oxalidaceae	*Oxalis corniculata*	Creeping Oxalis	E			0.2	100	0.2	100					
F	Oxalidaceae	*Oxalis latifolia*		E			0.1	2							
F	Oxalidaceae	*Oxalis perennans*		N									0.1	3	
F	Papaveraceae	*Fumaria muralis*		E			0.1	10	0.1	10					
F	Phormiaceae	*Dianella caerulea var. producta*		N	0.2	3									
F	Plantaginaceae	*Plantago lanceolata*	Lamb's Tongues	E			0.5	100	2	200	0.25	20	1	200	
F	Plantaginaceae	*Veronica plebeia*	Trailing Speedwell	N											X

Table A.1 Flora species list

Growth Form	Family	Scientific Name	Common Name	Native/Exotic	Q1		Q2		Q3		Q4		Q5		RMS1
					C	A	C	A	C	A	C	A	C	A	
F	Poaceae	*Holcus lanatus*	Yorkshire Fog	E											X
F	Polygonaceae	*Acetosella vulgaris*	Sheep Sorrel	HTE			0.1	2					0.2	50	
F	Polygonaceae	*Persicaria decipiens*	Slender Knotweed	N											X
F	Polygonaceae	*Rumex crispus*	Curled Dock	E							0.1	1	0.1	5	
F	Portulacaceae	*Portulaca oleracea*	Pigweed	N			0.2	20	0.1	2					
F	Primulaceae	*Lysimachia arvensis*	Scarlet Pimpernel	E			0.1	20	0.1	100	0.3	100			
F	Ranunculaceae	*Ranunculus repens*	Creeping Buttercup	HTE	1	100									
F	Solanaceae	*Solanum nigrum*	Black-berry Nightshade	E			0.2	1			0.1	2			
F	Solanaceae	*Solanum prinophyllum*	Forest Nightshade	N											X
F	Verbenaceae	*Verbena bonariensis*	Purpletop	E			0.1	5	0.1	2	0.1	10	0.1	3	
F	Verbenaceae	*Verbena officinalis*	Common Verbena	E											X
G	Poaceae	*Cynodon dactylon*	Common Couch	N			5	500							
G	Poaceae	*Digitaria sanguinalis*	Crab Grass	E			2	200			10	1000			
G	Poaceae	*Ehrharta erecta*	Panic Veldtgrass	HTE	0.2	50	1	100	5	500					
G	Poaceae	*Entolasia marginata*	Bordered Panic	N	3	300									
G	Poaceae	*Eragrostis curvula*	African Lovegrass	HTE			0.2	5							
G	Poaceae	*Eragrostis tenuifolia*	Elastic Grass	E							2	200			
G	Poaceae	*Microlaena stipoides*	Weeping Grass	N	15	1500	0.1	20	5	500					
G	Poaceae	*Oplismenus aemulus*		N	0.1	5			0.5	100					
G	Poaceae	*Paspalum dilatatum*	Paspalum	HTE			5	500			5	500	5	500	X
G	Poaceae	*Setaria parviflora*		E	0.1	20	0.3	50	0.2	50	40	4000	0.1	3	
G	Poaceae	*Setaria pumila*	Pale Pigeon Grass	E							0.2	10			
G	Poaceae	*Sporobolus africanus*	Parramatta Grass	E									0.1	2	
G	Poaceae	*Sporobolus fertilis*	Giant Parramatta Grass	HTE					0.2	5					x
G	Rubiaceae	*Galium aparine*	Goosegrass	E											X
L	Apocynaceae	*Araujia sericifera*	Moth Vine	HTE			0.2	10	0.1	3	0.1	2			X
L	Asparagaceae	*Asparagus asparagoides*	Bridal Creeper	HTE	0.1	2			0.1	2	0.1	1			
L	Basellaceae	*Anredera cordifolia*	Madeira Vine	HTE	0.1	2			3	100					
L	Caprifoliaceae	*Lonicera japonica*	Japanese Honeysuckle	HTE	1	100									
L	Fabaceae (Faboideae)	*Glycine clandestina*	Twining glycine	N											X
L	Fabaceae (Faboideae)	*Glycine microphylla*	Small-leaf Glycine	N	0.2	50									
L	Fabaceae (Faboideae)	*Glycine tabacina*	Variable Glycine	N					0.1	20					
L	Fabaceae (Faboideae)	*Kennedia rubicunda*	Dusky Coral Pea	N											X
L	Rosaceae	*Rubus fruticosus sp. agg.*	Blackberry complex	HTE	0.2	4	0.4	3							
L	Vitaceae	*Cayratia clematidea*	Native Grape	N			1	20	0.1	5					X
Q	Cyatheaceae	*Cyathea cooperi*	Straw Treefern	N											X
S	Asteraceae	*Ozothamnus diosmifolius*	White Dogwood	N											X
S	Ericaceae	*Leucopogon juniperinus*	Prickly Beard-heath	N	1	4									
S	Fabaceae (Mimosoideae)	*Acacia floribunda*	White Sally	N											X
S	Fabaceae (Mimosoideae)	*Acacia implexa*	Hickory Wattle	N	2	4	10	8	0.5	1					
S	Ochnaceae	*Ochna serrulata*	Mickey Mouse Plant	HTE	1	10									
S	Oleaceae	*Ligustrum sinense*	Small-leaved Privet	HTE	25	50	0.1	2	0.1	2	0.1	1			
S	Oleaceae	*Olea europaea subsp. cuspidata*	African Olive	HTE					0.1	1					
S	Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum	N	0.25	1			0.2	1					
S	Proteaceae	*Persoonia linearis*	Narrow-leaved Geebung	N	0.25	2									

Table A.1 Flora species list

Growth Form	Family	Scientific Name	Common Name	Native/Exotic	Q1		Q2		Q3		Q4		Q5		RMS1
					C	A	C	A	C	A	C	A	C	A	
S	Solanaceae	*Solanum mauritianum*	Wild Tobacco Bush	E					0.25	1	0.2	2			X
S	Verbenaceae	*Lantana camara*	Lantana	HTE	20	50									
T	Elaeocarpaceae	*Elaeocarpus reticulatus*	Blueberry Ash	N											X
T	Fabaceae (Mimosoideae)	*Acacia decurrens*	Black Wattle	N	2	2									
T	Myrtaceae	*Angophora costata*	Sydney Red Gum	N	20	5	0.5	1	10	2					
T	Myrtaceae	*Eucalyptus pilularis*	Blackbutt	N	20	11									
T	Myrtaceae	*Eucalyptus saligna*	Sydney Blue Gum	N			20	1							X
T	Myrtaceae	*Syncarpia glomulifera*	Turpentine	N	5	5			20	4					
T	Oleaceae	*Ligustrum lucidum*	Large-leaved Privet	HTE			0.25	3							
T	Sapindaceae	*Cupaniopsis anacardioides*	Tuckeroo	N											X
V	Cyperaceae	*Carex inversa*	Knob Sedge	N					100	1					
V	Cyperaceae	*Cyperus eragrostis*	Umbrella Sedge	HTE			0.1	1	0.1	2					
V	Cyperaceae	*Cyperus gracilis*	Slender Flat-sedge	N					0.1	50					
V	Cyperaceae	*Gahnia clarkei*	Tall Saw-sedge	N											X
V	Cyperaceae	*Lepidosperma laterale*	Variable Sword-sedge	N	1	20									
V	Euphorbiaceae	*Euphorbia peplus*	Petty Spurge	E			0.1	10	0.2	50					
V	Juncaceae	*Juncus usitatus*		N											X
V	Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush	N	3	20									
V	Poaceae	*Axonopus fissifolius*	Narrow-leafed Carpet Grass	HTE					0.1	20					

Growth Form: D = Other Grass; E = Fern and Fern Allies; F = Forb; G = Tussock Grass; L = Vine; Q = Other (OG); R = Rush; S = Shrub; T = Tree; V = Sedge

Native / Exotic: E = Exotic; THE = High Treat Exotic; N = Native

C = Cover

A = Abundance

X = Present

Appendix B

Threatened Flora Likelihood of Occurrence

Table B.1 Threatened Flora Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
Apocynaceae	*Cynanchum elegans*	White-flowered Wax Plant	E	E	0	Usually associated with dry rainforest vegetation and in coastal communities. Can occur in clay influenced woodland associated with *Eucalyptus tereticornis* and *Corymbia maculata.*	The species is unlikely to occur within the subject site. The species has not been recorded within the subject site and no suitable habitat occurs. Random Meander Searches and Flora Quadrats did not find the species on the subject site.
Casuarinaceae	*Allocasuarina glareicola*		E	E	0	Grows in Castlereagh woodland on lateritic soil with *Eucalyptus parramattensis, Eucalyptus fibrosa, Angophora bakeri, Eucalyptus sclerophylla* and *Melaleuca decora*. Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool.	The species is unlikely to occur within the subject site. The species has not been recorded within the subject site, and no suitable habitat occurs. Random Meander Searches and Flora Quadrats did not find the species on the subject site.
Dilleniaceae	*Hibbertia superans*		E		161	Found in open woodland and heathland often near disturbed areas.	Whilst the subject site contains potential habitat for this species, it was not detected during floristic surveys and is unlikely to occur.
Elaeocarpaceae	*Tetratheca*		V		195	Associated with shale-sandstone transition	Whilst the subject site contains

Table B.1 Threatened Flora Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
	glandulosa					habitat where shale-cappings occur over sandstone. Occupies ridgetops, upper-slopes and to a lesser extent mid-slope sandstone benches. Occurs in open woodland, woodland and open forest.	potential habitat for this species, it was not detected during floristic surveys and is unlikely to occur.
Ericaceae	*Epacris purpurascens* var. *purpurascens*		V		284	Found in a range of habitat types, most of which have a strong shale soil influence.	Whilst the subject site contains potential habitat for this species, it was not detected during floristic surveys and is unlikely to occur.
Ericaceae	*Leucopogon fletcheri* subsp. *fletcheri*		E		25	Occurs in north-western Sydney within the Hawkesbury, Baulkham Hills and Blue Mountains. Grows in dry eucalypt woodland or shrubland on clayey lateritic soils, preferring gently sloping terrain along ridges.	The species has potential to occur within the subject site. The specie has been recorded within the locality. The species was not detected during general flora surveys or threatened flora searches.
Fabaceae (Faboideae)	*Pultenaea parviflora*		E	V	0	Endemic to the Cumberland Plain. Core distribution is from Windsor to Penrith and east to Dean Park. Found in scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest	The species is unlikely to occur within the subject site. The species has not been recorded within the subject site. The species was not detected during general flora

Table B.1 Threatened Flora Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
						on tertiary alluvium or laterised clays and in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland.	surveys or threatened flora searches.
Fabaceae (Mimosoideae)	*Acacia bynoeana*	Bynoe's Wattle	E	V	16	Found in heath and woodland on sandy soils. Prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches. Associated overstorey species include *Corymbia maculata* (Red Bloodwood), *Eucalyptus haemastoma* (Scribbly Gum), Eucalyptus parramattensis (Parramatta Red Gum), *Banksia serrata* (Saw Banksia) and *Angophora bakeri* (Narrow-leaved Apple).	The species is unlikely to occur within the subject site. The species was not detected during general flora surveys or threatened flora searches. Associated overstorye species are not present.
Fabaceae (Mimosoideae)	*Acacia gordonii*		E	E	1	The species occurs on the lower eastern slopes of the Blue Mountains, and within the Glenorie-Maroota Area. It grows in dry sclerophyll forest and heathlands amongst or within sandstone outcrops.	The species is unlikely to occur within the subject site. The species was not detected during general flora surveys or threatened flora searches.
Fabaceae (Mimosoideae)	*Acacia pubescens*	Downy Wattle	V	V	13	Occurs on alluviums, shales and at the intergrade between shales and	The species is unlikely to occur within the subject site. The species

Table B.1 Threatened Flora Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
						sandstones. Occur in open woodland and forest, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland.	was not detected during general flora surveys or threatened flora searches.
Geraniaceae	*Pelargonium* sp. Striatellum	Omeo Stork's-bill	E	E	0	Has a narrow habitat that is usually just above the high-water level of irregularly inundated or ephemeral lakes, in the transition zone between surrounding grasslands or pasture and the wetland or aquatic communities.	The species is unlikely to occur within the subject site. The species has not been recorded within the subject site and no suitable habitat occurs. The species was not detected during general flora surveys or threatened flora searches.
Grammitidaceae	*Grammitis stenophylla*	Narrow-leaf Finger Fern	E		5	Grows on rocks in rainforest and wet sclerophyll forest, usually near streams.	The species is unlikely to occur within the subject site. No suitable habitat occurs. The species was not detected during general flora surveys or threatened flora searches.
Haloragaceae	*Haloragis exalata* subsp. *exalata*	Wingless Raspwort,	V	V	0	Species requires protected and shaded damp situations in riparian habitats.	The species is unlikely to occur within the subject site. The species has not been recorded within the subject site and no suitable habitat

Table B.1 Threatened Flora Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
							occurs. The species was not detected during general flora surveys or threatened flora searches.
Haloragaceae	*Haloragodendron lucasii*		E	E	3	Occurs on Hawkesbury Sandstone in moist sandy loam soils, preferring sheltered aspects, generally inhabiting gentle slopes below cliff lines near creeks in association with high soil moisture and phosphorous levels. It is found in association with species including *Eucalyptus piperita, Corymbia gummifera*, and *Callicoma serratifolia*. The species was assumed to be extinct until 1986 and is only known currently from nine sites across a 10 km range in the Hornsby-Gordon area of the northern suburbs of Sydney.	The species is unlikely to occur within the subject site. None of the associated overstorey species are present within the subject site. The species was not detected during general flora surveys or threatened flora searches.
Malvaceae	*Lasiopetalum joyceae*		V	V	37	Found in heath on sandstone.	The species has potential to occur within the subject site. The species has been recorded within the locality, however, the species was not detected during general flora surveys or threatened flora

Table B.1 Threatened Flora Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
							searches.
Myrtaceae	*Callistemon linearifolius*	Netted Bottle Brush	V		3	Grows in dry sclerophyll forest on the coast and adjacent ranges.	The species is unlikely to occur within the subject site. The species was not detected during general flora surveys or threatened flora searches.
Myrtaceae	*Darwinia biflora*		V	V	636	Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone.	Whilst the subject site contains potential habitat for this species, it was not detected during floristic surveys and is unlikely to occur.
Myrtaceae	*Darwinia peduncularis*		V	V	16	Occurs on sandy low nutrient soil over sandstone in dry sclerophyll forest.	The species is unlikely to occur within the subject site. The species was not detected during general flora surveys or threatened flora searches.
Myrtaceae	*Eucalyptus camfieldii*	Camfield's Stringybark	V	V	11	Found in exposed areas on sandstone ridges, slopes and plateaus near tall coastal heath or low open woodland.	The species is unlikely to occur within the subject site. No open woodland occurs within the subject site. The species was not detected during general flora surveys or threatened flora searches.

Table B.1 Threatened Flora Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
Myrtaceae	*Eucalyptus nicholii*	Narrow-leaved Black Peppermint	V	V	6	Occurs in dry grassy woodland on shallow soils of slopes and ridges. Prefers infertile soils derived from granite or metasedimentary rock on the lower slopes of the landscape.	The species is unlikely to occur within the subject site. The species was not detected during general flora surveys or threatened flora searches.
Myrtaceae	*Eucalyptus scoparia*	Wallangarra White Gum	E	V	3	Found in open eucalypt forest, woodland and heaths on well-drained granite/rhyolite hilltops, slopes and rocky outcrops, typically at high altitudes. In NSW, the species is only known from three locations near Tenterfield.	The species is unlikely to occur within the subject site. The species was not detected during general flora surveys or threatened flora searches. And the species has only been recorded near Tenterfield, which is far from the subject site.
Myrtaceae	*Eucalyptus* sp. Cattai		CE		33	Grows on sandy soils, occuring in the area betwen Colo Heights and Castle Hill, northwestern Sydney. They generally occur on flat sites, on ridge tops.	The species is unlikely to occur within the subject site. The species was not detected during general flora surveys or threatened flora searches.
Myrtaceae	*Kunzea rupestris*		V	V	1	Occurs in shallow depressions on large flat sandstone rock outcrops. Typically found in short to tall shrubland or heathland.	The species is unlikely to occur within the subject site. The species was not detected during general flora surveys or threatened flora

Table B.1 Threatened Flora Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
							searches.
Myrtaceae	*Leptospermum deanei*		V	V	11	Occurs in woodland on sandy alluvial soil or sand over sandstone.	The species is unlikely to occur within the subject site. The species was not detected during general flora surveys or threatened flora searches.
Myrtaceae	*Melaleuca biconvexa*	Biconvex Paperbark	V	V	0	Found in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	The species is unlikely to occur within the subject site. The species has not been recorded within the subject site and no suitable habitat occurs. The species was not detected during general flora surveys or threatened flora searches.
Myrtaceae	*Melaleuca deanei*	Deane's Paperbark	V	V	75	Found in marshy heath on coastal sandstone plateaus. Restricted to sandstones of Sydney and south coast.	The species is unlikely to occur within the subject site. No suitable habitat occurs on the subject site. The species was not detected during general flora surveys or threatened flora searches.
Myrtaceae	*Syzygium paniculatum*	Magenta Lilly Pilly	E	V	19	On south coast of NSW occurs on grey soils over sandstone, restricted mainly to	The species is unlikely to occur within the subject site. No suitable

Table B.1 Threatened Flora Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
						remnant stands of littoral (coastal) rainforest. On the central coast occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	habitat occurs on the subject site. The species was not detected during general flora surveys or threatened flora searches.
Orchidaceae	*Caladenia tessellata*	Thick-lipped Spider-orchid	E	V	0	Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil.	The species is unlikely to occur within the subject site. The species has not been recorded within the subject site, and no suitable soil types occur. The species was not detected during general flora surveys or threatened flora searches.
Orchidaceae	*Cryptostylis huneriana*	Leafless Tongue-orchid	V	V	0	Occur in a wide variety of habitats including heathlands, heathy woodlands, sedgelands, *Xanthorrhoea* spp. plains, dry sclerophyll forests (shrub/grass sub-formation and shrubby sub-formation), forested wetlands, freshwater wetlands, grasslands, grassy woodlands, rainforests and wet sclerophyll forests. Soils are generally considered to be moist and sandy, however, this species is also known	The species is unlikely to occur within the subject site. The species has not been recorded within the subject site. The species was not detected during general flora surveys or threatened flora searches.

Table B.1 Threatened Flora Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
						to grow in dry or peaty soils. Associated with the community Bloodwood/Scribbly Gum/Silver-top Ash Forest on the South Coast. Species is known to have occurrence associated with other *Cryptostylis* species. Flowering occurs generally from November to February.	
Orchidaceae	*Genoplesium baueri*	Bauer's Midge Orchid	E	E	4	Grows in dry sclerophyll forest and moss gardens over sandstone.	The species is unlikely to occur within the subject site. The species was not detected during general flora surveys or threatened flora searches and no moss gardens occur within the subject site.
Orchidaceae	*Pterostylis gibbosa*	Illawarra Greenhood	E	E	0	All known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage. In the Illawarra region, the species grows in woodland dominated by *Eucalyptus tereticornis* (Forest Red Gum), *E. longifolia* (Woollybutt), and *Melaleuca decora* (White Feather Honey-myrtle). Near Nowra, the species grows in open forest of *Corymbia maculata* (Spotted Gum), *E. tereticornis*, and *E.*	The species is unlikely to occur within the subject site. The species has not been recorded within the subject site. The species was not detected during general flora surveys or threatened flora searches.

Table B.1 Threatened Flora Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
						paniculata (Grey Ironbark). It is only visible above the ground between late summer and spring, and only when soil moisture levels can sustain its growth. The species is currently only known to occur at five sites three in the Illawarra, one near Nowra, and one at Milbrodale in the Hunter Valley.	
Orchidaceae	*Pterostylis saxicola*	Sydney Plains Greenhood	E	E	0	The species occurs in small pockets of shallow soil in flat areas on top of sandstone rock shelves above cliff lines, or on mossy rocks in gullies. Sclerophyll forest/woodland often occurs growing above where the species occurs, on shale or shale/sandstone transition soils. Flowering time is from October to December. It is currently only known to occur at five locations within western Sydney: Georges River National Park, close to Yeramba Lagoon, Peter Meadows Creek, and St Marys Towers.	The species is unlikely to occur within the subject site. The species has not been recorded within the subject site. The species was not detected during general flora surveys or threatened flora searches.
Proteaceae	*Grevillea parviflora subsp. supplicans*		E		3	Occurs in a range of vegetation types and in the Sydney region it typically grows on Tertiary sands, alluvium, and soils derived	The species is unlikely to occur within the subject site. The species was not detected during general

Table B.1 Threatened Flora Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
						from the Mittagong Formation. Species is often found in slightly disturbed areas such as along tracks.	flora surveys or threatened flora searches.
Proteaceae	*Persoonia hirsuta*	Hairy Geebung	E	E	20	Occurs in dry sclerophyll forest and woodland with a shrubby understorey.	The species is unlikely to occur within the subject site as suitable habitat does not occur. Suitable habitat occurs and the species has been recorded within the locality. The species was not detected during general flora surveys or threatened flora searches.
Proteaceae	*Persoonia mollis* subsp. *maxima*		E	E	338	Occurs in sheltered aspects of deep gullies or on the steep upper hillsides of narrow gullies on Hawkesbury Sandstone.	The species is unlikely to occur within the subject site as deep or steep gullies do not occur. The species was not detected during general flora surveys or threatened flora searches.
Proteaceae	*Persoonia nutans*	Nodding Geebung	E	E	1	Northern populations are confined to aeolian and alluvial sediments and occur in a range of sclerophyll forest and woodland vegetation communities, with the majority of individuals occurring within Agnes Banks	The species is unlikely to occur within the subject site. The species is usually found in areas outside of the locality and the species was not detected during general flora

Table B.1 Threatened Flora Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
						Woodland or Castlereagh Scribbly Gum Woodland and some in Cooks River / Castlereagh Ironbark Forests. Southern populations also occupy tertiary alluvium, but extend onto shale sandstone transition communities and into Cooks River / Castlereagh Ironbark Forest.	surveys or threatened flora searches.
Rhamnaceae	*Pomaderris brunnea*		E	V	1	In the region, the species is only found in a very limited area around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area and near Camden. It grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines.	The species is unlikely to occur within the subject site. The species was not detected during general flora surveys or threatened flora searches.
Rubiaceae	*Galium australe*	Tangled Bedstraw	E		7	Found in Turpentine forest and coastal Acacia shrubland.	The species is unlikely to occur within the subject site. Highly degraded Turpentine forest occurs within the subject site, however ground stratum plants associated with the community are absent. The species was not detected during general flora surveys or threatened flora searches.

Table B.1 Threatened Flora Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
Rutaceae	*Asterolasia elegans*		E	E	0	Occurs on Hawkesbury sandstone growing between sandstone boulders and rocky outcrops found in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest. It is currently only known from 7 populations occurring in the hills north of Maroota within a 22 km^2 extent of occurrence.	The species is unlikely to occur within the subject site. The species has not been recorded within the subject site. The species was not detected during general flora surveys or threatened flora searches.
Santalaceae	*Thesium australe*	Austral Toadflax	V	V	0	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast.	The species is unlikely to occur within the subject site. The species has not been recorded within the subject site. The species was not detected during general flora surveys or threatened flora searches.
Thymelaeaceae	*Pimelea spicata*	Spiked Rice-flower	E	E	0	On the Cumberland Plain sites it is associated with Grey Box communities (particularly Cumberland Plain Woodland variants and Moist Shale Woodland) and in areas of ironbark. In the coastal Illawarra it occurs commonly in Coast Banksia open woodland with a better developed shrub	The species is unlikely to occur within the subject site. The species has not been recorded within the subject site. The species was not detected during general flora surveys or threatened flora searches.

Table B.1 Threatened Flora Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
						and grass understorey. Coastal headlands and hilltops are the favoured sites.	
Thymelaeaceae	*Pimelea curviflora* var. *curviflora*		V	V	55	Confined to the coastal area of Sydney between northern Sydney in the south and Maroota in the north-west. Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands.	Whilst the subject site contains potential habitat for this species, it was not detected during floristic surveys and is unlikely to occur.

BC Act/EPBC Act Status: V = Vulnerable, E = Endangered, CE = Critically Endangered

Appendix C

Fauna Species List

Table C.1 Fauna Species List

Family	Species name	Common name	BC Act Status	EPBC Act Status	Detection Method
Aves					
Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra	-	-	O,W
Artamidae	*Cracticus nigrogularis*	Australian Magpie	-	-	W
Artamidae	*Strepera graculina*	Pied Currawong	-	-	W
Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	-	-	W
Cacatuidae	*Calyptorhynchus funereus*	Yellow-tailed Black-Cockatoo	-	-	O,W
Charadriidae	*Vanellus miles*	Masked Lapwing	-	-	W
Corvidae	*Corvus coronoides*	Australian Raven	-	-	W
Maluridae	*Malurus cyaneus*	Superb Fairy Wren	-	-	O,W
Meliphagidae	*Manorina melanocephala*	Noisy Miner	-	-	O,W
Meliphagidae	*Manorina melanophrys*	Bell Miner	-	-	W
Monarchidae	*Grallina cyanoleuca*	Magpie Lark	-	-	W
Psittaculidae	*Platycercus elegans*	Crimson Rosella	-	-	O,W
Psittaculidae	*Trichoglossus haematodus*	Rainbow Lorikeet	-	-	O,W
Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis	-	-	O
Amphibia					
Hylidae	*Litoria fallax*	Eastern Dwarf Tree Frog	-	-	W
Myobatrachidae	*Crinia signifera*	Common Eastern Froglet	-	-	W
Myobatrachidae	*Limnodynastes peronii*	Striped Marsh Frog	-	-	W

Detection Method: O = Observed, W = Heard Calling

Appendix D

Threatened Fauna Likelihood of Occurrence

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
Amphibia							
Hylidae	*Litoria aurea*	Green and Golden Bell Frog	E	V	3	The species is found in a wide range of water bodies except fast moving streams. It commonly inhabits disturbed sites such abandoned quarries and mines, though generally breeds in habitats that include still, shallow, unpolluted water bodies, that are unshaded, contain aquatic plants are are free of Mosquito fish and other predators, with a range of diurnal shelter sites (emergent aquatic vegetation).	Species is unlikely to occur on the subject site. No suitable habitat occurs within the subject site.
Hylidae	*Litoria littlejohni*	Littlejohn's Tree Frog	V	V	0	Inhabits forest, coastal woodland and heath, from 100 to 950 m above sea level. It breeds in rocky streams, still water in dams, ditches, isolated pools, and temporary pools where sufficient run-off water is available.	Littlejohn's Tree Frog is unlikely to occur within the subject site. The species has not been recorded in the locality, and only a small drainage line could potentially offer suitable habitat.
Myobatrachidae	*Heleioporus australiacus*	Giant Burrowing Frog	V	V	22	Occurs in heath, woodland and open dry sclerophyll forest on a variety of soil types. Breeding habitat for this species usually contains soaks or pools within first of second order streams.	The species is unlikely to occur within the subject site. Suitable forest occurs on the subject site, however no first or second order streams are present.

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
Myobatrachidae	*Mixophyes balbus*	Stuttering Frog	E	V	0	Typically found in association with permanent streams through temperate and sub-tropical rainforest, and wet sclerophyll forest. It is rarely found in dry, open, tableland, riparian vegetation, and moist gullies in dry forest.	The Stuttering Frog is unlikely to occur within the subject site. The species has not been previously recorded in the locality, and the subject site offers no suitable habitat.
Myobatrachidae	*Pseudophryne australis*	Red-crowned Toadlet	V		169	Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter. Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters.	The Red-crowned Toadlet may potentially occur on the subject site. An ephemeral drainage line occurs on site, however there is not suitable sheltering or breeding habitat around this drainage line.
Anguillidae							
Percichthyidae	*Macquaria australasica*	Macquarie Perch	E	E	0	The species is a riverine, schooling species that prefers clear water, and deep rocky holes with lots of cover. It naturally occurs in the murray-darling basin and associated water courses, Shoalhaven River, and the Hawkesbury Nepean System	The species is unlikely to occur within the subject site as no permanent water-bodies are present on the subject site.

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
Retropinnidae	*Prototroctes maraena*	Australian Grayling	E	V	0	Species spends part of its lifecycle in freshwater and part of the larval and/or juvenile stages in coastal seas. Adults inhabit cool, clear, freshwater streams with gravel substrate and areas alternating between pools and riffle zones	The species is unlikely to occur within the subject site as no permanent water-bodies are present on the subject site.
Aves							
Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	V	C	7	The White-bellied Sea-Eagle is found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands. The habitats occupied by the sea-eagle are characterised by the presence of large areas of open water.	The White-bellied Sea-eagle is unlikely to occur within the subject site. No large areas of open water occur within the subject site, however the species might fly-over the subject site as part of their wider range.
Accipitridae	*Hieraaetus morphnoides*	Little Eagle	V		12	The Little Eagle occupies habitats rich in prey within open eucalypt forest, woodland, or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. For nest sites it requires a tall living tree within a remnant patch.	The species is unlikely to occur within the subject site. The subject site may contain potential foraging habitat however, records exist within the locality.
Accipitridae	*Lophoictinia isura*	Square-tailed Kite	V		12	Found in a variety of timbered habitats	The species is unlikely to occur

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
						indluing dry woodlands and open forests. It is a specialist hunter preying on passerine birds, especially honeyeaters and targets predominately nestlings and insects occuring in the tree canopy. It nests in tree forks or on large horizontal tree limbs located mostly along or near watercourses.	within the subject site. The subject site may contain potential foraging habitat however, records exist within the locality.
Apodidae	*Apus pacificus*	Fork-tailed Swift		M	9	Species has been recorded throughout NSW, but mostly east of the Great Divide. The species is almost exclusively aerial in Australia and breeds overseas. It forages from a metre above the ground, up to hundreds of metres in altitude, and mostly occur over inland plains, though sometimes over foothills, and coastal areas.	The Fork-tailed Swift has potential to occur within the subject site. The species is highly mobile, and potentially uses the site as part of a wider foraging range. The species is not expected to directly utilise the habitat within the subject site as it almost exclusively aerial.
Apodidae	*Hirundapus caudacutus*	White-throated Needletail		M	41	Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Occur over most types of habitat, particularly above wooded areas including open forest and rainforest, between trees or in clearings and below the canopy.	The White-throated Needletail has potential to occur within the subject site. The species is highly mobile, and potentially uses the site as part of a wider foraging range. The species is not expected to directly utilise the habitat within the subject site as it almost exclusively aerial.

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
Ardeidae	*Ardea ibis*	Cattle Egret		M	6	Found in grasslands, woodlands and wetlands, and is not common in arid areas. It also uses pastures and croplands, especially where drainage is poor. Will also forage at garbage dumps, and is often seen with cattle and other stock.	The species is unlikely to occur within the subject site. Whilst the subject site may contain marginal habitat, few records exist from the locality since 1980.
Ardeidae	*Botaurus poiciloptilus*	Australasian Bittern	E	CE	0	Occurs in freshwater wetlands, and more rarely, estuarine wetlands. It favours wetlands with tall, dense vegetation, and forages in shallow water up to a depth of 0.3m. It nests in deep vegetative cover over shallow pools.	The Australasian Bittern is unlikely to occur within the subject site. The species has not been recorded in the locality, and the subject site offers no suitable wetland habitat.
Ardeidae	*Ixobrychus flavicollis*	Black Bittern	V		3	Inhabits terrestrial and estuarine wetlands, generally in areas containing permanent water and dense vegetation. The species can occur in flooded grassland, woodland, rainforest, and mangroves. It feeds on frogs, reptiles, fish, and invertebrates such as snails, dragonflies, shrimp and crayfish. It roosts during the day on the ground amongst dense reeds or within trees. It nests in branches overhanging water.	The Black Bittern is unlikely to occur within the subject site as the subject site offers no suitable habitat.

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
Artamidae	*Artamus cyanopterus cyanopterus*	Dusky Woodswallow	V	E	12	In New South Wales the species is widespread from coast to inland, including the western slopes of the Great Dividing Range and farther west. The Dusky Woodswallow is found in woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations. The species primarily eats invertebrates, mainly insects, which are captured whilst hovering and sallying above the canopy or over water.	The species is unlikely to occur within the subject site. The majority of the habitats within the subject site are moist forest communities which the species utilises less frequently.
Cacatuidae	*Callocephalon fimbriatum*	Gang-gang Cockatoo	V		62	In summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas. In NSW, the Gang-gang Cockatoo is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes.	The species has the potential to occur within the subject site. The species is highly mobile and has been recorded in the locality. Little suitable habitat occurs, however they might utilise the site as part of a larger foraging range.
Cacatuidae	*Callocephalon*	Gang-gang	E		58	More often found in forest and woodland	The species has the potential to

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
	fimbriatum	Cockatoo population in the Hornsby and Ku-ring-gai Local Government Areas				habitats containing old growth attributes. Known occurrences in Lane Cove National Park and Pennant Hills Park as well as other forested gullies.	occur within the subject site. The species is highly mobile and has been recorded in the locality. Little suitable habitat occurs, however they might utilise the site as part of a larger foraging range.
Cacatuidae	*Calyptorhynchus lathami*	Glossy Black-Cockatoo	V		47	Inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of she-oak species, particularly Black She-oak (*Allocasuarina littoralis*), Forest She-oak (*A. torulosa*) or Drooping She-oak (*A. verticillata*) occur.	The species has the potential to occur within the subject site. The species is highly mobile and has been recorded in the locality. No suitable feed trees were recorded on the subject site, however they might utilise the site as part of a larger foraging range.
Climacteridae	*Climacteris picumnus victoriae*	Brown Treecreeper (eastern subspecies)	V		1	Found in eucalypt woodlands and dry open forest of the inland slopes and plains inland of the Great Dividing Range. The species favours woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species. Fallen timber is an important habitat component for foraging.	The species is unlikely to occur within the subject site. The species has only been recorded once in the locality.

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
Columbidae	*Ptilinopus superbus*	Superb Fruit-Dove	V		4	Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees.	The Superb Fruit-Dove is unlikely to occur within the subject site as no suitable habitat is present.
Estrildidae	*Stagonopleura guttata*	Diamond Firetail	V		1	Occurs in grassy eucalypt woodland, open forest and riparian areas.	The species is unlikely to occur within the subject site. The species has only been recorded once in the locality.
Meliphagidae	*Anthochaera phrygia*	Regent Honeyeater	E	CE	1	Inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. The Regent Honeyeater is a generalist forager, which mainly feeds on the nectar from a wide range of eucalypts and mistletoes.	The species is unlikely to occur on the subject site. Some suitable habitat occurs, however it is degraded and only one record of the species has been recorded in the locality. The species may utilise trees in the locality as part of their larger foraging range.
Meliphagidae	*Grantiella picta*	Painted Honeyeater	V	V	0	Occurs in Boree, Brigalow and Box-Gum Woodlands and Box-Ironbarks. Feeds primarily on mistletoe fruit and insects.	The species is unlikely to occur within the subject site. The species has not been recorded in the

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
							locality.
Meliphagidae	*Melithreptus gularis gularis*	Black-chinned Honeyeater (eastern subspecies)	V		1	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (*Eucalyptus sideroxylon*), White Box (*E. albens*), Inland Grey Box (*E. microcarpa*), Yellow Box (*E. melliodora*) and Forest Red Gum (*E. tereticornis*). In NSW it is widespread, with records from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina.	The Black-chinned Honeyeater has been recorded in the subject site, and degraded ironbark forest occurs on site. The species may occur within the subject site, however it most-likely uses the site as part of a larger foraging range, as only a small portion of suitable habitat occurs, and no nests were recorded within the subject site.
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	V		8	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Inhabits most of mainland Australia except the treeless deserts and open grasslands.	The species has potential to occur within the subject site. The species has been recorded in the locality, and may utilise the subject site as part of a wider foraging range.
Pardalotidae	*Dasyornis brachypterus*	Eastern Bristlebird	E	E	0	Habitat for central and southern populations is characterised by dense, low vegetation including heath and open woodland with a	The species is unlikely to occur within the subject site. The species has not been recorded in the

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
						heathy understorey. In northern NSW the habitat occurs in open forest with dense tussocky grass understorey and sparse mid-storey near rainforest ecotone; all of these vegetation types are fire prone.	locality.
Petroicidae	*Petroica boodang*	Scarlet Robin	V		6	Occurs in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Habitat usually contains abundant logs and fallen timber: these are important components of its habitat. Nests are often found in a dead branch in a live tree, or in a dead tree or shrub.	The species has potential to occur within the subject site. The species has been recorded within the locality, and scattered piles of logs and woody debris occurs within the site.
Petroicidae	*Petroica phoenicea*	Flame Robin	V		2	Breeds in upland tall, moist, eucalypt forests and woodlands, often on ridges and slopes. Groundlayer of breeding habitat is dominated by native grasses. It occasionally occurs in herbfields, heathlands, shrublands, and sedgelands at high altitudes. In winter the	The species is unlikely to occur within the subject site. The areas of grassland on the subject site are dominated by exotic species.

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
						species migrates to drier, more open habitats in the lowlands. The species forages from low perches, pouncing on small invertebrates on the ground or off logs, and other coarse woody material.	
Procellariidae	*Pachyptila turtur subantarctica*	Fairy Prion		V, M	0	The Fairy Prion is small seabird occurring within the subantarctic islands south of the the mainland.	The species is unlikely to occur within the subject site as the subject site offers no suitable habitat.
Psittacidae	*Glossopsitta pusilla*	Little Lorikeet	V		13	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophoras, Melaleucas and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Also utilises isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees. Roosts in treetops, often distant from feeding areas. Nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts.	The species is likely to forage within the subject site. Degraded, foraging habitat occurs, and the species has been recorded in the locality.

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
Psittacidae	*Lathamus discolor*	Swift Parrot	E		14	In NSW mostly occurs on the coast and south west slopes. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as *Eucalyptus robusta, Corymbia maculata, C. gummifera, E. sideroxylon,* and *E. albens*. Breeds in Tasmania in spring and summer.	The Swift Parrot has potential to occur within the subject site. The species has been recorded in the locality, and may utilise the subject site as part of a wider foraging range.
Psittacidae	*Neophema pulchella*	Turquoise Parrot	V		2	Found at the edges of eucalypt woodland adjacent to clearings, timbered ridges and creeks in farmland. Associated with coastal scrubland, open forest and timbered grassland. Nests in hollow-bearing trees, logs or posts.	The Turquoise Parrot is unlikely to occur within the subject site. The species has been recorded in the locality. No suitable sized hollows are present on the subject site, the species may utilise the forested areas as part of a wider foraging range.
Psittacidae	*Polytelis swainsonii*	Superb Parrot	V	V	3	Occurs in Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest.	The Superb Parrot is unlikely to occur within the subject site as no suitable habitat is present.
Rostratulidae	*Rostratula*	Australian Painted	E	E, M	0	Inhabits fringes of shallow inland wetlands,	The Australasian Bittern is unlikely

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
	australis	Snipe				swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	to occur within the subject site. The species has not been recorded in the locality. The subject site offers no suitable habitat.
Scolopacidae	*Calidris acuminata*	Sharp-tailed Sandpiper		C, M	9	Species prefers muddy edges of shallow fresh or brackish wetlands with inundated or low vegetation. Known to occur lagoons, swamps, lakes, dams, and other water bodies. Roosts at the edges of wetlands.	The Sharp-tailed Sandpiper is unlikely to occur within the subject site as the subject site offers no suitable habitat.
Scolopacidae	*Calidris ferruginea*	Curlew Sandpiper	E	CE, M	5	The Curlew Sandpiper is found in coastal areas with intertidal mudflats, including estuaries, inlets and lagoons, and ponds in saltworks. The species have also occasionally been recorded inland around lakes , dams and waterholes with mud or sand present. Main requirements for feeding habitats are the presence of mudflats or shallow water up to 60mm. The Curlew Sandpiper may also forage in saltmarsh environments and flooded paddocks.	The Curlew Sandpiper is unlikely to occur within the subject site as the subject site offers no suitable habitat.
Scolopacidae	*Gallinago hardwickii*	Latham's Snipe		C, M	1	Seen in small groups or singly in freshwater wetlands on or near the coast, generally	The Latham's Snipe is unlikely to occur within the subject site as the

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
						among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration. They also use crops and pasture.	subject site offers no suitable habitat.
Scolopacidae	*Limicola falcinellus*	Broad-billed Sandpiper	V	C, M	1	Occurs in sheltered parts of the coast including mudflats, harbours and lagoons.	The Broad-billed Sandpiper unlikely to occur within the subject site as the subject site offers no suitable habitat.
Scolopacidae	*Numenius madagascariensis*	Eastern Curlew		CE, M		Prefers sheltered coasts, especially estuaries, bays, harbours, inlets and lagoons. Also known to occur in sewage farms, wetlands and mangroves. Species roosts on sandy spits and in low Saltmarsh or mangroves.	The Eastern Sandpiper is unlikely to occur within the subject site as the subject site offers no suitable habitat. The species has not been recorded in the locality.
Strigidae	*Ninox connivens*	Barking Owl	V		9	Inhabits eucalypt woodland, open forest, swamp woodlands and, especially in inland areas, timber along watercourses. Denser vegetation is used occasionally for roosting. Nests in hollows of large, old eucalypts. Hunts small arboreal mammals such as Squirrel Gliders and Ringtail Possums, but	The species may potentially occur within the subject site. Whilst the species has been recorded in the locality, few records exist and the species and has large home-ranges. The species most-likely uses the area as part of a larger

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
						when loss of tree hollows decreases these prey populations it becomes more reliant on birds, invertebrates and terrestrial mammals. Requires very large permanent territories in most habitats due to sparse prey densities.	foraging range, as no suitable nesting trees are present within the subject site.
Strigidae	*Ninox strenua*	Powerful Owl	V		391	In NSW the Powerful Owl lives in forests and woodlands occurring in the coastal, escarpment, tablelands and western slopes environments. Specific habitat requirements include eucalypt forests and woodlands on productive sites on gentle terrain; a mosaic of moist and dry types, with mesic gullies and permanent streams; presence of leafy sub canopy trees or tall shrubs for roosting; presence of large old trees to provide nest hollows. Optimal habitat includes a tall shrub layer and abundant hollows supporting high densities of arboreal marsupials.	The Powerful Owl is likely to occur within the subject site. The species has been recorded extensively in the locality, and is known to have large home-ranges. The species most-likely uses the area as part of a larger foraging range, as no suitable large-hollowed nesting trees are present within the subject site. Assessment of Significance Performed.
Tytonidae	*Tyto novaehollandiae*	Masked Owl	V		13	Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting. Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts	The species may potentially occur within the subject site. Whilst the species has been recorded in the locality, few records exist and the species and has large home-

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
						along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats.	ranges. The species most-likely uses the area as part of a larger foraging range, as no suitable large-hollowed nesting trees are present within the subject site.
Tytonidae	*Tyto tenebricosa*	Sooty Owl	V		2	Occurs in coastal rainforest, including dry, subtropical, and temperate rainforests, and moist eucalypt forests. Utilises tall trees in heavily vegetated areas for day time resting. It hunts during the night for small ground or tree dwelling mammals such as the Common Ringtail Possum or Sugar Glider. The species requires very large tree hollows for nesting.	The Sooty Owl is likely to occur within the locality. TWhilst the species has been recorded in the locality, few records exist and the species and has large home-ranges. The species most-likely uses the area as part of a larger foraging range, as no suitable large-hollowed nesting trees are present within the subject site.
Scolopacidae	Actitis hypoleucos	Common Sandpiper		M	0	Species occurs near coastlines utilising coastal and inland wetlands, streams, mudflats, lakes, claypans and reservoirs. Forages in shallow water and roosts on rocks or in roots or branches of vegetation.	The species is unlikely to occur within the subject site. The species has not been recorded in the locality and there is no suitable habitat.
Scolopacidae	Calidris melanotos	Pectoral Sandpiper		M	0	Species prefers shallow fresh to saline wetlands and is known to utilise lagoons,	The species is unlikely to occur within the subject site. The species

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
						estuaries, bays, swamps, lakes, inundated grasslands and other water bodies. Species does not breed in Australia.	has not been recorded in the locality and there is no suitable habitat.
Meropidae	Merops ornatus	Rainbow Bee-eater		M	0	In Australia it is widespread, except in desert areas, and breeds throughout most of its range, although southern birds move north to breed. The Rainbow Bee-eater is most often found in open forests, woodlands and shrublands, and cleared areas, usually near water. It will be found on farmland with remnant vegetation and in orchards and vineyards. It will use disturbed sites such as quarries, cuttings and mines to build its nesting tunnels.	The species has potential to occur on the subject site. Some suitable habitat occurs, however the species has not been recorded in the locality.
Monarchidae	Monarcha melanopsis	Black-faced Monarch		M	0	Found along the coast of eastern Australia, becoming less common further south. The Black-faced Monarch is found in rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating.	The species is unlikely to occur within the subject site. The species has not been recorded in the locality and there is no suitable habitat.
Monarchidae	*Monarcha trivirgatus*	Spectacled Monarch		M	0	Found along the entire eastern seaboard of Australia. More often found where there is	The species is unlikely to occur within the subject site. The species

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
						thick understorey in rainforests, wet gullies, waterside vegetation and also in mangroves.	has not been recorded in the locality and there is no suitable habitat.
Motacillidae	*Motacilla flava*	Yellow Wagtail		M	0	Species is believed to be a regular summer visitor to NSW, preferring open grassy flats near water.	The species is unlikely to occur within the subject site. The species has not been recorded in the locality and there is limited suitable habitat.
Monarchidae	*Myiagra cyanoleuca*	Satin Flycatcher		M	0	Inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests.	The species is unlikely to occur within the subject site. The species has not been recorded in the locality and there is no suitable habitat.
Pandionidae	*Pandion haliaetus*	Osprey		M	0	Found in littoral and coastal habitats and terrestrial wetlands. They generally are found in coastal areas though will travel inland along major water courses. They visit a wide range of wetland habitats including inshore waters, reefs, bays, coastal cliffs, estuaries, mangrove swamps, broad rivers, reservoirs, large lakes, and water holes. They feed on fish over clear, open water, and nest in trees	The species is unlikely to occur within the subject site. The species has not been recorded in the locality and there is no suitable habitat.

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
						or dead trees, generally within one kilometre of the ocean.	
Rhipiduridae	*Rhipidura rufifrons*	Rufous Fantail		M	0	Found in rainforest, dense wet forests, swamp woodlands and mangroves, preferring deep shade, and is often seen close to the ground.	The species is unlikely to occur within the subject site. The species has not been recorded in the locality and there is no suitable habitat.
Gastropoda							
Camaenidae	*Meridolum corneovirens*	Cumberland Plain Land Snail	E		23	Primarily inhabits Cumberland Plain Woodland. Lives under litter of bark, leaves and logs, or shelters in loose soil around grass clumps. Lives in a very small area on the Cumberland Plain west of Sydney, from Richmond and Windsor south to Picton and from Liverpool west to the Hawkesbury and Nepean Rivers at the base of the Blue Mountains.	The Cumberland Plain Land Snail is unlikely to occur on the subject site. There is no suitable habitat within the subject site as it does not contain Cumberland Plain Woodland.
Camaenidae	*Pommerhelix duralensis*	Dural Woodland Snail	E	E	31	Species occurs under rocks or inside curled-up bark within communities in the interface region between sandstone-derived and shale-derived soils.	The Dural Woodland Land Snail has the potential to occur on the subject site. Areas of logs and woody debris occur on the subject site, however the species was not

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
							found in targeted snail searches. Assessment of significance has been performed as a precaution.
Mammalia							
Burramyidae	*Cercartetus nanus*	Eastern Pygmy-possum	V		29	Species is found in a broad range of habitats from rainforest to wet and dry sclerophyll forests through to woodland and heath. Woodland and heath habitats are preferred. The species feeds on pollen and nectar from banksias, eucalypts, and bottlebrushes, though will eat soft fruits when flowers are unavailable, and will also eat insects throughout the year. They shelter in tree hollows, rotten stumps, holes in the ground, abandoned birds nests and Ringtail Possum dreys, and thickets of vegetation. Tree hollows are preferred for nesting but the species will also nest under tree bark and shredded bark in tree forks.	The species is unlikely to occur within the subject site. Some degraded habitat and nesting hollows occur on the subject site, however the site is isolated from other vegetated areas.
Dasyuridae	*Dasyurus maculatus*	Spotted-tailed Quoll	V	E	13	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from	The species is unlikely to occur withint the subject site. The species has not been recorded

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
						the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites.	within the subject site. The species has large home ranges, however the site is isolated from other vegetated areas.
Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	V		20	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.	The species has potential to occur within the subject site. The species has been recorded within the locality, but few suitable roosting habitat is found on the subject site. The species may use the site as part of a larger foraging range.
Macropodidae	*Petrogale penicillata*	Brush-tailed Rock-Wallaby	E	V	0	Prefers rocky habitats, including loose boulder-piles, rocky outcrops, steep rocky slopes, cliffs, gorges, and isolated rock stacks. Vegetation types associated with the species include dense forest, wet sclerophyll forest, vine thicket, dry sclerophyll forest, and open forest.	The species is unlikely to occur within the subject site. No suitable habitat occurs and the species has not been recorded in the locality.
Molossidae	*Mormopterus norfolkensis*	Eastern Freetail-bat	V		44	Found in dry sclerophyll forest, woodland, swamp forest and mangrove forests east of the Great dividing Range. Primarily roosts in	The Eastern Freetail-bat likely occurs within the subject site. The species has been recorded within

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
						tree hollows but will also utilise man-made structures.	the locality and some suitable hollows are present on site. The species may use the site as part of a larger foraging range.
Muridae	*Pseudomys gracilicaudatus*	Eastern Chestnut Mouse	V		2	Distributed from north of the Hawkesbury river into Northern Queensland. The species occurs in heathland, and is most common in dense, wet heath and swamps.	The species is unlikely to occur within the subject site. No suitable habitat occurs within the site.
Muridae	*Pseudomys novaehollandiae*	New Holland Mouse		V		Occurs in open habitats (heathland, woodland and forest) with a heath understorey and vegetated sand dunes. The species prefers deep soft top soils in order to burrow.	The species is unlikely to occur within the subject site. The species has not been recorded in the locality and no suitable habitat occurs.
Peramelidae	*Isoodon obesulus obesulus*	Southern Brown Bandicoot (eastern)	E	E	10	Within NSW, the species is rare and almost exclusively restricted to the coastal fringe of the state, from the southern side of the Hawkesbury River in the north to the Victorian border in the south. More specifically, the subspecies is considered to occur primarily in two areas: Ku-ring-gai Chase and Garigal National Parks; and in the far south-east corner of the state. Occurs	The species is unlikely to occur within the subject site. The species has not been recorded in the subject site and the subject site is outside the primary range of the species.

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
						within their distribution in a variety of habitats including heathland, shrubland, sedgeland, heathy open forest and woodland.	
Petauridae	*Petaurus australis*	Yellow-bellied Glider	E		3	Occurs in tall, mature, eucalypt forest generally in areas with high rainfall and nutrient rich soils. It feeds primarily on plant and insect exudate, with insects providing protein. It extracts sap from trees by biting into the trunk and branches leaving distinctive 'V' shaped scars. It dens in large hollows within trees, in groups of two to six individuals.	The species is unlikely to occur within the subject site. No large hollows are present within the subject site.
Phascolarctidae	*Phascolarctos cinereus*	Koala	V	V	7	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred feed species. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.	The Koala is unlikely to occur within the subject site, as their is a lack of suitable habitat and the vegetation is isoalted from other vegetated areas in the locality.
Pseudocheiridae	*Petauroides volans*	Greater Glider		V	2	Occurs in eucalypt forests and woodlands from north-eastern Queensland to the Central Highlands of Victoria. The species	The species is unlikely to occur within the subject site. Only a few tree hollows are present on the

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
						has a relatively small home range which consists of numerous tree hollows.	subject site, and the forested areas a highly degraded.
Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	V	V	134	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	The species is likely to occur within the subject site. The species has been recorded within the subject site, however, no roost camps were present. The species probably uses the subject site as part of their wider foraging range.
Vespertilionidae	*Chalinolobus dwyeri*	Large-eared Pied Bat	V	V	2	The species is assocated with areas dominated by sandstone escarpments; sandstone cliffs and fertile woodland valley habitat occurring in close proximity to each other is important for the species. It roosts in cliff/escarpment areas and forages in fertile forest. Roosting is predominately in arch caves with dome roofs, but has been observed in disused mines shafts, overhangs, and disused Fairy Martin nests.	The species has potential to occur within the subject site. The species has been recorded within the locality, but no suitable roosting habitat is found on the subject site. The species may use the site as part of a larger foraging range.
Vespertilionidae	*Falsistrellus tasmaniensis*	Eastern False Pipistrelle	V		22	Favours hollow trunks of Eucalypt trees over 20m high in wet sclerophyll forest and	The Eastern False Pipstrelle likely occurs within the subject site. The

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
						coastal mallee. Occasionally found in old wooden buildings.	species has been recorded in the locality,and some suitable hollows are present on site. The species may use the site as part of a larger foraging range.
Vespertilionidae	*Miniopterus australis*	Little Bentwing-bat	V		22	Moist eucalypt forest, rainforest or dense coastal banksia scrub. Little Bentwing-bats roost in caves, tunnels and sometimes tree hollows during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.	The species has potential to occur within the subject site. The species has been recorded within the locality, some suitable roosting hollows are found on the subject site. The species may use the site as part of a larger foraging range.
Vespertilionidae	*Miniopterus schreibersii oceanensis*	Eastern Bentwing-bat	V		110	Forages above the canopy and eats mostly moths. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.	The Eastern Bentwing-bat likely occurs within the subject site. The species has been recorded in the locality, however no roosting habitat is present. The species may use the site as part of a larger foraging range.
Vespertilionidae	*Myotis macropus*	Southern Myotis	V		23	Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under	The species has potential to occur within the subject site. The species has been recorded in the locality,

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
						bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.	however no permanent water sources are present within the subject site. The species may utilise the subject site for roosting.
Vespertilionidae	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V		22	Found mainly in the gullies and river systems that drain the Great Dividing Range. Usually roosts in tree hollows and buildings. Forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m. Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects.	The Greater Broad-nosed Bat is likely to occur within the subject site. The species has been recorded within the locality and some suitable hollows are present on site. The species may use the site as part of a larger foraging range.
Reptilia							
Varanidae	*Varanus rosenbergi*	Rosenberg's Goanna	V		7	Found in heath, open forest and woodland. Associated with termites, the mounds of which this species nests in; termite mounds are a critical habitat component.	The species is unlikely to occur within the subject site. No termite mounds have been found within the site.
Elapidae	*Hoplocephalus bungaroides*	Broad-headed Sanke	E	V	0	Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in	The species is unlikely to occur within the subject site. The species has not been recorded in the locality and there is no suitable

Table D.1 Threatened Fauna Likelihood of Occurrence

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records	Habitat Requirements	Likelihood of Occurrence
						crevices or hollows in large trees within 500m of escarpments in summer.	habitat.

Key: V= Vulnerable, E = Endangered, CE = Critically Endangered, M = Migratory

Appendix E

Assessments of Significance

E.1 Introduction

This appendix contains the formal Test of Significance required under Section 7.3 of the BC Act that have been prepared in accordance with the DRAFT Threatened Species Test of Significance Guidelines (OEH 2017a). The Test of Significance is used for determining whether proposed development or activity likely to significantly affect threatened species or ecological communities, or their habitats.

Tests of Significance have been provided for communities and species listed as vulnerable, endangered or critically endangered under the BC Act. Each Test of Significance is a series of factors (shown as italicised text below) for which a response has been supplied beneath in plain text.

E.2 Ecological Communities

E.2.1 Sydney Turpentine-Ironbark Forest

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Elements of the STIF endangered ecological community occur on the subject site in the form of scattered trees, largely without native understorey or ground stratum. It has previously been substantially cleared and/or modified within the subject site.

The elements of STIF within the subject site do not directly adjoin to a contiguous patch of vegetation extending outside of the subject site. However, other such patches of the community occur within the broader locality, within several considerably larger patches according to the Vegetation Maps of the Cumberland Plain (NSW NPWS 2002).

Of the ~0.11 ha occurring within the subject site, approximately ~0.7 ha is anticipated to be cleared. This will include four trees and the exotic dominated understorey. The remaining ~0.04 ha will be partially cleared and managed within the APZ with no further tree removal anticipated. Whilst the remaining STIF within the subject site falls within the APZ, this community is anticipated to be unaltered as a result of creation of the APZ as the community currently presents as isolated trees without connectivity to hazardous, flammable vegetation.

Given the highly modified nature and small extent of the community directly and indirectly impacted, the Project is not considered to have an adverse effect on the extent of the community such that its local occurrence is placed at risk of extinction.

Previous land uses has resulted in a modification of the composition of the community within the subject site. Within the subject site, this community is highly modified and comprises remnant canopy trees above an exotic dominated understorey. The Project will result in the loss of a small area of a highly modified form of the community and may potentially indirectly impact retained remnants. The potential modification of vegetation through direct and indirect impacts is not considered to place the local occurrence of the community at risk of extinction.

(c) in relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality

A ~0.11 ha area of STIF occurs within the subject site. Of this extent, approximately 0.07 ha will be cleared within the subject site. This will involve the clearance of five trees and the exotic dominated understorey with scattered native forbs and shrubs. The remaining ~0.07 ha will be partially cleared and managed within the APZ. The potential changes to the retained extent of this community resulting from indirect impacts are expected to be localised and overall are not considered to cause a substantial change in the extent of the community.

The Project is not considered to significantly increase fragmentation of STIF within the subject site. The majority of the subject site has previously been cleared of treed vegetation potentially due to past agricultural use of the property. Fragmentation between isolated patches of trees may be increased as a result of the Project.

Previous land uses has resulted in the modification of the composition of the community within the subject site. The ground layer is dominated by exotic pasture species and exotic weeds. Given the land use history of the subject site and the current condition of the community, it is unlikely that the community would respond to assisted natural regeneration. The small area of the community directly and directly impacted by the Project is not considered important for the long-term survival of the community in the locality.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)

No area of outstanding biodiversity value for STIF has currently been identified under the BC Act. No area of outstanding biodiversity value is located in the locality of the subject site. Therefore, the Project is not likely to have an adverse effect of an area of outstanding biodiversity value (directly or indirectly).

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process

The proposal may exacerbate the following processes, impacting on STIF:

- 'Clearing of native vegetation' as this reduces the area of habitat available for this community. The Project will only remove a small area of a highly modified form of the community;
- Threatening processes involving the invasion of exotic flora including 'Invasion and establishment of exotic vines and scramblers', 'Invasion of native plant communities by exotic perennial grasses' and 'Invasion, establishment and spread of Lantana (*Lantana camara* L. Sens. Lat)'. These threatening processes may result in further degradation of native vegetation within the subject site. These threatening processes are unlikely to result in a reduction in vegetation quality further than the current degraded conditions., and;
- 'Removal of dead wood and dead trees' as this reduces the area of habitat available for the species that may utilise the habitat features within this community. The utilisation of these habitat features has been reduced due to the modified landscape in which this community occurs.

Conclusion

An estimated ~0.11 ha of STIF occurs within the study area in the form of scattered trees. Of this extent, ~0.07 ha will be cleared resulting in the loss of four canopy trees and associated heavily degraded understorey with some scattered natives. The remaining 0.04 ha of STIF vegetation will be partially cleared within the APZ with all remaining trees to be retained. Previous land uses has resulted in the modification of the community within the subject site, with the majority of its occurrence comprising remnant trees above a predominantly cleared understorey dominated by exotic species. The direct and indirect impacts of the Project are not considered likely to result in a significant impact to this community.

E.3 Fauna

E.3.1 Diurnal Woodland Birds

This Test of Significance covers the following diurnal woodland bird species:

- Gang-gang Cockatoo (*Callocephalon fimbriatum*);
- Little Lorikeet (*Glossopsitta pusilla*); and
- Swift Parrot (*Lathamus discolour*).

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

The Gang-gang Cockatoo, Little Lorikeet and Swift Parrot have not been recorded within the subject site; however these species have been recorded in the locality. The local populations of these potentially occurring species is considered to extend beyond the subject site. The assessed species would be expected to utilise the foraging resources within the subject site occasionally or opportunistically as part of a broader habitat range.

These bird species will primarily be impacted by the Project through direct removal of foraging habitat within the subject site. Due to the modified and fragmented nature of the habitat within the subject site, these species are not considered likely to breed within the subject site. The habitat to be impacted within the subject site is not considered important for the long-term survival of the species within the locality. Sufficient foraging habitat will be retained within the subject site. Accordingly, the Project is not considered to have an adverse effect on the life cycle of these species such that a viable local population is likely to be placed at risk of extinction.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable.

(c) In relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

A total of ~0.79 ha of woody vegetation occurs within the subject site which constitutes foraging habitat for the assessed threatened bird species. Of this extent, a total of ~0.44 ha of this woody vegetation will be cleared within the subject site whilst an additional ~0.34 ha will be partially cleared during the creation and maintenance of the APZ. The potential changes to the retained extent of woody vegetation resulting from indirect impacts are expected to be localised and overall are not considered to cause a substantial change in the extent of the habitat for these species.

The Project is not considered to significantly increase fragmentation of foraging habitat comprising woody vegetation within the subject site. The majority of the subject site has

previously been cleared of treed vegetation through past clearing. Some fragmentation will occur between isolated patches of treed vegetation, including scattered trees.

Previous land uses has resulted in the modification of the habitat of the assessed threatened bird species within the subject site. The foraging habitat comprises remnant trees above a cleared understorey. Given the condition of the habitat and its fragmented nature, the small area of habitat directly and indirectly impacted by the Project is not considered important for the long-term survival of these bird species in the locality.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

No area of outstanding biodiversity value for the assessed threatened flora species has currently been identified under the BC Act. No area of outstanding biodiversity value is located in the locality of the subject site. Therefore, the Project is not likely to have an adverse effect on an area of outstanding biodiversity value (directly or indirectly).

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

The Project may exacerbate the following processes, impacting on threatened diurnal woodland bird species:

- 'Clearing of native vegetation' as this reduces the area of foraging habitat available for diurnal woodland birds. The Project will only remove a small area of a highly modified and degraded native vegetation;
- 'Loss of hollow-bearing trees' as this reduces the area of habitat available for the species that may utilise these habitat features. The utilisation of these habitat features has been reduced due to the modified landscape in which this species occurs; and
- 'Removal of dead wood and dead trees' as this reduces the area of habitat available for the species that may utilise the habitat features within this community. The utilisation of these habitat features has been reduced due to the modified landscape in which this community occurs.

Conclusion

A total of ~0.79 ha of native woody vegetation occurs within the subject site which constitutes foraging habitat for the assessed threatened diurnal woodland bird species. Of this extent, a total of~ 0.44 ha will be cleared whilst ~0.34 ha will be partially cleared within the APZ. Previous land uses has resulted in the modification of the habitat for threatened diurnal woodland bird species within the subject site, with its occurrence comprising either highly degraded patches or remnant trees above a cleared understorey of exotic species. The direct and indirect impacts of the Project are not considered to result in a significant impact to diurnal woodland bird habitat.

E.3.2 Large Forest Owls

This Test of Significance covers the following threatened large forest owl species:

- Powerful Owl (*Ninox strenua*); and
- Masked Owl (*Tyto novaehollandiae*).

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

The Powerful Owl and Masked Owl have not been recorded within the subject site; however these species have been recorded in the locality. The local populations of these potentially occurring species is considered to extend beyond the subject site. The assessed species would be expected to utilise the foraging resources within the subject site occasionally or opportunistically as part of a broader habitat range.

These large forest owl species will primarily be impacted by the Project through direct removal of foraging habitat within the subject site. Due to the modified and fragmented nature of the habitat within the subject site, and the lack of suitably large tree hollows, these species are not considered likely to breed within the subject site. The habitat to be impacted within the subject site is not considered important for the long-term survival of the species within the locality. Sufficient foraging habitat will be retained within the subject site. Accordingly, the Project is not considered to have an adverse effect on the life cycle of these species such that a viable local population is likely to be placed at risk of extinction.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable.

(c) In relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

A total of ~0.79 ha of woody vegetation occurs within the subject site which constitutes foraging habitat for the assessed threatened bird species. Of this extent, a total of ~0.44 ha of this woody vegetation will be cleared within the subject site whilst an additional ~0.34 ha will be partially cleared during the creation and maintenance of the APZ. The potential changes to the retained extent of woody vegetation resulting from indirect impacts are expected to be localised and overall are not considered to cause a substantial change in the extent of the habitat for these species.

The Project is not considered to significantly increase fragmentation of foraging habitat comprising woody vegetation within the subject site. The majority of the subject site has previously been cleared of treed vegetation. Some fragmentation will occur between isolated patches of treed vegetation, including scattered trees.

Previous land uses has resulted in the modification of the habitat of the assessed threatened bird species within the subject site. The foraging habitat comprises remnant trees above a cleared understorey. Given the condition of the habitat and its fragmented nature, the small area of habitat directly and indirectly impacted by the Project is not considered important for the long-term survival of these bird species in the locality.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

No area of outstanding biodiversity value for the assessed threatened flora species has currently been identified under the BC Act. No area of outstanding biodiversity value is located in the locality of the subject site. Therefore, the Project is not likely to have an adverse effect on an area of outstanding biodiversity value (directly or indirectly).

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

The Project may exacerbate the following processes, impacting on threatened large forest owl species:

- 'Clearing of native vegetation' as this reduces the area of foraging habitat available for large forest owls. The Project will only remove a small area of a highly modified and degraded native vegetation; and

- 'Loss of hollow-bearing trees' as this reduces the area of potential future habitat available for the species that may utilise these habitat features. The tree hollows within the subject site are currently too small for utilisation by large forest owls. The utilisation of these habitat features has been reduced due to the modified landscape in which this species occurs;

Conclusion

A total of ~0.79 ha of native woody vegetation occurs within the subject site which constitutes foraging habitat for the assessed threatened large forest owl species. Of this extent, a total of ~0.44 ha will be cleared whilst ~0.34 ha will be partially cleared within the

APZ. Previous land uses has resulted in the modification of the habitat for threatened diurnal woodland bird species within the subject site, with its occurrence comprising either highly degraded patches or remnant trees above a cleared understorey of exotic species. The direct and indirect impacts of the Project are not considered to result in a significant impact to large forest owl habitat.

E.3.3 Microchiropteran Bats

This Test of Significance covers the following threatened microchiropteran bat species:

- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*);
- Eastern Freetail-bat (*Mormopterus norfolkensis*);
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*);
- Little Bentwing-bat (*Miniopterus australis*);
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*);
- Southern Myotis (*Myotis macropus*); and
- Greater Broad-nosed Bat (*Scoteanax rueppellii*).

All of these species are listed as Vulnerable under the BC Act. These species could potentially occur in the subject site as part of a wider foraging range and could also roost in tree hollows within the subject site (exception of Eastern Bentwing-bat which mainly roosts in caves).

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

Threatened microchiropteran bat species are known to occur throughout the broader locality and would be expected to utilise the resources within the subject site as foraging habitat. Species which utilise tree hollows may utilise habitat features within the subject site as refuge or roosting habitat. The local populations of these potentially occurring species is considered to extend beyond the subject site. The assessed species would be expected to utilise the foraging resources within the subject site occasionally or opportunistically as part of a broader habitat range.

These microchiropteran bat species may be impacted by the Project through direct removal of foraging habitat and roosting habitat features within the subject site. The habitat to be impacted within the subject site is not considered important for the long-term survival of the species within the locality. Sufficient foraging habitat will be retained within the subject site. Accordingly, the Project is not considered to have an adverse effect on the life cycle of these species such that a viable local population is likely to be placed at risk of extinction.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable.

(c) In relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

A total of ~0.79 ha of woody vegetation occurs within the subject site which constitutes foraging habitat for the assessed threatened microchiropteran bat species. Of this extent, a total of ~0.44 ha of this woody vegetation will be cleared within the subject site whilst an additional ~0.34 ha will be partially cleared during the creation and maintenance of the APZ. Three trees containing potential hollows and one large stag containing fissures and decorticating bark may be removed by the Project as they fall within the proposed APZ. The potential changes to the retained extent of woody vegetation resulting from indirect impacts are expected to be localised and overall are not considered to cause a substantial change in the extent of the habitat for these species.

The Project is not considered to significantly increase fragmentation of foraging habitat comprising woody vegetation within the subject site. The majority of the subject site has previously been cleared of treed vegetation through past clearing. Some fragmentation will occur between isolated patches of treed vegetation, including scattered trees.

Previous land uses has resulted in the modification of the habitat of the assessed threatened microchiropteran bat species within the subject site. The foraging habitat comprises remnant trees above a cleared understorey in areas of STIF and remnant trees above a highly degraded understorey in areas of Blackbutt Gully Forest. Given the degraded condition of the habitat and its fragmented nature, the small area of habitat directly and indirectly impacted by the Project is not considered important for the long-term survival of these bird species in the locality.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

No area of outstanding biodiversity value for the assessed threatened flora species has currently been identified under the BC Act. No area of outstanding biodiversity value is located in the locality of the subject site. Therefore, the Project is not likely to have an adverse effect on an area of outstanding biodiversity value (directly or indirectly).

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

The Project may exacerbate the following processes, impacting on threatened large forest owl species:

- 'Clearing of native vegetation' as this reduces the area of foraging and roosting habitat available for microchiropteran bats. The Project will only remove a small area of a highly modified and degraded native vegetation;
- 'Loss of hollow-bearing trees' as this reduces the area of potential future habitat available for the species that may utilise these habitat features. The utilisation of these habitat features has been reduced due to the modified landscape in which this species occurs; and
- 'Removal of dead wood and dead trees' as this reduces the area of habitat available for the species that may utilise the habitat features within the subject site. The utilisation of these habitat features has been reduced due to the modified landscape in which this community occurs.

Conclusion

A total of ~0.79 ha of native woody vegetation occurs within the subject site which constitutes foraging habitat for the assessed threatened microchiropteran bat species. Of this extent, a total of ~0.44 ha will be cleared whilst ~0.34 ha will be partially cleared within the APZ. Previous land uses has resulted in the modification of the habitat for threatened diurnal woodland bird species within the subject site, with its occurrence comprising either highly degraded patches or remnant trees above a cleared understorey of exotic species. The direct and indirect impacts of the Project are not considered to result in a significant impact to microchiropteran bat habitat.

E.3.4 Grey-headed Flying Fox

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

The Grey-headed Flying Fox has not been recorded within the subject site; however the species has been recorded in the locality. The local population of this potentially occurring species is considered to extend beyond the subject site. The assessed species would be expected to utilise the foraging resources within the subject site occasionally or opportunistically as part of a broader habitat range.

The Grey-headed Flying Fox will primarily be impacted by the Project through direct removal of foraging habitat within the subject site. The habitat to be impacted within the subject site is not considered important for the long-term survival of the species within the locality. Sufficient foraging habitat will be retained within the subject site. Accordingly, the Project is not considered to have an adverse effect on the life cycle of the Grey-headed Flying Fox such that a viable local population is likely to be placed at risk of extinction.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable.

(c) In relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

A total of ~0.79 ha of woody vegetation occurs within the subject site which constitutes foraging habitat for the Grey-headed Flying Fox. Of this extent, a total of ~0.44 ha of this woody vegetation will be cleared within the subject site whilst an additional ~0.134 ha will be partially cleared during the creation and maintenance of the APZ. The potential changes to the retained extent of woody vegetation resulting from indirect impacts are expected to be localised and overall are not considered to cause a substantial change in the extent of the habitat for these species.

The Project is not considered to significantly increase fragmentation of foraging habitat comprising woody vegetation within the subject site. The majority of the subject site has previously been cleared of treed vegetation through past clearing and agricultural practices. Some fragmentation will occur between isolated patches of treed vegetation, including scattered trees.

Previous land uses has resulted in the modification of the habitat of the Grey-headed Flying Fox within the subject site. The foraging habitat comprises remnant trees above a cleared or highly degraded understorey. Given the condition of the habitat and its fragmented nature, the small area of habitat directly and indirectly impacted by the Project is not considered important for the long-term survival of these bird species in the locality.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

No area of outstanding biodiversity value for the assessed threatened flora species has currently been identified under the BC Act. No area of outstanding biodiversity value is located in the locality of the subject site. Therefore, the Project is not likely to have an adverse effect on an area of outstanding biodiversity value (directly or indirectly).

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

- 'Clearing of native vegetation' as this reduces the area of foraging habitat available for the Grey-headed Flying Fox. The Project will only remove a small area of a highly modified and degraded native vegetation;

Conclusion

A total of ~0.79 ha of woody vegetation occurs within the subject site which constitutes foraging habitat for the Grey-headed Flying Fox. Of this extent, a total of ~0.44 ha will be cleared whilst ~0.34 ha will be partially cleared within the APZ. Previous land uses has resulted in the modification of the habitat for threatened diurnal woodland bird species within the subject site, with its occurrence comprising either highly degraded patches or remnant trees above a cleared understorey of exotic species. The direct and indirect impacts of the Project are not considered to result in a significant impact to Grey-headed Flying Fox habitat.

E.3.5 Dural Woodland Snail

Assessment of Significance

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

The Dural Woodland Snail has not been recorded within the subject site; however the species has been recorded in the locality. The local population of this potentially occurring species is considered to exist beyond the subject site due to the large tract of adjacent intact and higher quality habitat extending beyond the subject site. Due to the contiguous habitat extending within the subject site, there is the potential for the local population's range to extend to within the subject site.

The Dural Woodland Snail will primarily be impacted by the Project through direct removal of potential foraging and refuge habitat within the subject site. The habitat to be impacted within the subject site is not considered important for the long-term survival of the species within the locality. Sufficient foraging habitat will be retained within the subject site. Accordingly, the Project is not considered to have an adverse effect on the life cycle of the Dural Woodland Snail such that a viable local population is likely to be placed at risk of extinction.

The Dural Woodland Snail may potentially use the subject site as foraging and refuge habitat as part of a much larger habitat range consisting of contiguous vegetation extending beyond the boundaries of the subject site. The proposal is not likely to place a viable local population of the species at risk of extinction as the majority of potential habitat will be retained on the subject site.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable.

(c) In relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

A total of ~0.18 ha of habitat, comprising Blackbutt Gully Forest, occurs within the subject site which constitutes foraging and refuge habitat for the Dural Woodland Snail. Of this extent, a total of 0.03 ha will be cleared within the subject site whilst an additional ~0.14 ha will be partially cleared during the creation and maintenance of the APZ. The potential changes to the retained extent of habitat resulting from indirect impacts are expected to be localised and overall are not considered to cause a substantial change in the extent of the habitat for these species.

The Project is not considered to significantly increase fragmentation of foraging habitat comprising Blackbutt Gully Forest within the subject site. The majority of the subject site has previously been cleared of treed vegetation through past clearing and agricultural practices. Some minor fragmentation may occur between patches of Blackbutt Gully Forest vegetation as a result of the construction of paths throughout the APZ.

Previous land uses has resulted in the modification of the habitat of Dural Woodland Snail within the subject site. The foraging and refuge habitat comprises accumulated litter at the base of exposed sandstone, at the bases of trees and throughout the highly degraded understorey. Given the highly degraded condition of the habitat, the small area of habitat directly and indirectly impacted by the Project is not considered important for the long-term survival of the Dural Woodland Snail in the locality.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

No area of outstanding biodiversity value for the Dural Woodland Snail has currently been identified under the BC Act. No area of outstanding biodiversity value is located in the locality of the subject site. Therefore, the Project is not likely to have an adverse effect on an area of outstanding biodiversity value (directly or indirectly).

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

The following key threatening processes are relevant to the proposed development:

- 'Clearing of native vegetation' as this reduces the area of foraging and refuge habitat available for the Dural Woodland Snail. The Project will only remove a small area of highly degraded native vegetation;
- 'Removal of dead wood and dead trees' as this reduces habitat features for the species. The utilisation of these habitat features has been reduced due to the modified landscape in which this community occurs.
- 'Invasion and establishment of exotic vines and scramblers' as the resulting clearance and modification of vegetation associated with the Project may create ideal conditions for exotic vines and scramblers to further invade native vegetation. Due to the high degree of invasion by exotic vines and scramblers currently observed within the Blackbutt Gully Forest, this threat is unlikely to impact the available habitat further than current conditions.
- 'Invasion of native plant communities by exotic perennial grasses' as the resulting clearance and modification of vegetation associated with the Project may create ideal conditions for exotic grasses to further invade native vegetation. Due to the high degree of invasion by exotic perennial grasses currently observed within the Blackbutt Gully Forest, this threat is unlikely to impact the available habitat further than current conditions.
- 'Invasion, establishment and spread of Lantana (*Lantana camara*)' as the resulting clearance and modification of vegetation associated with the Project may create ideal conditions for Lantana to further invade native vegetation. Due to the high degree of invasion by Lantana currently observed within the Blackbutt Gully Forest, this threat is unlikely to impact the available habitat further than current conditions.

Conclusion

A total of ~0.18 ha of potential habitat, comprising Blackbutt Gully Forest, with sufficient connectivity to higher quality contiguous vegetation occurs within the subject site. Of this extent, a total of 0.03 ha will be cleared whilst ~0.14 ha will be partially cleared within the APZ. Previous land uses and exotic flora invasion has resulted in the modification of the habitat for the Dural Woodland Snail within the subject site, with its occurrence comprising a

highly degraded patch along the eastern boundary. The direct and indirect impacts of the Project are not considered to result in a significant impact to the Dural Woodland Snail.