

**12 AND 14 EDWARDS ROAD AND 263 ANNANGROVE
ROAD**

Ecological Constraints Assessment

For:

Barr Properties and Planning

July 2018

Final



**PO Box 2474
Carlingford Court 2118**

Report No. 17010RP2

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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Executive Summary

S1 Introduction

Cumberland Ecology Pty Ltd (Cumberland Ecology) has been commissioned Barr Planning and Property to prepare an Ecological Constraints Assessment for 12 Edwards Road (Lot 122 DP 530049) 14 Edwards Road (Lot 2 DP 259604) and 263 Annangrove Road (Lot 2 DP 259604) Rouse Hill (the subject site). The purpose of this Ecological Constraints Assessment is to identify ecological constraints to development, specifically threatened flora, fauna or ecological communities listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) known to occur within the locality of the subject site. Further this, report will support an application to the Director General for a site compatibility certificate for the subject site. This is required to support an application to the Director General for a site compatibility certificate for the subject site under the *State Environmental Planning Policy (Housing for Seniors with a Disability) 2004* (Seniors Housing SEPP).

S2 Background

The subject site is located in the Hills Shire Council Local Government Area (LGA). It is approximately 6.82 ha in area and contains existing residential dwellings, sheds and other structures. The proposed development is a seniors living development with 226 self-contained units and a 120 bed residential care facility to be located above a community centre. Associated infrastructure will include access roads, landscaped corridors/parkland, pedestrian walkways and associated common facilities including a community centre, tennis court and bowling green and men's shed.

S3 Methods

Database analysis, vegetation/flora surveys, fauna habitat surveys and incidental fauna observations were undertaken during November 2017. Flora surveys involved recording the presence of flora species using the random meander survey technique, two full plots surveyed using the Biodiversity Assessment Method (BAM) and one additional BAM flora plot, and targeted threatened flora surveys. Fauna surveys included a habitat assessment and any incidental observations of birds and other vertebrates.

S4 Results

Vegetation within the subject site was found to consist of Shale Sandstone Transition Forest (0.67 ha), Urban Exotic/Native Vegetation (0.50 ha) and Exotic Grassland (5.44 ha). Shale Sandstone Transition Forest is listed as an Endangered Ecological Community (EEC) under the BC Act, and although also listed under the EPBC Act did not meet referral criteria. This community is present in a highly modified form, as the understorey shrubs have been

removed and the ground layer is dominated by exotic species. The community only exists as canopy tree species.

No exotic flora species were observed and none are considered likely to occur due to the highly disturbed nature of the subject site.

The desktop assessment indicated that a number of threatened fauna species have been recorded from the locality and have the potential to occur within the subject site. From the desktop assessment and subsequent site inspections, ten threatened fauna species are considered as having potential to occur within the subject site. An additional two migratory species listed under the EPBC Act have the potential to forage aerially above the subject site. The known and potentially occurring fauna species are highly mobile and are expected to move between areas of remaining habitat within the immediate vicinity of the subject site and the wider area. These species are therefore not considered dependent upon the degraded habitats present within the subject site.

S5 Constraints Assessment

The area proposed to be cleared exceeds the threshold for entry into the Biodiversity Offsets Scheme (BOS) this would trigger the requirement for offsetting in addition to requirements for further assessment under the Biodiversity Assessment Method (BAM) and the preparation of a Biodiversity Development Assessment Report (BDAR). In addition to this, Shale Sandstone Transition Forest is currently listed as a candidate serious and irreversible impact (SAIL). Should Council determine that the project will result in an SAIL to Shale Sandstone Transition Forest, it must be refused (assuming it is a Part 4 development under the EPBC Act).

Some foraging and roosting habitat for threatened fauna species will be removed for the proposed works; however none are known to occur, and those threatened fauna species with potential to occur are unlikely to be dependent on the habitats present within the subject site for their survival. The species with potential to occur are highly mobile species that can access resources from a wide area. As such the presence of these habitat features is not considered to represent a significant constraint to development of the subject site.

S6 Mitigation Measures

A number of mitigation measures are recommended for the proposed project. The mitigation measures recommended to be implemented include:

- Avoidance;
- Vegetation protection;
- Erosion, sedimentation and pollution control;
- Clearing surveys; and
- Weed control measures.

S7 Conclusion

A number of ecological constraints have been identified for the project. The key constraint is the presence of Shale Sandstone Transition Forest, which is listed under the BC Act. Future development of the project should seek to avoid and minimise impacts to ecological values. The project will likely require assessment under the BOS and require consideration of SAI.

Introduction

1.1 Purpose

Cumberland Ecology Pty Ltd (Cumberland Ecology) has been engaged by Barr Planning and Property to prepare a Flora and Fauna Assessment (FFA) for 12 Edwards Road (Lot 122 DP 530049), 14 Edwards Road (Lot 2 DP 259604) and 263 Annangrove Road (Lot 2 DP 259604) Rouse Hill (hereafter referred to collectively as the 'subject site') (**Figure 1**).

The purpose of this report is to describe the current biodiversity values of the subject site and to identify constraints to development including flora and fauna, particularly threatened species, populations and communities that are listed under the New South Wales (NSW) *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The specific objectives of this report are to:

- Describe the vegetation communities on the subject site;
- Describe fauna habitats and fauna usage of the subject site;
- Identify any threatened species, populations or ecological communities (as listed under the BC Act and/or EPBC Act) existing on the subject site;
- Assess the likelihood of occurrence of threatened species, populations or communities (as listed under the BC Act and/or EPBC Act) within the subject site;
- Assess constraints to development associated with on threatened communities, and flora and fauna species; and
- Where relevant, recommend mitigation measures to reduce the impacts of the proposed development on biodiversity values.

This report will support an application to the Director General for a site compatibility certificate for the subject site. This is required to support an application to the Director General for a site compatibility certificate for the subject site under the *State Environmental Planning Policy (Housing for Seniors with a Disability) 2004* (Seniors Housing SEPP).

1.2 Background

1.2.1 Site Description

The subject site is 6.82 ha in area and is located at 12 & 14 Edwards Road (Lot 1 and 2 DP 259604) and 263 Annangrove Road (Lot 122 DP 530049), Rouse Hill and is located within Hills Shire Council. The location of these properties is shown in **Figure 1.1**. These properties are acreage properties containing existing dwellings and sheds and are grazed by horses. A small farm dam is located in the south west corner. The subject site is bounded by Edwards Road to the south, Annangrove Road to the east, Hession Road to the west and other rural residential properties to north. The subject site is largely open exotic grassland with some patches of treed vegetation, mainly in the north-west and north-east. A drainage easement is located on the south west corner of Lot 122 DP 530049 near the farm dam. The subject site slopes gently from east to west.

1.2.2 Proposed Development

The proposed development (based on Option C prepared by Jackson Teece) is a seniors living development with 226 self-contained units and a 120 bed residential care facility to be located above a community centre. Associated infrastructure will include access roads, visitor parking, landscaped corridors/parkland, pedestrian walkways and associated common facilities including a community centre, tennis court and bowling green and men's shed. The proposed development layout is shown in **Figure 1.2**.

The proposed development will require the removal of existing dwellings, the farm dam, existing structures and small areas of existing vegetation.

1.3 Relevant Legislation

i. Zoning

The subject site is currently zoned as Zone RU6 Transition and Zone SP2 Infrastructure under the Hills Shire Council Local Environmental Plan 2012. The zoning of the subject site is shown in **Figure 1.3**.

The objectives of Zone RU6 Transition are to:

- To protect and maintain land that provides a transition between rural and other land uses of varying intensities or environmental sensitivities;
- To minimise conflict between land uses within this zone and land uses within adjoining zones;
- To encourage innovative and sustainable tourist development, sustainable agriculture; and
- the provision of farm produce directly to the public.

The objectives of Zone SP2 Infrastructure are to:

- To provide for infrastructure and related uses; and
- To prevent development that is not compatible with or that may detract from the provision of infrastructure.

ii. *State Environmental Planning Policy (Housing for Seniors with a Disability) 2004*

In order for the proposed development to proceed, the subject site will require at site compatibility under the Seniors Housing SEPP. Specific requirements under the Seniors Housing SEPP in regard to approval of an application of a site compatibility certificate are listed in Section 25 (5 and 6) of the Seniors Housing SEPP which states that:

(5) The Director General must not issue a compatibility certificate unless the Director General;

(b) is of the opinion that the proposed development is compatible with the surrounding land uses having regard to (at least) the following criteria:

(i) the natural environment (including known significant environmental values, resources or hazards) and the existing uses and approved uses of land in the vicinity of the proposed development,

(ii) the impact that the proposed development is likely to have on the uses that, in the opinion of the Director-General, are likely to be the future uses of that land,

(iii) the services and infrastructure that are or will be available to meet the demands arising from the proposed development (particularly, retail, community, medical and transport services having regard to the location and access requirements set out in clause 26) and any proposed financial arrangements for infrastructure provision,

(iv) in the case of applications in relation to land that is zoned open space or special uses—the impact that the proposed development is likely to have on the provision of land for open space and special uses in the vicinity of the development,

(v) without limiting any other criteria, the impact that the bulk, scale, built form and character of the proposed development is likely to have on the existing uses, approved uses and future uses of land in the vicinity of the development,

(vi) if the development may involve the clearing of native vegetation that is subject to the requirements of section 12 of the [Native Vegetation Act 2003](#)—the impact that the proposed development is likely to have on the conservation and management of native vegetation.

(6) Without limiting subclause (4) (a), the Director-General may refuse to issue a certificate if the Director-General considers that the development is likely to have an adverse effect on the environment.

iii. *Environment Protection and Biodiversity Conservation Act 1999*

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's key piece of environmental legislation and is administered by the Commonwealth Department of the Environment and Energy (DoEE). It is designed to protect national environmental assets, known as Matters of National Environmental Significance (MNES), which include threatened species of flora and fauna, threatened ecological communities, migratory species as well as other protected matters. Among other things, it defines the categories of threat for threatened flora and fauna, identifies key threatening processes and provides for the preparation of recovery plans for threatened flora, fauna and communities.

Under the EPBC Act, any action (which includes a development, project or activity) that is considered likely to have a significant impact on MNES must be referred to the Commonwealth Minister for the Environment.

iv. *Biodiversity Conservation Act 2016 and associated legislation*

There have been number of recent changes to NSW biodiversity legislation. Under the NSW Land Management and Biodiversity Conservation (LMBC) reform, the NSW Parliament passed the following two Acts in November 2016:

- *Biodiversity Conservation Act 2016* (BC Act), which replaces the *Threatened Species Conservation Act 1995* (TSC Act), the *Nature Conservation Trust Act 2001* and parts of the *National Parks and Wildlife Act 1974*; and
- *Local Land Services Amendment Act 2016* (LLSA Act), which replaces the *Native Vegetation Act 2003* and the *Native Vegetation Regulation 2005*.

These reforms commenced on 25 August 2017, however under the *Biodiversity Conservation (Savings & Transitional) Regulation 2017* new applications for development consent, or modifications to an approved development, under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) could continue to be assessed under the former planning provisions until 25 February 2018. As this date has now passed, the Development Application will be assessed under the planning provisions of the BC Act.

Under the BC Act there are thresholds that determine whether a project will need to be assessed under the Biodiversity Offsets Scheme (BOS) and therefore requires an assessment following the Biodiversity Assessment Methodology (BAM) by an accredited BAM assessor and the preparation of a Biodiversity Development Assessment Report (BDAR).

The BOS applies to local development (assessed under Part 4 of EP&A Act) that is likely to significantly affect threatened species or communities or triggers threshold levels for when the BOS will be triggered. The threshold has three elements:

- Whether the amount of native vegetation being cleared exceeds a threshold area;

- Whether the area being cleared is mapped on the Biodiversity Values map published by the Minister for the Environment; and
- Whether the impact on threatened species or ecological communities is deemed significant.

Not also that if an impact is considered likely to be serious and irreversible a local development application cannot be approved.

Proponents are required to carry out a 'test of significance' for all local development proposals that do not exceed the Biodiversity Offset Scheme Threshold. The test of significance is intended to provide standardised and transparent consideration of threatened species, ecological communities, and their habitats, through the development assessment process. In the context of a Part 4 development (not including major projects) if the 'test of significance' assessment indicates that there will be a significant impact, the proponent must carry out a BAM assessment.

The subject site is not mapped on the Biodiversity Values Map, and therefore entry into the BOS will be dependent to the area to be cleared relative to thresholds and whether the impacts are deemed significant, as discussed in **Chapter 5**.

v. *Biosecurity Act 2015*

Under the NSW *Biosecurity Act 2015* (Biosecurity Act) all weeds are required to be controlled by all persons under a "General Biosecurity Duty". The General Biosecurity Duty means that all public and private land owners or managers and all other people who deal with weed species (biosecurity matters) must use the most appropriate approach to prevent, eliminate, or minimise the negative impact (biosecurity risk) of those weeds (DPI 2017).

State-wide management of weeds under the new legislation is directed by the NSW Invasive Species Plan (NSW Local Land Services 2017). This assigns weed responses to four categories:

- Prevention of new weeds establishing;
- Eradication of small and localised infestations where feasible;
- Containment of larger infestation to stop wider spread; and
- Protection of key assets such as threatened plants and agricultural land, to prevent their damage or degradation by weed invasion.

Under the Biosecurity Act some weed species have been prioritised for management by specific regulations and controls under the act. These are known as State Level Priority Weeds.

The state has been divided into 11 regions (each covering a number of LGAs) under the Act, with each region managed by a Regional Weeds Committee. Management actions for weeds within a region are detailed within a Regional Strategic Weed Management Plan. Within each

region, additional weed species to the State Level Priority Weeds have been prioritised for management. These species are known as Regional Priority Weeds.

A further set of weeds are identified within the Regional Strategic Weed Management Plans as being “other weeds of regional concern”. The Biosecurity Act provides powers to Local Control Authorities to take action in relation to these weeds in particular circumstances, for example where a weed threatens a high value asset, and prevention, elimination or reduction of the risk is feasible and reasonable. Examples of high values assets include the Environment, Human Health, and Agriculture.

All land within the subject site occurs within the Greater Sydney Local Land Services region, and weed management within the region is to be undertaken under the direction of the South East Regional Strategic Weed Management Plan (Greater Sydney LLS 2017). Appendix 1 of the Weed Management Plan outlines the State Priority Weeds, Regional Priority Weeds, and other weeds of regional concern.



Legend

Subject Site



Coordinate System: MGA Zone 56 (GDA 94)

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0 50 100 150 m

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Figure 1.1. Location of the Subject Site



Figure 1.2. Proposed Development Layout

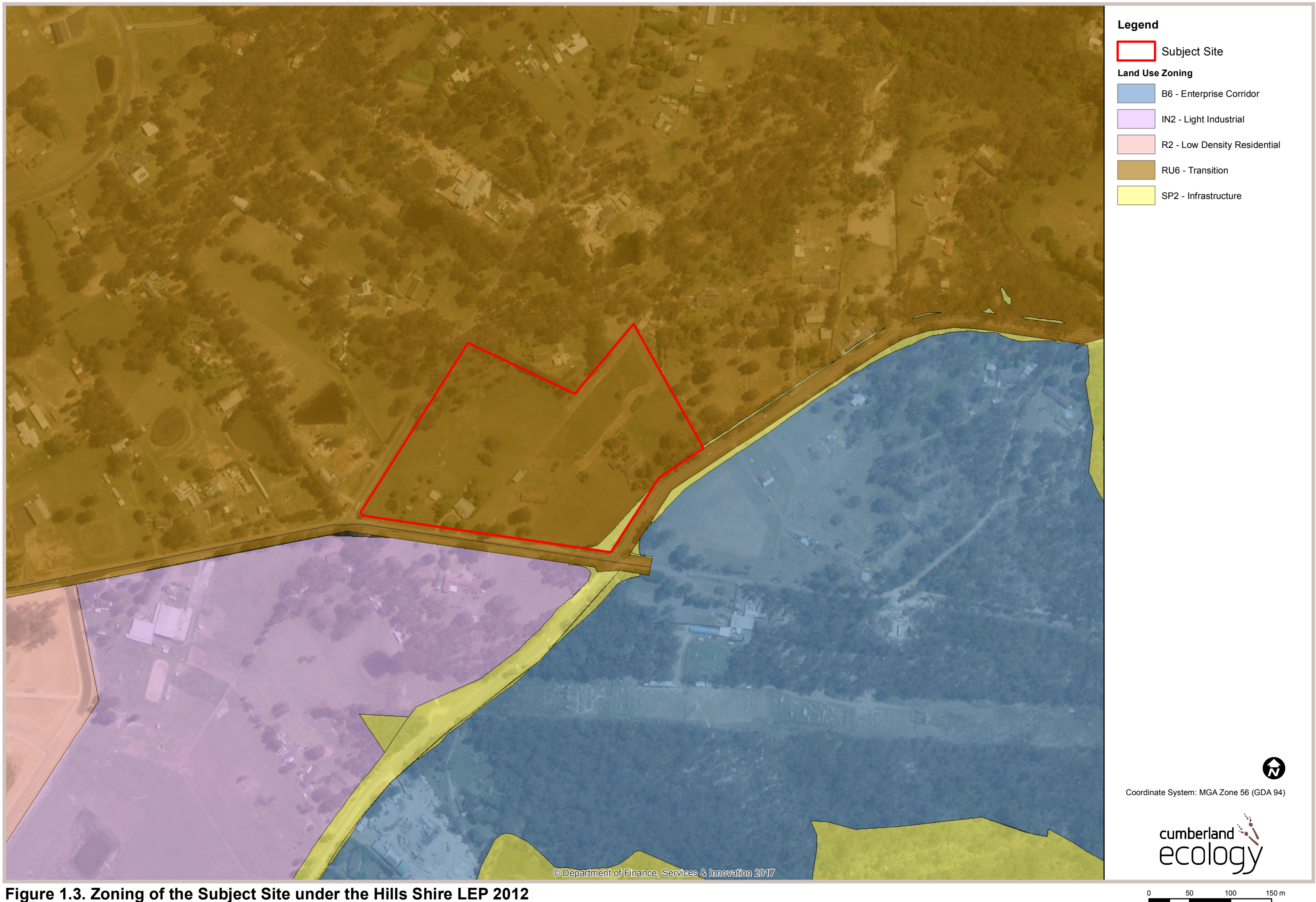


Figure 1.3. Zoning of the Subject Site under the Hills Shire LEP 2012

Methodology

2.1 Database Analysis and Literature Review

Database analysis was conducted for the locality using both the NSW Office of Environment and Heritage (OEH) Atlas of NSW Wildlife (OEH 2017a) and the Commonwealth Department of the Environment and Energy (DoEE) Protected Matters Search Tool (DoEE 2017). The locality is defined as the area within a 5 km radius of the subject site. The Atlas of NSW Wildlife Database search was used to generate records of threatened flora and fauna species listed under the BC Act within the locality of the subject site. The Protected Matters Search Tool generated a list of Matters of National Environmental Significance listed under the EPBC Act potentially occurring within the locality of the subject site.

Marine, aquatic and migratory wetlands species were excluded for the purpose of this report as only one small artificial dam is present within the subject site that is unlikely to be utilised by any threatened marine, aquatic or migratory wetland species. The lists generated from these databases were reviewed against available vegetation mapping and aerial photographs of the subject site, in conjunction with the abundance, distribution and age of records, to ascertain the likelihood of occurrence of threatened species within the subject site.

2.2 Flora Survey

Flora surveys were undertaken across the subject site by Cumberland Ecology on 30 November 2017 by a botanist. Surveys included vegetation mapping, plot surveys, random meander surveys, and targeted threatened flora searches. Further details of each of the survey methods are provided below.

All vascular plants recorded or collected were identified using keys and nomenclature provided in Harden (1990-1993). Where known, taxonomic and nomenclatural changes have been incorporated into the results, as derived from PlantNET (Botanic Gardens Trust 2017).

2.2.1 *Vegetation Mapping*

Existing vegetation mapping available from “the Native Vegetation of the Sydney Metropolitan Area” (OEH 2013) was reviewed prior to the site inspection in order to determine existing vegetation communities that occur on the subject site. Cumberland Ecology conducted vegetation surveys to revise and update the vegetation mapping

prepared by OEH. The vegetation within the subject site was then ground-truthed 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 OEH mapping, records were made of proposed new boundaries using a hand-held Global Positioning System (GPS) unit and mark-up of aerial photographs.

The resultant information was synthesised using a Geographic Information System (GIS) to create a spatial database that was used to interpret and interpolate the data to produce a vegetation map of the subject site. Vegetation was categorised into communities taking into account condition of vegetation (i.e. disturbance history), and where communities were native communities, they were matched with the description and nomenclature of threatened ecological communities under the BC Act if applicable.

2.2.2 Plot Survey

Two 20 x 20m plots were located in areas consisting of native vegetation communities. The location of these plots (P1 and P2) is shown in **Figure 2.1**. These plots were assessed according to the Biodiversity Assessment Methodology (BAM). This included recording the following:

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

An additional 20 x 20m plot was located within an area of exotic grassland in which the only data for the composition and structure for each growth form and cover of High Threat Exotic weeds was collected. The location of this plot (P3) is shown in **Figure 2.1**.

2.2.3 Random Meander Survey

Random meander surveys were undertaken in accordance with the methods described in CSIRO “Management of Endangered Plants” (Cropper 1993) to record characteristic flora species occurring throughout parts of the subject site. Surveys were undertaken within all vegetation communities.

2.2.4 Targeted Threatened Flora Surveys

Targeted threatened flora searches via random meanders were undertaken within suitable habitat of threatened flora species known from the locality.

2.3 Fauna Survey

Fauna surveys were undertaken within the subject site by Cumberland Ecology on 30 November 2017. Surveys included a fauna habitat assessment and incidental observations. Further details of each of the survey methods are provided below.

2.3.1 Habitat Assessment

The fauna habitat assessment included consideration of important indicators of habitat condition and complexity including the occurrence of microhabitats such as tree hollows, fallen logs, bush rock and wetland areas such as creeks and soaks. Structural features considered included the nature and extent of the understorey and ground stratum and extent of canopy. The fauna habitat assessment also included an assessment of the presence of habitat features suitable for use by threatened fauna species known from the locality.

2.3.2 Incidental Observations

Any incidental fauna species that were 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 Limitations

Vertebrate fauna and vascular flora of the locality are well known based upon a sizeable database of past records and various published reports. The site survey undertaken by Cumberland Ecology added to the existing database and has helped to provide a clear 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.

The weather conditions at the time of the flora surveys were hot with some cloud and light showers. Weather conditions in the lead up to the surveys were generally favourable for

plant growth and production of features required for identification of most species. Shrubs, grasses, herbs and creepers were readily identifiable in most instances. Not all flora species present within planted garden areas were recorded during surveys, as these comprised exotic ornamental species with no conservation significance. Despite this, it is considered that sufficient information has been collected to assess issues including conservation significance of the flora, condition and viability of bushland and likely impact on native vegetation. An assessment of the likelihood of occurrence of threatened flora species recorded within the locality of the subject site in the database searches was undertaken to supplement the flora survey.

No targeted fauna survey was undertaken for this assessment, which relied on database analysis and fauna habitat assessment. In general, opportunistic observations of fauna provide a “snapshot” of some of the fauna present on a site that were active during the time of the survey. 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. Therefore not all fauna utilising the subject site are likely to have been recorded during surveys. An assessment of the likelihood of occurrence of threatened and migratory fauna species listed for the locality in the database searches was undertaken to supplement the fauna surveys. The combination of these techniques is considered appropriate for assessing the habitat values for threatened fauna within the subject site.



- Legend**
- Subject Site
 - Random Meander
 - Plot Locations

Coordinate System: MGA Zone 56 (GDA 94)

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0 50 m

Figure 2.1. Location of Plots and random meanders

Results

3.1 Vegetation Mapping

Existing vegetation mapping available from “the Native Vegetation of the Sydney Metropolitan Area” (OEH 2013) indicated that the subject site contains two area of Shale/Sandstone Transition Forest (SSTF) located in the north east and north west of the subject site. The remainder of the subject site is not mapped as having native vegetation communities. This mapping is shown in **Figure 3.1**.

Flora surveys undertaken by Cumberland Ecology confirmed the two patches of SSTF, although boundaries were revised, and several small patches of SSTF close to the southern boundary of the subject site, consisting of isolated trees consistent with this community.

The majority of the subject site consists of Exotic Grassland, although there a number of areas of Urban Exotic/Native Vegetation, largely in the vicinity of the existing dwellings.

The vegetation communities and areas they cover within the subject site are detailed in **Table 3.1** below. The distribution of these communities across the subject site is shown in **Figure 3.2**. The species composition and condition of vegetation communities is described under sub-headings below.

Table 3.1 Vegetation communities within the subject site

| Vegetation Community | BC Act Status | EPBC Act Status | Total Area (ha) |
|-----------------------------------|---------------|-----------------|-----------------|
| Shale/Sandstone Transition Forest | CEEC | CEEC | 0.67 |
| Urban Exotic/Native Vegetation | not listed | not listed | 0.50 |
| Exotic Grassland | not listed | not listed | 5.49 |
| Dwellings and other structures | not listed | not listed | 0.15 |
| TOTAL | | | 6.82* |

**All areas have been rounded to the nearest hundredth. Area of subject site is approximately 6.82ha*

3.1.1 Shale/Sandstone Transition Forest

BC Act Status: Critically Endangered

EPBC Act Status: Critically Endangered (does not meet listing criteria)

Shale/Sandstone Transition Forest (SSTF) was recorded in two patches in the north-west and north-east of the subject site. In addition to these two patches there were several small patches located in the south along Edward Road. This occurred in the form of persisting shrubs along fence lines in the south-east including *Bursaria spinosa* (Blackthorn) and *Acacia floribunda* (Gossamer Wattle). There were several *Eucalyptus tereticornis* (Forest Red Gum) overhanging in the south-east but the trees were in the Council nature strip and not on the property, with the exception of one small tree of *Eucalyptus tereticornis*.

The patch of SSTF in which plot P1 was located consisted of a woodland canopy dominated by *Eucalyptus crebra* (Narrow-leaved Ironbark) (15% canopy cover) with co-dominant *Eucalyptus amplifolia* ssp. *amplifolia* (Cabbage Gum) (3% cover) over a ground layer of exotic grasses. The understorey shrubs have been removed with the ground layer replaced by exotic grasses which are grazed by horses. The ground layer was dominated by exotic grasses such as *Lolium perenne* (Perennial Ryegrass), *Briza maxima* (Quaking grass), *Briza subaristata*, *Paspalum dilatatum* (Broad-leaved Paspalum) and *Vulpia bromoides* (Foxtail Fescue). A range of native grasses were present, but with lower overall cover, including *Microlaena stipoides* (Weeping Grass), *Themeda triandra* (Kangaroo Grass) and *Dichelachne micrantha* (Hairy Plumegrass), in addition to *Cynodon dactylon* (Couch grass) which is widely cultivated as a lawn grass. Some native sedges or rushes were present, but with low overall cover, including *Carex inversa* and *Juncus usitatus* (Common Rush). The remaining species were largely exotic forbs that are common agricultural/pastoral weeds including *Plantago lanceolata* (Lamb's tongue), *Hypochaeris radicata* (Cat's Ear) and *Senecio madagascariensis* (Fireweed). Litter cover was 23% and coarse woody debris was absent. No hollow bearing trees were present. A photograph of the location of this plot is shown in **Photograph 3.1**.

The patch of SSTF in which plot P2 was located consisted of a woodland canopy dominated by *Eucalyptus fibrosa* (Broad-leaved Ironbark) (25% cover) and *Eucalyptus punctata* (Grey Gum) (5% cover). Other than a single sapling of *Eucalyptus crebra*, a shrub layer was also absent. The ground layer was dominated by the exotic grasses *Eragrostis curvula* (African Love Grass) (70% cover) and *Lolium perenne* (25% cover) which had recently been mowed. Native grasses were present, but with little (3%) cover, including *Microlaena stipoides*. There were some native forbs present with little cover including *Commelina cyanea* (Scurvy Weed) *Glycine tabacina* and *Glycine microphylla* (Small-leaved Glycine). The remaining species were largely exotic forbs that are common agricultural/pastoral weeds including *Sida rhombifolia* (Paddy's Lucerne) and *Senecio madagascariensis*. Litter cover was low at 12.4%, and coarse woody debris was sparse. This plot contained large trees with a total of three hollows. A photograph of the location of this plot is shown in **Photograph 3.2**.

Shale/Sandstone Transition Forest is listed as a Critically Endangered Ecological Community (CEEC) under the BC Act as Shale Sandstone Transition Forest in the Sydney Basin Bioregion. The distribution of SSTF is strongly correlated with soils derived from

Wianamatta Shale, although it is restricted to areas where the shale stratum is thin, and the soil properties are influenced by underlying sandstone (NSW Scientific Committee 2014). Shale/Sandstone Transition Forest is recognised as a distinct assemblage with a variable species composition that occurs on soils overlying the transition between shale and sandstone lithology. Variation in species composition depends on the composition of adjoining communities and the relative influence of the underlying sandstone and shale lithology (NSW Scientific Committee 2014). When the community occurs in areas of less sandstone influence it is dominated by *Eucalyptus tereticornis*, with *E. eugenioides*, *E. crebra*, *E. fibrosa* and *E. punctata* occurring less frequently. When the community occurs in areas of greater sandstone influence it is dominated by *Eucalyptus punctata* and *E. crebra*, with *E. fibrosa*, *Corymbia gummifera* and *Syncarpia glomulifera* occurring less frequently (NSW Scientific Committee 2014). Given the general dominance of *E. crebra*, *E. fibrosa* and *E. punctata* the subject site is likely to represent an area of SSTF with high sandstone influence.

It is noted that the patches of SSTF within the subject site are highly degraded, with no shrub layer and a ground layer dominated by exotic grasses. However nearly all patches of SSTF are small, fragmented and degraded and prone to varying degrees of weed invasion (NSW Scientific Committee 2014). As such the patches of SSTF within the subject site are consistent with this community.

Shale/Sandstone Transition Forest is also listed as a Critically Endangered Ecological Community (CEEC) under the EPBC Act. However there are minimum condition criteria in the approved conservation advice (Department of Environment 2014) for a patch of SSTF to meet before it can be considered as a Matter of National Environmental Significance under the EPBC Act. These are that patch size is greater than or equal to 0.5ha and that greater than or equal to 30% of the perennial understorey vegetation cover is made up of native species. Although the combined area of SSTF is 0.05ha, given that the ground layer is dominated by exotic grass species, the degraded patches within the subject site do not meet criteria for listing under the EPBC Act.



Photograph 3.1 Shale/Sandstone Transition Forest at plot P1



Photograph 3.2 Shale/Sandstone Transition Forest at plot P2

3.1.2 Urban Exotic/Native Vegetation

BC Act Status: Not Listed

EPBC Act Status: Not Listed

This community consists of garden plantings associated with residential dwellings. Some of the plantings in the front yard of the house at 14 Edwards Road were eucalypts and other natives, which the owner indicated had been planted. On 12 Edwards Road this included *Eucalyptus saligna* (Sydney Blue Gum) and *Eucalyptus scoparia* (Wallangarra White Gum) planted in the south around the house and in the adjacent paddock. In the north-east of this property there was some small tree shrub growth of *Eucalyptus botryoides* x *saligna* which is likely to have originated from seed fall from mature individuals of this hybrid planted along the fence line within the adjoining property to the north. This property also included a larger number of plantings of exotic species relative to the adjacent properties including a range of planted fruiting trees. Number 263 Annangrove Road also included *Eucalyptus scoparia*, together with a range of non-local native species. This community is shown as **Photograph 3.3.**



Photograph 3.3 Urban Exotic/Native Vegetation on 12 Edwards Road

3.1.3 Exotic Grassland

BC Act Status: Not Listed

EPBC Act Status: Not Listed

The majority of the subject site is vegetated with this community consisting of exotic grassland that was either grazed by horses or regularly mown. At plot P3 the dominant exotic grass species include *Lolium perenne*, *Cynodon dactylon*, *Paspalum dilatatum*, *Briza subaristata* and *Avena barbata* (Bearded Oats). The native grass *Microlaena stipoides* (Weeping Grass) was present but not dominant. A diverse range of weedy exotic forbs were present but not dominant including *Plantago lanceolata* and *Hypochaeris radicata*. Native forbs were rare and included *Commelina cyanea*. A photograph of this community is shown as **Photograph 3.4**.



Photograph 3.4 Exotic Grassland on 14 Edwards Road

3.2 Flora Species

In total, 140 flora species were recorded throughout the subject site during surveys. Species present within the subject site consist of:

- 30 naturally occurring, locally native species;
- 16 planted native species including hybrids and cultivars (including species that naturally occur within the Sydney Basin in different habitats); and
- 94 exotics species (including both weeds and planted exotics).

3.2.1 Threatened Flora Species

No naturally-occurring threatened flora species were recorded within the subject site or are likely to occur. The vegetation in the subject site is too disturbed and is comprised mostly of previously cleared areas.

Eucalyptus scoparia (Wallangarra White Gum) (listed as Endangered under BC Act and as Vulnerable EPBC Act) was recorded within both 263 Annangrove Road and 14 Edwards Road. This species has been planted on these properties and is therefore of reduced conservation significance. The species is commonly cultivated, and in NSW it is naturally only known from only three locations near Tenterfield, including Bald Rock National Park. A photograph of a planted *Eucalyptus scoparia* is shown as **Photograph 3.5**.

No threatened flora species have been recorded within the locality of the subject site; however, the EPBC Protected Matters Search Tool identifies the locality as having suitable habitat for 30 threatened flora species. An analysis of the likelihood of occurrence on the subject site for the 30 threatened flora species is provided in **Appendix B**. Shale/Sandstone Transition Forest is potential habitat for a number of threatened flora species. However the subject site is considered to be too disturbed for any of these species to be present as the ground layer is dominated by exotic grasses and impacted by grazing and or regular mowing. None of the species were detected during targeted searches.



Photograph 3.5 Planted *Eucalyptus scoparia* on 12 Edwards Road

3.2.2 State Listed Priority Weeds, Regional Priority Weeds and Other Weeds of Regional Concern

A total of seven weeds recorded within the subject site are listed as state priority weeds, or regional priority weeds listed under the Greater Sydney Regional Strategic Weed Management Plan 2017-2012 operating under *Biosecurity Act 2015*. Three of these species are nationally listed Weeds of National Significance (WoNs). A further ten weeds are other weeds of regional concern listed under the Greater Sydney Regional Strategic Weed Management Plan 2017-2012. These weed species are identified in **Table 3.2**.

Table 3.2 Priority Weeds Recorded

| Species Name | Common Name | Status | WoNS |
|--|---------------------|--------|------|
| <i>Asparagus asparagoides</i> | Asparagus Fern | SP | Yes |
| <i>Cestrum parqui</i> | Green Cestrum | SP | |
| <i>Opuntia stricta</i> | Common Prickly Pear | SP | yes |
| <i>Rubus fruticosus</i> spp. agg. | Blackberry | SP | yes |
| <i>Senecio madagascariensis</i> | Fireweed | SP | yes |
| <i>Olea europaea</i> subsp. <i>cuspidata</i> | African Olive | RP | |
| <i>Sporobolus africanus</i> | Parramatta Grass | RP | |
| <i>Araujia sericifera</i> | Moth Vine | OWRC | |
| <i>Cenchrus clandestinum</i> | Kikuyu | OWRC | |
| <i>Cinnamomum camphora</i> | Camphor Laurel | OWRC | |

Table 3.2 Priority Weeds Recorded

| Species Name | Common Name | Status | WoNS |
|---|---------------------|--------|------|
| <i>Cotoneaster glaucophyllus</i> | Cotoneaster | OWRC | |
| <i>Eragrostis curvula</i> | African Love Grass | OWRC | |
| <i>Hypericum perforatum</i> | St. John's Wort | OWRC | |
| <i>Ligustrum sinense</i> | Broad-leaved Privet | OWRC | |
| <i>Olea europaea</i> subsp. <i>europaea</i> | European Olive | OWRC | |
| <i>Romulea rosea</i> | Onion Grass | OWRC | |
| <i>Syagrus romanzoffiana</i> | Cocos Palm | OWRC | |

Key: SP (State Priority Weed), RP (Regional Priority Weed), OWRC (Other weed of regional concern)

3.3 Fauna

3.3.1 Fauna Habitat

The majority of the subject site is comprised of exotic grassland; therefore, the habitat value of most of the subject site is quite limited for fauna. The patches of SSTF provide the most suitable habitat for a number fauna species, including a limited number of threatened species. Hollows were recorded from a total of three trees in these patches of SSTF and from a single exotic *Diospyros* sp. within Urban Exotic/Native Vegetation. Other microhabitats present within the subject site include the existing farm dam, a pile of rocks, and a tree with decorticating bark (see **Table 3.3** below for details and **Figure 3.3** for locations of habitat features). There is also very limited roosting habitat for microchiropteran bat species within sheds, horse stables and other structures within the subject site.

Table 3.3 Habitat items recorded in the subject site

| Habitat ID | Habitat Type | Description |
|------------|---------------------|--|
| H1 | Hollow Bearing Tree | <i>Diospyros</i> sp. with two small hollows |
| H2 | Rocks | Pile of rocks |
| H3 | Dam | Farm dam |
| H4 | Hollow Bearing Tree | <i>Eucalyptus punctata</i> with 3 small hollows and 1 medium hollow |
| H5 | Hollow Bearing Tree | <i>Eucalyptus punctata</i> with 6 small hollows and 1 medium hollow |
| H6 | Hollow Bearing Tree | <i>Eucalyptus tereticornis</i> with 5 small hollows and one medium hollows |

i. *Urban Exotic/Native Vegetation*

Areas containing planted flowering and fruiting trees and shrubs are likely to support insects for microchiropteran bats and birds, and blossoms, fruit and nectar for the Grey-headed Flying-fox (*Pteropus poliocephalus*) and birds.

ii. *Hollow-bearing Trees*

Large trees containing hollows may provide roosting/breeding habitat for some birds and microchiropteran bats. A total of four hollow bearing trees were recorded within the subject site. This included three large native Eucalypts (diameter at breast height 35 to 75cm with height from 12 to 20m) which each contained a single large hollow, and a number of small hollows, and a single planted *Diospyros* sp. with two small hollows (diameter at breast height 15cm and height 2.5m). The hollow bearing trees are located in the north east of the subject site largely within a small patch of SSTF. The locations of hollow bearing trees are identified in **Figure 3.1**.

iii. *Farm Dam*

The farm dam present in the southwest corner may provide limited habitat for aquatic fauna. Species most likely to utilise this area are commonly occurring fish, frogs, turtles, reptiles and eels. This dam is not likely to provide suitable habitat for any threatened frog species, as it is not fringed by aquatic vegetation that would provide suitable habitat for these species.

3.3.2 General Species

Twenty one (21) native bird species were recorded within the subject site during the survey by Cumberland Ecology. These species were predominantly common woodland bird species. In addition, two exotic bird species were recorded, these being the Spotted Dove (*Streptopelia chinensis*) and the Indian Myna (*Acridotheres tristis*). In addition, two exotic mammal species were recorded, these being the Horse (*Equus caballus*) (kept as livestock) and the European Rabbit (*Oryctolagus cuniculus*). No native mammals, amphibians or reptiles were recorded during the survey.

Table 3.4 below contains a list of all fauna species recorded within the subject site.

Table 3.4 Fauna species recorded in the subject site

| Family | Scientific Name | Common Name |
|--------------|----------------------------|-------------------------|
| Birds | | |
| Acanthizidae | <i>Acanthiza lineata</i> | Striated Thornbill |
| Acanthizidae | <i>Gerygone olivacea</i> | White-throated Gerygone |
| Alcedinidae | <i>Dacelo novaeguineae</i> | Laughing Kookaburra |
| Alcedinidae | <i>Todiramphus sanctus</i> | Sacred Kingfisher |
| Anatidae | <i>Chenonetta jubata</i> | Australian Wood Duck |

Table 3.4 Fauna species recorded in the subject site

| Family | Scientific Name | Common Name |
|-----------------|--|---------------------------|
| Artamidae | <i>Cracticus tibicen</i> | Australian Magpie |
| Cacatuidae | <i>Cacatua galerita</i> | Sulphur-crested Cockatoo |
| Campephagidae | <i>Coracina novaehollandiae</i> | Black-faced Cuckoo-shrike |
| Columbidae | * <i>Streptopelia chinensis</i> | Spotted Dove |
| Corvidae | <i>Corvus coronoides</i> | Australian Raven |
| Hirundinidae | <i>Hirundo neoxena</i> | Welcome Swallow |
| Maluridae | <i>Malurus cyaneus</i> | Superb Fairy-wren |
| Meliphagidae | <i>Manorina (Myzantha) melanocephala</i> | Noisy Miner |
| Meliphagidae | <i>Philemon (Tropidorhynchus) corniculatus</i> | Noisy Friarbird |
| Monarchidae | <i>Myiagra inquieta</i> | Restless Flycatcher |
| Monarchidae | <i>Grallina cyanoleuca</i> | Magpie-lark |
| Oriolidae | <i>Oriolus sagittatus</i> | Olive-backed Oriole |
| Pachycephalidae | <i>Pachycephala pectoralis</i> | Golden Whistler |
| Psittacidae | <i>Psephotus haematonotus</i> | Red-rumped Parrot |
| Psittacidae | <i>Trichoglossus haematodus</i> | Rainbow Lorikeet |
| Psittacidae | <i>Platycercus eximius</i> | Eastern Rosella |
| Rhipiduridae | <i>Rhipidura leucophrys</i> | Willie Wagtail |
| Sturnidae | * <i>Acridotheres tristis</i> | Indian Myna |
| Mammals | | |
| Equidae | * <i>Equus caballus</i> | Horse |
| Leporidae | * <i>Oryctolagus cuniculus</i> | Rabbit |

*Introduced species

3.3.3 Threatened Species

No threatened fauna species were recorded within the subject site. 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 undertaken (see **Appendix C**). The analysis determined that the following ten threatened fauna species have the potential to utilise the subject site:

- Little Eagle (*Hieraaetus morphnoides*);
- Square-tailed Kite (*Lophoictinia isura*);
- Powerful Owl (*Ninox strenua*);
- Grey-headed Flying-fox (*Pteropus poliocephalus*);

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

Two species listed as migratory under the EPBC Act may potentially pass through the locality. These are the Fork-tailed Swift (*Apus pacificus*) and White-throated Needletail (*Hirundapus caudacutus*) which are aerial species that may forage aerially above the subject site on occasion.

A discussion of threatened species and their likely occurrence within the subject site is provided below.

i. Little Eagle

The Little Eagle (*Hieraaetus morphnoides*) occurs throughout the mainland except within more densely vegetated parts of the Dividing Range. It occurs within open eucalypt forest, woodland, open woodland as well as Sheoak or Acacia woodlands and riparian woodlands of interior NSW. It is listed as Vulnerable under the BC Act (OEH 2015a).

Potential foraging and breeding habitat for this species occurs within the subject site. The species could forage within the forest vegetation of the subject site as part of its wider foraging range. Although the species could breed within the subject site, no nests were observed during surveys.

ii. Square-tailed Kite

The Square-tailed Kite (*Lophoictinia isura*) occurs from south-western to northern Australia, Queensland, NSW and Victoria. The Square-tailed Kite can hunt over large ranges over 100 km² and breeds within the vicinity of watercourses. It occurs within dry woodland and open forest and prefers timbered watercourses. It is listed as Vulnerable under the BC Act (OEH 2016a).

Potential foraging habitat for this species occurs within the subject site. The species could forage within the forested vegetation of the subject site as part of its large home range which can be up to 100 km². Although the species could breed within the subject site, no nests were observed during surveys.

iii. *Powerful Owl*

The Powerful Owl is listed as vulnerable under the BC Act. The habitat within the subject site offers a very small area of potential foraging habitat for this species. While three trees provide potential roosting/breeding habitat the hollows are likely to be too small for roosting/breeding by this species. This species has the potential to utilise the subject site for foraging purposes, but would likely do so only on occasion as part of a much broader foraging range.

iv. *Grey-headed Flying-fox*

The Grey-headed Flying-fox is listed as vulnerable under the BC Act and EPBC Act. The habitat within the subject site offers a very small area of potential foraging habitat for this species.

This species roosts in large “camps” that support many thousands of individuals. The location of these camps is well known, with the nearest camp located north of Parramatta over 16km to the south (Ku-ring-gai Bat Conservation Society 2017). No suitable roosting habitat is present as a camp is not within or nearby the subject site. The species has the potential to utilise the subject site for foraging purpose, but would likely do so only on occasion as part of a much broader foraging range.

v. *Yellow-bellied Sheath-tailed Bat*

The Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*) occurs across northern and eastern Australia. It forages in many habitats, with or without trees and roosts in tree hollows and buildings, or in burrows where trees are absent (OEH 2016b). The species is listed as Vulnerable under the BC Act.

Potential foraging and breeding habitat for this species occurs within the subject site. The species could forage within the forested vegetation of the subject site as part of its wider foraging range. The species could potentially roost within tree hollows or less likely in sheds and other structures within the subject site.

vi. *Eastern False Pipistrelle*

The Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) is distributed along south-east coast and ranges of Australia. It inhabits moist habitats with trees taller than 20m. The species generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. It preys on insects above or just below tree canopy and forages up to 12km from roost sites (OEH 2016c). The Eastern False Pipistrelle is listed as Vulnerable under the BC Act. This species was identified in the subject site as a ‘possible’ species.

Potential foraging and breeding habitat for this species occurs within the subject site. The species could forage within the forested vegetation of the subject site as part of its wider foraging range. The species could potentially roost within tree hollows or less likely in sheds or other structures within the subject site.

vii. *Little Bent-wing-bat*

The Little Bent-wing-bat (*Miniopterus australis*) is found from Cape York in Queensland to Wollongong in NSW. It inhabits well-timbered habitats in a variety of vegetation types including moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub (OEH 2017b). Roosting habitat comprises of caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings. The species is listed as Vulnerable under the BC Act.

Potential foraging and breeding habitat for this species occurs within the subject site. The species could forage within the forested vegetation of the subject site as part of its wider foraging range. The species could potentially roost within tree hollows within the subject site.

viii. *Eastern Bent-wing-bat*

The Eastern Bent-wing-bat (*Miniopterus schreibersii oceanensis*), occurs throughout the east and north-west coast of Australia. They hunt in forested areas above the canopy, and roost primarily in caves, however derelict mines, storm-water tunnels, buildings and other man-made structures can be utilised (OEH 2016d). The species is listed as Vulnerable under the BC Act.

Potential foraging and breeding habitat for this species occurs within the subject site. The species could forage within the forested vegetation of the subject site as part of its wider foraging range. The species could potentially roost within sheds and other structures within the subject site.

ix. *Eastern Freetail Bat*

The Eastern Freetail Bat (*Mormopterus norfolkensis*) is listed as Vulnerable under the BC Act. The species occurs from southern NSW to south Queensland along the east coast (OEH 2015a). The Eastern Freetail bat hunts in forested areas, catching moths and other flying insects above the tree tops. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.

The species could potentially forage within the subject site as part of a wider foraging range, and could potentially roost in hollows, buildings or sheds on or near the subject site.

x. *Southern Myotis*

The Southern Myotis (*Myotis macropus*) is listed as Vulnerable under the BC Act (OEH 2016 e) The species occurs across the top-end and south to western Victoria, in the coastal band from the north-west of Australia and is typically found within 100km of the coast, except along any major rivers. The Southern Myotis forages over streams and pools catching insects and fish. The species roosts close to water in caves, mines, tree hollows, storm water channels, bridges, buildings or in dense foliage.

The species could potentially forage above the farm dam as part of a wider foraging range, and could potentially roost in hollows, buildings, and sheds within the subject site.

xi. Greater Broad-nosed Bat

The Greater Broad-nosed Bat (*Scoteanax rueppellii*) occurs from the Atherton Tableland to north-eastern Victoria. It is found in various habitats being most commonly found in tall wet forest. Predominantly roosts in tree hollows but also roosts in buildings. The Greater Broad-nosed Bat flies approximately 3 to 6m above creek and river corridors (OEH 2016e). The species is listed as Vulnerable under the BC Act.

Potential foraging and breeding habitat for this species occurs within the subject site. The species could forage within the forested vegetation of the subject site as part of its wider foraging range. The species could potentially roost within tree hollows or less likely in sheds and other structures within the subject site.

xii. Migratory Species

Two species listed as migratory under the EPBC Act may potentially pass through the locality. These are the Fork-tailed Swift (*Apus pacificus*) and White-throated Needletail (*Hirundapus caudacutus*) which are aerial species that may forage aerially above the subject site on occasion.



Legend



Subject Site

Vegetation Community



2 - Shale Sandstone Transition Forest (High Sandstone Influence)



9999 - Unclassified Vegetation



Coordinate System: MGA Zone 56 (GDA 94)



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0 50 m

Figure 3.1. Existing Vegetation Mapping



Legend



Subject Site

Vegetation Community



Shale Sandstone Transition Forest



Urban Exotic/Native Vegetation



Exotic Grassland



Coordinate System: MGA Zone 56 (GDA 94)



0 50 m

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Figure 3.2. Revised Vegetation Mapping



Legend



Subject Site

Habitat Features



Hollow Bearing Tree



Rock Pile



Dam



Coordinate System: MGA Zone 56 (GDA 94)



Figure 3.3. Location of habitat features

Constraints Assessment

4.1 Introduction

The primary constraint to development of the subject site is the presence of Shale/Sandstone Transition Forest, as this community is listed as Critically Endangered under the BC Act. This community and associated constraints is discussed further below. Other more minor constraints are discussed further in this section.

4.2 Ecological Communities

4.2.1 *Shale/Sandstone Transition Forest*

The proposed development will require the removal of SSTF, although the area requiring removal will not be known until the final development layout has been determined. Shale/Sandstone Transition Forest may be removed is from 12 Edwards Road and 263 Annangrove Road. The small area (0.01ha) on 12 Edwards Road represents shrubs of species typical of SSTF growing along the southern boundary of the property.

Under the BC Act, there are a number of mechanisms for a project to be deemed as '*likely to significantly affect threatened species*', including exceeding the thresholds of the BOS. The *Biodiversity Conservation Regulation 2017* outlines these thresholds, one of which comprises an area of native vegetation clearing threshold. The area of native vegetation clearing threshold is determined from the minimum lot size associated with a property which is determined from the relevant Local Environmental Plan (LEP). Under the Hills Shire LEP 2012 the associated lot size with each of the properties is 2ha. Based on this lot size the threshold for clearing is 0.5ha or more. The area threshold applies to all proposed native vegetation clearing associated with a proposal, regardless of whether this clearing is across multiple lots. In the case of a subdivision, the proposed clearing must include all future clearing likely to be required for the intended use of the land after it is subdivided. The proposed development may also be deemed to have a significant impact on this community (as determined by a Test of Significance), which would also trigger the BOS.

As such, both a potential significant impact, and that the lot size is 2ha and proposed clearing may exceed the 0.5ha threshold would therefore trigger entry into the BOS and the requirement for preparation of a BDAR under the BAM.

The BDAR requires the consideration of serious and irreversible impacts (SAIL). Shale/Sandstone Transition Forest is a candidate SAIL entity. Should Council determine that the project will result in a serious and irreversible impact to the SAIL entity at the DA stage, then the project must be refused. The presence of SSTF therefore represents a significant constraint to development, and any proposed development should avoid clearing of this community to the maximum extent possible.

Should SSTF not be cleared, any proposed development would not trigger entry into the BOS.

4.2.2 Urban Exotic/Native Planted Vegetation

The proposed development will require the clearing of Urban Exotic/Planted Native Vegetation. The removal of this community from the subject site will not have a significant detrimental impact on the biodiversity values of the subject site or locality as the vegetation offers little ecological value, other than a small area of sub-optimal foraging habitat for native fauna species, primarily birds and potentially the Grey-headed Flying-fox, and a single small tree (*Diospyros* species) containing two small hollows. As such the presence of habitat features within vegetation community represents a constraint to development of the subject site, although this constraint is likely to be manageable through appropriate mitigation measures.

4.2.3 Exotic Grassland

The main vegetation community likely to be impacted is Exotic Grassland. As described previously, this community has minimal biodiversity value except for a low abundance of some common and widespread native grass and forb species.

The proposed removal of this community from the subject site will not have a significant detrimental impact on the biodiversity values of the subject site or locality as the vegetation offers little ecological value as it has been heavily grazed by horses. As such, this vegetation community does not represent a constraint to development of the subject site,

4.3 Threatened Flora Species

No naturally occurring threatened flora species were recorded as occurring in the subject site during the field survey. *Eucalyptus scoparia* (listed as Endangered under BC Act and as Vulnerable under the EPBC Act) was recorded within both 263 Annangrove Road and 14 Edwards Road. This species has been planted on these properties. Accordingly, this species is not considered to have conservation significance for the purposes of this assessment and is not considered further.

No threatened flora species are considered to have the potential to occur naturally within the subject site due to the subject site due to previous disturbances. Therefore, any development is unlikely to impact on any threatened flora species listed under the BC Act or EPBC Act, or impact suitable habitat for threatened species. As such, threatened flora species do not represent a constraint to development of the subject site.

4.4 Fauna

4.4.1 *Habitat Features*

A number of specific habitat features or potential habitat features are present within the subject site, including:

- Fruit and nectar-producing trees;
- Sheds, stables and other buildings;
- A pile of logs;
- The farm dam; and
- Four hollow-bearing trees.

These habitat features represent a constraint to development and will need to be considered in the calculation of species credits as part of the BAM assessment process. Should it be identified that these features provide habitat for species that are species credit species during the BAM assessment process, this may trigger offset requirements for the removal of these features, the majority of which (three of four hollow bearing trees) are contained within areas of SSTF. In addition, pre-clearance supervision will be required during clearing/removal of these features.

4.4.2 *Threatened Fauna Species*

No threatened fauna species were recorded as occurring within the subject site during the field survey. A total of ten threatened fauna species listed under the BC Act and/or the EPBC Act were considered to have the potential to occur within the subject site due to the presence of suitable foraging habitat and/or roosting/nesting habitat.

Threatened fauna species considered to have potential to occur include three bird species, the Grey-headed Flying-fox and six microchiropteran bat species. The habitat with potential to be removed constitutes foraging habitat only for all of the threatened species, and four trees with small to medium hollows.

The total area of potential foraging habitat to be modified/removed for these species is approximately 6.66 ha (includes grasslands) for microchiropteran bats, and 1.17 ha (excludes grasslands) for birds and the Grey-headed Flying-fox. The farm dam to be removed also provides potential foraging habitat for the Southern Myotis.

Potential impacts on groups of species that share similar habitat requirements are described collectively and are summarised below.

As many of these species are species credit species, removal of habitat may trigger offset requirements under the BAM, and therefore these species, if present, and their habitat represent a moderate constraint to development.

i. *Little Eagle and Square-tailed Kite*

The Little Eagle (*Hieraaetus morphnoides*) and Square-tailed Kite (*Lophoictinia isura*) are considered to have the potential to occur within the subject site as potential foraging habitat is present. Although potential foraging habitat is present, it is sub-optimal as the subject site is small, highly disturbed and is unlikely to contain high numbers of prey for these species. Additionally, these species is highly mobile and would likely only utilise the subject site on occasion as part of a much broader foraging range. These species is unlikely to utilise the subject site for roosting purposes as no stick nests were observed.

ii. *Powerful Owl*

The Powerful Owl (*Ninox strenua*) is considered to have the potential to occur within the subject site as potential foraging habitat is present. Although potential foraging habitat is present, it is sub-optimal as the subject site is small, highly disturbed and is unlikely to contain high numbers of prey for the species. Additionally, this owl is highly mobile and would likely only utilise the subject site on occasion as part of a much broader foraging range. This species is unlikely to utilise the subject site for roosting purposes as the hollows present in three trees would be only marginally large enough for roosting.

iii. *Grey-headed Flying-fox*

The Grey-headed Flying-fox is considered to have the potential to utilise the subject site for foraging purposes as part of a much broader foraging range. As a roosting camp is not present and only a small amount of foraging habitat is available, this species is unlikely to be reliant on the subject site for survival and the proposed removal of vegetation as a result of the proposed development is unlikely to adversely impact this species.

iv. *Microchiropteran bats*

The following threatened microchiropteran bat species are considered to have potential to occur on the subject site:

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

These Microchiropteran bat species may utilise the subject site for roosting purposes as potential roosting habitat is present within hollowing bearing trees and to a lesser extent with sheds, stables and other structures within the subject site, which are proposed to be removed.

Suitable foraging habitat is also present within SSTF and Urban Exotic/Native Vegetation for these bat species, and over the existing farm dam for the Southern Myotis. These species are highly mobile and if the subject site is utilised as foraging habitat, it is likely part of a much broader foraging range. Only a small area of potential foraging habitat will be removed and it is unlikely to be important to any of these species long-term survival in the locality.

Mitigation Measures

5.1 Introduction

The purpose of the Biodiversity Offsets Scheme is to assist developers in avoiding, minimising and offsetting potential impacts to biodiversity values, in this order. There are often considerable costs involved with offsets, and as such avoidance and minimisation of impacts are the preferred mitigation measures. Details of such measures are recommended below for any proposed development. These measures should be implemented to minimise impacts to the ecological values of the subject site and adjoining properties.

5.2 Avoidance

Given that OEH is yet to release thresholds for clearing of SSTF, clearing of this vegetation community should be avoided. This would also avoid removal of the majority of hollow-bearing trees. It is noted that parts of the subject site are bushfire prone land, and there may be requirements for Asset Protection Zones (APZs) (which are not assessed in this report). Given that the SSTF has an open canopy structure with no shrub layer and a ground layer dominated by exotic grasses that is modified by grazing or mowing, these areas could be incorporated into an APZ without the need to further modify vegetation. The remaining mitigation measures assume that areas of SSTF within the subject site will be removed.

5.3 Vegetation Protection

To avoid unnecessary removal or damage to vegetation occurring outside of the subject site, the clearing area should be clearly demarcated and signed, where appropriate, to ensure no vegetation beyond these boundaries is removed. Clearing works and equipment should be excluded from areas outside the clearing area. Site inductions are to be given by the civil contractor to ensure all site workers and visitors are aware of subject site's boundaries.

5.4 Erosion, Sedimentation and Pollution Control

Potential impacts to flora and fauna occurring in the construction phase 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.

5.5 Clearing Supervision

Due to the presence of habitat features within the subject site (e.g. tree hollows, sheds and other structures and a pile of rocks), it is recommended that an ecologist be present for all clearing works undertaken. Once the extent of the works has been appropriately identified, the attending ecologist will inspect all areas for the presence of fauna. Any fauna captured will be either relocated into adjacent areas of habitat to be retained. If any fauna are injured during the clearing works, works should cease and the animal should either be humanely euthanized or taken to a veterinarian clinic. Works should not commence until the attending ecologist has said it is okay to proceed.

In the event that a hollow bearing tree is to be removed, the following two-stage clearing process should occur in order to minimise impacts to native fauna species:

- 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 as gently as possible, followed by an inspection.

If possible, trees marked as containing hollows will be shaken by machinery prior to clearing to encourage any animals remaining to leave the hollows and move on. An ecologist should investigate all hollows and/or nests for the presence of fauna following felling of the tree.

The dam on the subject site should be dewatered prior to filling. Should native fish or other species be present these should be relocated to a suitable location. If present, any exotic species such as Mosquito Fish (*Gambusia holbrooki*) should be appropriately euthanized. Such works should be supervised by an aquatic ecologist.

Following the completion of the clearing works, a letter should be issued by the attending ecologist documenting the results of the clearing process.

5.6 Nest Boxes

Nest boxes can be used as a mitigation measure to replace hollow-bearing trees removed from the subject site. These can be placed in trees to be retained within the subject site.

5.7 Landscaping

It is recommended that native plant species characteristic of SSTF be incorporated into the landscape plan for the subject site where possible. Existing areas of SSTF to be retained could be improved through the planting of native understorey species and the removal of weeds. All plant material should be sourced from local nurseries or come from local provenance seed.

5.8 Weed Control Measures

The priority weed species occurring within the subject site should be managed in order to prevent further spread. Prior to any vegetation clearance, priority weeds should be demarcated by the attending ecologist in order for these to be disposed of appropriately as identified in the Regional Strategic Weed Management Plan. As some of the weed species can spread from root tubers or other vegetative parts, it may be necessary to either treat these weeds with herbicide on site, or remove the soil and dispose of the weed infested soil appropriately.

5.9 Offsetting

Offsetting is considered to be the final option for mitigation of impacts, should avoidance and mitigation of impacts not be possible.

The BAM process identifies the offset requirements for both ecosystems and species, and identifies the offset liability, including the costs associated with securing credits. The offset requirement is determined by identifying the residual impact of a proposal (i.e. loss of biodiversity values) which is determined from the change in vegetation condition and the area impacted. Offset requirements cannot be determined until calculations are undertaken. However, given the small area and poor condition, offset requirements could be low. However, given the rarity of SSTF, the cost of securing offsets for this ecosystem could be considerable.

Conclusion

Shale/Sandstone Transition Forest is the only listed TEC under the BC Act present within the subject site. Although this community is listed under the EPBC Act it does not meet condition criteria for the EPBC Act listed community as it is present only as canopy trees, with the shrub layer and ground layer entirely removed and replaced by exotic grasses. As such clearing of SSTF within the subject site will not trigger referral to the Commonwealth Department of Environment and Energy.

For certain communities (including some Critically Endangered Ecological Communities) there is as yet no threshold for clearing under the BC Regulation. Shale/Sandstone Transition Forest is one such community. As such, any clearing of this community would trigger entry into the BOS. Further there is potential for impacts associated with clearing of this community to be assessed as significant, which would also be a trigger for entry the BOS. The BDAR requires the consideration of serious and irreversible impacts (SAIL). Shale/Sandstone Transition Forest is a candidate SAIL entity. Should Council determine that the project will result in a serious and irreversible impact to the SAIL entity at the DA stage, then the project must be refused. The presence of SSTF therefore represents a significant constraint to development, and any proposed development should avoid clearing of this community to the maximum extent possible. Given that the SSTF has an open canopy structure with no shrub layer and a ground layer dominated by exotic grasses that is modified by grazing or mowing, these areas could be incorporated into an APZ without the need to further modify vegetation.

The BDAR requires the consideration of serious and irreversible impacts (SAIL). Shale/Sandstone Transition Forest is a candidate SAIL entity. Should Council determine that the project will result in a serious and irreversible impact to the SAIL entity at the DA stage, then the project must be refused.

As the subject site is highly disturbed it is not considered to be suitable habitat for any threatened flora species and none were detected during surveys. The subject site contains four trees with hollows and represents suitable roosting and/or foraging habitat for a eleven threatened bird or bat species. Due to the small area, the available habitat is unlikely to be important to any threatened species in the area, as it would likely only be utilised periodically as part of a much broader foraging range. These habitat features are a moderate constraint to development, with the majority of the habitat features (i.e. three of four hollow-bearing trees) contained within areas of SSTF. Habitat features within other communities represent a more minor constraint that can be managed through the mitigation measures proposed.

Should clearing of SSTF be proposed and the BOS be triggered, a BDAR will be required which must include:

- An assessment of impacts associated with the project including serious and irreversible impacts;
- Avoidance measures;
- Mitigation Measures; and
- Calculation of offset requirements.

Should SSTF not be cleared, any proposed development would not trigger entry into the BOS.

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OEH. 2017b. Little Bentwing-bat - Profile. NSW Office of the Environment and Heritage, Hurstville.

Appendix A

Flora Species List

Table A.1 Flora species on each property listed by family

| Family | Species Name | Common Name | Status | No. 14 | No. 12 | No. 263 |
|---------------|---|------------------------|--------|--------|--------|---------|
| Alliaceae | <i>Nothoscordum gracile</i> | Onion Weed | E | | | X |
| Altingiaceae | <i>Liquidambar styraciflua</i> | Liquidambar | E | | X | |
| Anacardiaceae | <i>Schinus molle</i> var. <i>areira</i> | Peppercorn Tree | E | | X | X |
| Apiaceae | <i>Centella asiatica</i> | Indian Pennywort | L | X | | X |
| Apiaceae | <i>Cyclospermum leptophyllum</i> | Slender Celery | E | X | X | X |
| Apocynaceae | <i>Araujia sericifera</i> | Moth Vine | E | X | | X |
| Apocynaceae | <i>Nerium oleander</i> | Oleander | E | | | X |
| Apocynaceae | <i>Plumeria</i> sp. | Frangipani | E | | | X |
| Arecaceae | <i>Syagrus romanzoffiana</i> | Cocos Palm | E | | X | X |
| Asparagaceae | <i>Asparagus asparagoides</i> | Asparagus Fern | E | X | | |
| Asteraceae | <i>Bidens subalternans</i> | Greater Cobbler's Pegs | E | X | | X |
| Asteraceae | <i>Cirsium vulgare</i> | Spear Thistle | E | X | X | X |
| Asteraceae | <i>Conyza sumatrensis</i> | Tall Fleabane | E | X | X | X |
| Asteraceae | <i>Gamochaeta purpurea</i> | Purple Cudweed | E | | X | X |
| Asteraceae | <i>Hypochaeris microcephala</i> | | E | | | X |
| Asteraceae | <i>Hypochaeris radicata</i> | Cat's Ear | E | X | X | X |
| Asteraceae | <i>Lactuca saligna</i> | Willow-leaved Lettuce | E | | X | |
| Asteraceae | <i>Lactuca serriola</i> | Prickly Lettuce | E | X | | X |
| Asteraceae | <i>Senecio madagascariensis</i> | Fireweed | E | X | X | X |

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| Family | Species Name | Common Name | Status | No. 14 | No. 12 | No. 263 |
|-----------------|--|-----------------------|--------|--------|--------|---------|
| Asteraceae | <i>Sonchus asper</i> | Prickly Sowthistle | E | X | | X |
| Asteraceae | <i>Sonchus oleraceus</i> | Milk Thistle | E | X | | X |
| Berberidaceae | <i>Nandina domestica</i> | Sacred Bamboo | E | X | | |
| Bignoniaceae | <i>Jacaranda mimosifolia</i> | Jacaranda | E | | X | |
| Boraginaceae | <i>Boraginaceae</i> sp. | | E | | X | |
| Buxaceae | <i>Buxus microphylla</i> | Japanese Box | E | | X | |
| Cactaceae | <i>Opuntia stricta</i> | Common Prickly Pear | E | X | | |
| Campanulaceae | <i>Wahlenbergia gracilis</i> | Sprawling Bluebell | L | | | X |
| Caryophyllaceae | <i>Paronychia brasiliensis</i> | Brazilian Whitlow | E | | X | X |
| Caryophyllaceae | <i>Petrorhagia dubia</i> | | E | X | | |
| Caryophyllaceae | <i>Polycarpon tetraphyllum</i> | Four-leaved Allseed | E | | | X |
| Caryophyllaceae | <i>Silene gallica</i> | French Catchfly | E | | | X |
| Casuarinaceae | <i>Casuarina cunninghamiana</i> | River Oak | P | X | | X |
| Chenopodiaceae | <i>Chenopodium album</i> | Fat Hen | E | | X | |
| Chenopodiaceae | <i>Einadia nutans</i> subsp. <i>nutans</i> | Climbing Saltbush | L | X | | |
| Clusiaceae | <i>Hypericum gramineum</i> | Small St. John's Wort | L | | | X |
| Clusiaceae | <i>Hypericum perforatum</i> | St. John's Wort | E | X | X | |
| Commelinaceae | <i>Commelina cyanea</i> | Scurvy Weed | L | X | | |
| Convolvulaceae | <i>Dichondra repens</i> | Kidney Weed | L | X | | |
| Convolvulaceae | <i>Polymeria calycina</i> | | L | X | | |

Table A.1 Flora species on each property listed by family

| Family | Species Name | Common Name | Status | No. 14 | No. 12 | No. 263 |
|------------------------|-------------------------------|----------------------|--------|--------|--------|---------|
| Cupressaceae | <i>Cupressus</i> sp. | Cypress | E | | X | X |
| Cyperaceae | <i>Carex inversa</i> | | L | X | | X |
| Cyperaceae | <i>Cyperus eragrostis</i> | Umbrella Sedge | E | | | X |
| Cyperaceae | <i>Cyperus gracilis</i> | Slender Flat-sedge | L | X | | |
| Ebenaceae | <i>Diospyros</i> sp. | | E | X | | |
| Euphorbiaceae | <i>Triadica sebifera</i> | Chinese Tallow | E | X | X | |
| Fabaceae (Faboideae) | <i>Daviesia ulicifolia</i> | Gorse Bitter Pea | L | | | X |
| Fabaceae (Faboideae) | <i>Glycine microphylla</i> | Small-leaved Glycine | L | X | | X |
| Fabaceae (Faboideae) | <i>Glycine tabacina</i> | | L | X | | X |
| Fabaceae (Faboideae) | <i>Lotus uliginosus</i> | Birds-foot Trefoil | E | X | X | X |
| Fabaceae (Faboideae) | <i>Trifolium repens</i> | White Clover | E | X | X | X |
| Fabaceae (Faboideae) | <i>Vicia sativa</i> | Common vetch | E | X | | |
| Fabaceae (Mimosoideae) | <i>Acacia falcata</i> | Sickle Wattle | L | | | X |
| Fabaceae (Mimosoideae) | <i>Acacia floribunda</i> | Gossamer Wattle | L | | | X |
| Fabaceae (Mimosoideae) | <i>Acacia podalyriifolia</i> | Mount Morgan Wattle | P | X | | |
| Gentianaceae | <i>Centaurium tenuiflorum</i> | | E | | | X |
| Iridaceae | <i>Gladiolus undulatus</i> | Gladioli | E | X | | |
| Iridaceae | <i>Romulea rosea</i> | Onion Grass | E | | X | |
| Juncaceae | <i>Juncus cognatus</i> | | L | | X | |
| Juncaceae | <i>Juncus usitatus</i> | Common Rush | L | X | | X |

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| Family | Species Name | Common Name | Status | No. 14 | No. 12 | No. 263 |
|------------|--|-----------------------------|--------|--------|--------|---------|
| Lauraceae | <i>Cinnamomum camphora</i> | Camphor Laurel | E | | X | |
| Linaceae | <i>Linum trigynum</i> | French Flax | E | X | | |
| Lythraceae | <i>Lagerstroemia indica</i> | Crepe Myrtle | E | | X | |
| Lythraceae | <i>Lythrum hyssopifolia</i> | Hyssop Loosestrife | L | | | X |
| Malvaceae | <i>Modiola caroliniana</i> | Red-flowered Mallow | E | X | X | X |
| Malvaceae | <i>Pyrus</i> sp. | Pear | E | X | | X |
| Malvaceae | <i>Sida rhombifolia</i> | Paddy's Lucerne | E | X | X | X |
| Meliaceae | <i>Melia azedarach</i> | White Cedar | L | X | | |
| Myrtaceae | <i>Callistemon citrinus</i> | Bottlebrush | P | X | | X |
| Myrtaceae | <i>Callistemon viminalis</i> | Weeping Bottlebrush | P | X | | X |
| Myrtaceae | <i>Corymbia citriodora</i> | Lemon-scented Gum | P | | X | |
| Myrtaceae | <i>Eucalyptus botryoides</i> | Bangalay, Southern Mahogany | P | X | | |
| Myrtaceae | <i>Eucalyptus botryoides x saligna</i> | | P | | X | |
| Myrtaceae | <i>Eucalyptus crebra</i> | Narrow-leaf Ironbark | L | X | X | |
| Myrtaceae | <i>Eucalyptus elata</i> | River Peppermint | P | X | | |
| Myrtaceae | <i>Eucalyptus fibrosa</i> | Broad-leaved Ironbark | L | | | X |
| Myrtaceae | <i>Eucalyptus grandis</i> | Flooded Gum | P | X | | |
| Myrtaceae | <i>Eucalyptus microcorys</i> | Tallowood | P | | X | |
| Myrtaceae | <i>Eucalyptus punctata</i> | Grey Gum | L | | | X |
| Myrtaceae | <i>Eucalyptus saligna</i> | Sydney Blue Gum | P | X | X | |

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| Family | Species Name | Common Name | Status | No. 14 | No. 12 | No. 263 |
|----------------|--|-------------------------|--------|--------|--------|---------|
| Myrtaceae | <i>Eucalyptus scoparia</i> | Wallangarra White Gum | P | | X | X |
| Myrtaceae | <i>Eucalyptus</i> sp. | | P | X | | |
| Myrtaceae | <i>Eucalyptus tereticornis</i> | Forest Red Gum | L | | | X |
| Myrtaceae | <i>Leptospermum petersonii</i> | Lemon-scented Tea Tree | P | X | | |
| Myrtaceae | <i>Lophostemon confertus</i> | Brush Box | P | X | | |
| Myrtaceae | <i>Melaleuca armillaris</i> | Bracelet Honey Myrtle | P | X | | |
| Myrtaceae | <i>Melaleuca linariifolia</i> | Flax-leaved Paperbark | P | | X | |
| Myrtaceae | <i>Melaleuca styphelioides</i> | Prickly-leaved Tea Tree | P | X | | |
| Oleaceae | <i>Ligustrum sinense</i> | Broad-leaved Privet | E | X | | X |
| Oleaceae | <i>Olea europaea</i> subsp. <i>cuspidata</i> | African Olive | E | X | | |
| Oleaceae | <i>Olea europaea</i> subsp. <i>europaea</i> | European Olive | E | X | X | |
| Passifloraceae | <i>Passiflora caerulea</i> | Blue Passionflower | E | X | | |
| Phormiaceae | <i>Dianella longifolia</i> | Blue Flax-lily | L | | | X |
| Pinaceae | <i>Pinus</i> sp. | Pine | E | | | X |
| Pittosporaceae | <i>Bursaria spinosa</i> | Blackthorn | L | | | X |
| Pittosporaceae | <i>Pittosporum undulatum</i> | Sweet Pittosporum | L | X | | X |
| Plantaginaceae | <i>Plantago lanceolata</i> | Lamb's Tongues | E | X | X | X |
| Plantaginaceae | <i>Plantago myosuroides</i> | | E | | | X |
| Platanaceae | <i>Platanus x acerifolia</i> | London Plane | E | | X | |
| Poaceae | <i>Aira caryophyllaea</i> | Silvery Hairgrass | E | X | | |

Table A.1 Flora species on each property listed by family

| Family | Species Name | Common Name | Status | No. 14 | No. 12 | No. 263 |
|--------------|------------------------------|----------------------------|--------|--------|--------|---------|
| Poaceae | <i>Avena barbata</i> | Bearded Oats | E | X | | X |
| Poaceae | <i>Axonopus fissifolius</i> | Narrow-leaved Carpet Grass | E | | X | |
| Poaceae | <i>Briza maxima</i> | Quaking Grass | E | X | X | |
| Poaceae | <i>Briza subaristata</i> | | E | X | X | X |
| Poaceae | <i>Bromus catharticus</i> | Prairie Grass | E | X | X | X |
| Poaceae | <i>Bromus hordeaceus</i> | Soft Brome | E | X | X | X |
| Poaceae | <i>Cenchrus clandestinum</i> | Kikuyu | E | X | X | X |
| Poaceae | <i>Cynodon dactylon</i> | Couch Grass | E | X | X | X |
| Poaceae | <i>Dichelachne micrantha</i> | Hairy Plumegrass | L | X | X | X |
| Poaceae | <i>Ehrharta erecta</i> | Panic Veldt Grass | E | | | X |
| Poaceae | <i>Eragrostis curvula</i> | African Love Grass | E | X | X | X |
| Poaceae | <i>Eragrostis tenuifolia</i> | Elastic Grass | E | | | X |
| Poaceae | <i>Lolium perenne</i> | Perennial Rye Grass | E | X | X | X |
| Poaceae | <i>Microlaena stipoides</i> | Weeping Grass | L | X | X | X |
| Poaceae | <i>Paspalum dilatatum</i> | Broad-leaved Paspalum | E | X | X | X |
| Poaceae | <i>Phyllostachys aurea</i> | Fishpole Bamboo | E | X | | X |
| Poaceae | <i>Sporobolus africanus</i> | Parramatta Grass | E | X | X | X |
| Poaceae | <i>Themeda triandra</i> | Kangaroo grass | L | X | | X |
| Poaceae | <i>Vulpia bromoides</i> | Squirrel Tail Fescue | E | | X | X |
| Polygonaceae | <i>Acetosella vulgaris</i> | Sheep Sorrel | E | | X | |

Table A.1 Flora species on each property listed by family

| Family | Species Name | Common Name | Status | No. 14 | No. 12 | No. 263 |
|---------------|-----------------------------------|-----------------------|--------|--------|--------|---------|
| Polygonaceae | <i>Rumex brownii</i> | Swamp Dock | L | X | | |
| Polygonaceae | <i>Rumex crispus</i> | Curled Dock | E | X | X | |
| Primulaceae | <i>Lysimachia arvensis</i> | Pimpernel | E | X | X | |
| Proteaceae | <i>Grevillea robusta</i> | Silky Oak | P | | | X |
| Proteaceae | <i>Grevillea</i> 'Robyn Gordon' | | P | X | | |
| Ranunculaceae | <i>Clematis aristata</i> | Old Man's Beard | L | | | X |
| Rosaceae | <i>Briza minor</i> | Quaking Grass | E | X | | |
| Rosaceae | <i>Cotoneaster glaucophyllus</i> | Glaucous Cotoneaster | E | | X | |
| Rosaceae | <i>Photinia serratifolia</i> | Chinese Photinia | E | | X | |
| Rosaceae | <i>Prunus</i> sp. | Plum | E | X | | X |
| Rosaceae | <i>Rubus fruticosus</i> spp. agg. | Blackberry | E | X | | |
| Rubiaceae | <i>Sherardia arvensis</i> | Field Madder | E | X | X | |
| Rutaceae | <i>Citrus x limon</i> | Lemon | E | X | | X |
| Sapindaceae | <i>Dimocarpus longan</i> | Longan | E | X | X | |
| Solanaceae | <i>Cestrum parqui</i> | Green Cestrum | E | X | | X |
| Solanaceae | <i>Solanum nigrum</i> | Blackberry Nightshade | E | X | | X |
| Theaceae | <i>Camellia</i> sp. | Camellia | E | | X | |
| Ulmaceae | <i>Ulmus glabra</i> | Scotch Elm | E | | X | |
| Verbenaceae | <i>Verbena bonariensis</i> | Purpletop | E | X | X | |
| Verbenaceae | <i>Verbena officinalis</i> | Common Verbena | E | | X | |

Table A.1 **Flora species on each property listed by family**

| Family | Species Name | Common Name | Status | No. 14 | No. 12 | No. 263 |
|-------------|-----------------------|----------------|--------|--------|--------|---------|
| Verbenaceae | <i>Verbena rigida</i> | Veined Verbena | E | X | X | X |

Status: L = Local indigenous, P = Planted native, E = Exotic

Appendix B

Threatened Flora Species - Likelihood of Occurrence

Table B.1 Threatened flora species likelihood of occurrence in the subject site

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|----------------|---------------------------------|-------------|---------------|-----------------|---------|---|---|
| Casuarinaceae | <i>Allocasuarina glareicola</i> | | E | E | 0 | Found in open woodland with <i>Eucalyptus parramattensis</i> , <i>Eucalyptus fibrosa</i> , <i>Angophora bakeri</i> , <i>Eucalyptus sclerophylla</i> and <i>Melaleuca decora</i> on lateritic soil. | Unlikely to occur. Marginally suitable habitat is present on the subject site, but is likely to be too disturbed. Species not detected during surveys |
| Dilleniaceae | <i>Hibbertia superans</i> | | E | | 44 | Occurs from Baulkham Hills to South Maroota in the northern outskirts of Sydney, where there are currently 16 known sites, and at one locality at Mount Boss, inland from Kempsey. The species occurs on sandstone ridgetops often near the shale/sandstone boundary. Occurs in both open woodland and heathland, and prefers open disturbed areas, such as tracksides. | Unlikely to occur. No sandstone ridgetops present on the subject site. |
| Elaeocarpaceae | <i>Tetratheca glandulosa</i> | | V | | 39 | Found in various communities from heaths and scrub to woodlands/open woodlands, and open forest. Common woodland tree species include: <i>Corymbia gummifera</i> , <i>C. eximia</i> , <i>Eucalyptus haemastoma</i> , <i>E. punctata</i> , <i>E. racemosa</i> , and/or <i>E. sparsifolia</i> . Soils are generally shallow, consisting of a yellow, clayey/sandy loam. | Unlikely to occur. Marginally suitable habitat is present on the subject site, but is likely to be too disturbed. Species not detected during surveys |

Table B.1 Threatened flora species likelihood of occurrence in the subject site

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|----------------------|--|-------------|---------------|-----------------|---------|---|---|
| Ericaceae | <i>Epacris purpurascens</i> var. <i>purpurascens</i> | | V | | 35 | Recorded from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South. Found in a range of habitat types, most of which have a strong shale soil influence. These include ridgetop drainage depressions supporting wet heath within or adjoining shale cap communities e.g. Stringybark and Ironbark woodlands, various shale/sandstone transition forest associations including Turpentine Ironbark Margin Forest, Stringybark/Scribbly Gum Woodland and Scribbly Gum/ Grey Gum/ Red Bloodwood Woodland. | Unlikely to occur. Suitable habitat present on the subject site, but is highly disturbed and weedy. Species was not detected |
| Ericaceae | <i>Leucopogon fletcheri</i> subsp. <i>fletcheri</i> | | E | | 8 | Occurs on flat to gently sloping ground along ridges and spurs in dry eucalypt woodland or shrubland. Grows on soils which are clayey lateritic. | Unlikely to occur. No suitable ridgetop habitat present in the subject site. |
| Fabaceae (Faboideae) | <i>Dillwynia tenuifolia</i> | | V | | 7 | Locally abundant particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. May also be common in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland. | Unlikely to occur. Marginally suitable habitat is present on the subject site, but is likely to be too disturbed. Species not detected during surveys |

Table B.1 Threatened flora species likelihood of occurrence in the subject site

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|---------------------------|-----------------------------|--|---------------|-----------------|---------|---|---|
| Fabaceae (Faboideae) | <i>Dillwynia tenuifolia</i> | <i>Dillwynia tenuifolia</i> Sieber ex D.C. in the Baulkham Hills local government area | EP,V | | 6 | Occurs in vegetation similar to Cumberland Plain Woodland, on Wianamatta Shale soils. Only two confirmed locations are known, both near the junction of Wisemans Ferry and Sackville Roads. | Unlikely to occur. No suitable habitat present on the subject site. Species only currently known from two locations. |
| Fabaceae (Faboideae) | <i>Pultenaea parviflora</i> | | E | V | 1 | 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 on tertiary alluvium or laterised clays and in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland. | Unlikely to occur. No suitable habitat present on the subject site. |
| Fabaceae (Mimosoideae) | <i>Acacia bynoeana</i> | Bynoe's Wattle | E | V | 9 | Occurs in heath or dry sclerophyll forest on sandy soils. Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches. | Unlikely to occur. No suitable habitat present on the subject site. |
| Fabaceae (Mimosoideae) | <i>Acacia pubescens</i> | Downy Wattle | V | V | 2 | Grows in dry sclerophyll forest and woodland in clay soils. | Unlikely to occur. No suitable habitat present on |

Table B.1 Threatened flora species likelihood of occurrence in the subject site

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|---------------------------|--|--------------------------------------|---------------|-----------------|---------|--|--|
| | | | | | | | the subject site. |
| Fabaceae (Mimosoideae) | <i>Acacia gordonii</i> | | E | E | 0 | Grows in dry sclerophyll forest and heathlands amongst or within rock platforms on sandstone outcrops. Restricted to the north-west of Sydney. | Unlikely to occur. No suitable habitat present on the subject site. |
| Geraniaceae | <i>Pelargonium</i> sp. <i>Striatellum</i> (G.W.Carr 10345) | Omeo Storksbill | 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. | Unlikely to occur. No suitable habitat present on the subject site. |
| Haloragaceae | <i>Haloragis exalata</i> subsp. <i>exalata</i> | Square Raspwort | V | V | 0 | Occurs in riparian habitats in protected, shaded and damp situations. | Unlikely to occur. No suitable habitat present on the subject site. |
| Malvaceae | <i>Lasiopetalum</i> <i>joyceae</i> | | V | V | 1 | Grows in heath on sandstone. | Unlikely to occur. No suitable habitat present on the subject site. |
| Myrtaceae | <i>Darwinia biflora</i> | | V | V | 264 | Grows in Sandstone Ridge top woodlands where weathered shale-capped ridges intergrade with Hawkesbury Sandstone. | Unlikely to occur. No suitable habitat present on the subject site. |
| Myrtaceae | <i>Eucalyptus nicholii</i> | Narrow-leaved Black Peppermint | V | V | 2 | Often found in dry grassy woodland mainly on infertile soils. | Unlikely to occur. No suitable habitat present on the subject site. |
| Myrtaceae | <i>Eucalyptus</i> sp. | | CE | | 35 | A small, often mallee-form tree to 4.5 m with | Unlikely to occur. |

Table B.1 Threatened flora species likelihood of occurrence in the subject site

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|-------------|--------------------------------|------------------------|---------------|-----------------|---------|--|---|
| | Cattai | | | | | thick, somewhat fibrous, furrowed bark. Occurs in the area between Colo Heights and Castle Hill, north-western Sydney. Occurs as a rare emergent tree in scrub, heath and low woodland on sandy soils, usually as isolated individuals or occasionally in small clustered groups. The sites at which it occurs are flat and on ridge tops. Associated soils are laterised clays overlying sandstone. | No suitable habitat present on the subject site. |
| Myrtaceae | <i>Melaleuca deanei</i> | Deane's Paperbark | V | V | 1 | Grows predominately in ridgetop woodland although rarely found in heath on sandstone. Found in two disjunct locations in Ku-ring-gai/Berowra and Holsworthy/Wedderburn. | Unlikely to occur. No ridge-top habitat present on the subject site. |
| Myrtaceae | <i>Micromyrtus minutiflora</i> | | E | V | 0 | Found in Castlereagh Scribbly Gum Woodland, Ironbark Forest, Shale/Gravel Transition Forest, open forest on tertiary alluvium and consolidated river sediments. | Unlikely to occur. No suitable habitat present on the subject site. |
| Myrtaceae | <i>Syzygium paniculatum</i> | Magenta Lilly Pilly | E | V | 0 | Rainforest species on sandy soils. | Unlikely to occur. No suitable habitat present on the subject site. |
| Orchidaceae | <i>Cryptostylis hunteriana</i> | Leafless Tongue Orchid | V | V | 0 | Grows in swamp-heath on sandy soils. | Unlikely to occur. No suitable habitat present on |

Table B.1 Threatened flora species likelihood of occurrence in the subject site

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|-------------|--|--------------------------|---------------|-----------------|---------|---|---|
| | | | | | | | the subject site. |
| Orchidaceae | <i>Genoplesium baueri</i> | Bauer's Midge Orchid | E | E | 0 | Grows in dry sclerophyll forest and moss gardens over sandstone. | Unlikely to occur. No suitable habitat present on the subject site. |
| Orchidaceae | <i>Pterostylis gibbosa</i> | Illawarra Greenhood | E | E | 0 | All known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage. | Unlikely to occur. No suitable habitat present on the subject site. |
| Orchidaceae | <i>Pterostylis saxicola</i> | Sydney Plains Greenhood | E | E | 0 | Found in sclerophyll forests or woodland on shale/sandstone transition soils or shale soils over flat sheets of sandstone rock shelves above cliff lines and also in crevices between sandstone boulders. | Unlikely to occur. No sandstone shelf habitat present on the subject site. |
| Proteaceae | <i>Grevillea juniperina</i> subsp. <i>juniperina</i> | Juniper-leaved Grevillea | V | | 2 | Found in Cumberland Plain Woodland and Castlereagh Woodland often in small populations on road verges. Grows on reddish clay to sandy soils typically containing lateritic gravels. | Unlikely to occur. No suitable habitat present on the subject site. |
| Proteaceae | <i>Persoonia hirsuta</i> | Hairy Geebung | E | E | 8 | Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone. | Unlikely to occur. No suitable habitat present on the subject site. |
| Rutaceae | <i>Asterolasia elegans</i> | | E | E | 0 | Found on Hawkesbury sandstone in sheltered forests on mid- to lower slopes and valleys. | Unlikely to occur. No suitable habitat present on the subject site. |

Table B.1 Threatened flora species likelihood of occurrence in the subject site

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|---------------|---|--------------------|---------------|-----------------|---------|---|---|
| Santalaceae | <i>Thesium australe</i> | Austral Toadflax | V | V | 0 | Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. | Unlikely to occur. No suitable habitat present on the subject site. |
| Thymelaeaceae | <i>Pimelea curviflora</i> var. <i>curviflora</i> | | V | V | 32 | Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands | Unlikely to occur. No ridge tops or upper slopes present within the subject site |
| Thymelaeaceae | <i>Pimelea spicata</i> | Spiked Rice-flower | E | E | 1 | Occurs on well-structured clay soils in two disjunct areas, the Cumberland Plain (Narellan, Marayong, Prospect Reservoir, Freemans Reach, Georges Hall areas) and the Illawarra (Landsdowne to Shellharbour to northern Kiama). On the inland Cumberland Plain sites it is associated with Grey Box and Ironbark. In the coastal Illawarra it occurs commonly in Coast Banksia open woodland with a more well developed shrub and grass understorey. Has been recorded from both shale hills and shale plains woodland. | Unlikely to occur. No suitable habitat present on the subject site. |

Status: CE = Critically Endangered; E= Endangered; V = Vulnerable

Appendix C

Threatened Fauna Species - Likelihood of Occurrence

Table C.1 Likelihood of occurrence for threatened and migratory fauna species

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|----------------|-------------------------------|----------------------------|---------------|-----------------|---------|---|--|
| Amphibia | | | | | | | |
| Hylidae | <i>Litoria aurea</i> | Green and Golden Bell Frog | E | V | 1 | Permanent or ephemeral swamps, dams and slow flowing streams with emergent vegetation such as reeds, particularly those containing bulrushes (<i>Typha</i> spp.) and Spikerushes (<i>Eleocharis</i> spp.). Optimal habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (<i>Gambusia holbrooki</i>), have a grassy area nearby and sheltering sites available. Can occur in highly disturbed areas. It inhabits a variety of forest types including coastal forest, open woodland and cleared areas. | Unlikely to occur. No suitable habitat present on the subject site. Although a dam is present, it does not have suitable emergent vegetation. |
| Hylidae | <i>Litoria littlejohni</i> | Littlejohn's Tree Frog | V | V | 0 | Occurs in heath based forests and woodlands. Breeding habitat occurs in upper reaches of permanent streams and in perched swamps. | Unlikely to occur. No suitable habitat present on the subject site. |
| Myobatrachidae | <i>Pseudophryne australis</i> | Red-crowned Toadlet | V | | 4 | 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 | Unlikely to occur. No suitable habitat present on the subject site. |

Table C.1 Likelihood of occurrence for threatened and migratory fauna species

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|----------------|---------------------------------|-------------------------|---------------|-----------------|---------|--|---|
| | | | | | | 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. | |
| Myobatrachidae | <i>Heleioporus australiacus</i> | Giant Burrowing Frog | V | V | 0 | Ephemeral or semi-permanent small sandy streams in heathland or open woodland are used for breeding. Foraging may occur several kilometres from a breeding site within the same habitat. | Unlikely to occur. No suitable habitat present on the subject site. |
| Myobatrachidae | <i>Mixophyes balbus</i> | Stuttering Frog | E | V | 0 | Permanent flowing rocky rivers and streams. It inhabits rainforest, wet sclerophyll forest and montane forests, it is rarely encountered far from a stream. | Unlikely to occur. No suitable habitat present on the subject site. |
| Aves | | | | | | | |
| Accipitridae | <i>Haliaeetus leucogaster</i> | White-bellied Sea-Eagle | V | C | 2 | 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. | Unlikely to occur. No suitable habitat present on the subject site. |
| Accipitridae | <i>Hieraaetus morphnoides</i> | Little Eagle | V | | 2 | Occurs in 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 | Potential to occur. Highly mobile, aerial species that may utilise the subject site as part of a wider |

Table C.1 Likelihood of occurrence for threatened and migratory fauna species

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|--------------|---------------------------|--------------------|---------------|-----------------|---------|--|--|
| | | | | | | remnant patch. | foraging range on occasion. No nests sighted so no breeding habitat is currently present. |
| Accipitridae | <i>Lophoictinia isura</i> | Square-tailed Kite | V | | 9 | Found in a variety of timbered habitats including dry woodlands and open forests. It is a specialist hunter preying on passerine birds, especially honeyeaters and targets predominately nestlings and insects occurring in the tree canopy. It nests in tree forks or on large horizontal tree limbs located mostly along or near watercourses. | Potential to occur. Highly mobile, aerial species that may utilise the subject site as part of a wider foraging range on occasion. No nests sighted so no breeding habitat is currently present. |
| Accipitridae | <i>Pandion cristatus</i> | Eastern Osprey | V | | 0 | Found at littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. | Unlikely to occur. No suitable habitat present on the subject site. |
| Anatidae | <i>Oxyura australis</i> | Blue-billed Duck | V | | 2 | Requires deep water in large permanent wetlands and swamps with dense aquatic vegetation. | Unlikely to occur. No suitable habitat present on the subject site. |

Table C.1 Likelihood of occurrence for threatened and migratory fauna species

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|------------|--|---------------------------|---------------|-----------------|---------|---|--|
| Apodidae | <i>Hirundapus caudacutus</i> | White-throated Needletail | | C,J,K | 1 | 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. | Potential to occur. Highly mobile, aerial species that may pass over the subject site but unlikely to utilise it directly. |
| Apodidae | <i>Apus pacificus</i> | Fork-tailed Swift | | C,J,K | 0 | Forages aerially over a variety of habitats usually over coastal and mountain areas with a preference for wooded areas. | Potential to occur. Highly mobile, aerial species that may pass over the subject site but unlikely to utilise it directly. |
| Ardeidae | <i>Botaurus poiciloptilus</i> | Australasian Bittern | E | E | 1 | Favours permanent freshwater wetlands with tall, dense vegetation, particularly bulrushes (<i>Typha</i> spp.) and spikerushes (<i>Eleocharis</i> spp.). | Unlikely to occur. No suitable habitat present on the subject site. |
| Artamidae | <i>Artamus cyanopterus cyanopterus</i> | Dusky Woodswallow | V | | 6 | Found in dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. | Potential to occur. Highly mobile, aerial species that may pass over the subject site but unlikely to utilise it directly. |
| Cacatuidae | <i>Callocephalon</i> | Gang-gang | V | | 2 | In summer, generally found in tall mountain | Unlikely to occur. |

Table C.1 Likelihood of occurrence for threatened and migratory fauna species

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|---------------|---------------------------------------|--|---------------|-----------------|---------|--|---|
| | <i>fimbriatum</i> | Cockatoo | | | | 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. | Highly marginal suitable habitat present on the subject site. Not commonly known from the locality and would more likely utilise larger areas of intact forest. |
| Cacatuidae | <i>Calyptrorhynchus lathamii</i> | Glossy Black-Cockatoo | V | | 11 | 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 (<i>Allocasuarina littoralis</i>), Forest She-oak (<i>A. torulosa</i>) or Drooping She-oak (<i>A. verticillata</i>) occur. | Unlikely to occur. No favoured feed trees present. Not commonly known from the locality and would more likely utilise larger areas of intact forest. |
| Climacteridae | <i>Climacteris picumnus victoriae</i> | 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 | Unlikely to occur. No suitable habitat present on the subject site. |

Table C.1 Likelihood of occurrence for threatened and migratory fauna species

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|----------------|-------------------------------------|--------------------------|---------------|-----------------|---------|--|---|
| Cuculidae | <i>Cuculus optatus</i> | Oriental Cuckoo | | M | 0 | habitat component for foraging. Inhabits forest and woodland. | Unlikely to occur. Although suitable habitat present on the subject site, the species is sparsely recorded in NSW. |
| Dasyornithidae | <i>Dasyornis brachypterus</i> | Eastern Bristlebird | E | E | 0 | Habitat for central and southern populations is characterised by dense, low vegetation including heath and open woodland with a 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. | Unlikely to occur. No suitable habitat present on the subject site. |
| Hirundinidae | <i>Hirundo rustica</i> | Barn Swallow | | C,J,K | 1 | Summer visitor to north Australia, foraging over open country, particularly at wetlands where insect abundance is high. | Unlikely to occur. No suitable habitat present on the subject site. Occurs in northern Australia only. |
| Meliphagidae | <i>Melithreptus gularis gularis</i> | Black-chinned Honeyeater | V | | 1 | Occupies mostly upper levels of drier open forests or woodlands dominated by box and | Unlikely to occur. No suitable habitat |

Table C.1 Likelihood of occurrence for threatened and migratory fauna species

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|--------------|-----------------------------|----------------------|---------------|-----------------|---------|--|---|
| | | (eastern subspecies) | | | | ironbark eucalypts, especially Mugga Ironbark (<i>Eucalyptus sideroxylon</i>), White Box (<i>E. albens</i>), Inland Grey Box (<i>E. microcarpa</i>), Yellow Box (<i>E. melliodora</i>) and Forest Red Gum (<i>E. tereticornis</i>). 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. | present on the subject site. |
| Meliphagidae | <i>Anthochaera phrygia</i> | Regent Honeyeater | CE | CE | 0 | The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. | Unlikely to occur. No suitable habitat present on the subject site. |
| Meliphagidae | <i>Grantiella picta</i> | Painted Honeyeater | V | V | 0 | Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. | Unlikely to occur. No suitable habitat present on the subject site. |
| Monarchidae | <i>Monarcha melanopsis</i> | Black-faced Monarch | | M | 0 | Wetter, denser forest, often at high elevations. | Unlikely to occur. No suitable habitat present on the subject site. |
| Monarchidae | <i>Monarcha trivirgatus</i> | Spectacled Monarch | | M | 0 | Found along the entire eastern seaboard of Australia. More often found where there is thick understorey in rainforests, wet gullies, waterside | Unlikely to occur. No suitable habitat present on the |

Table C.1 Likelihood of occurrence for threatened and migratory fauna species

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|--------------|--|-----------------------------------|---------------|-----------------|---------|--|---|
| Monarchidae | <i>Myiagra cyanoleuca</i> | Satin Flycatcher | | M | 0 | vegetation and also in mangroves. Found in rainforest, dense wet eucalypt and monsoon forests, paperbark and mangrove swamps and riverside vegetation. | subject site. Unlikely to occur. No suitable habitat present on the subject site. |
| Motacillidae | <i>Motacilla flava</i> | Yellow Wagtail | | C,J,K | 0 | Prefers moist areas, such as the edges of sewage works and exposed mud banks. | Unlikely to occur. No suitable habitat present on the subject site. |
| Neosittidae | <i>Daphoenositta chrysoptera</i> | Varied Sittella | V | | 14 | 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. | Unlikely to occur. Marginal suitable habitat present on the subject site. Species typically occurs in larger tracts of vegetation. |
| Petroicidae | <i>Melanodryas cucullata cucullata</i> | Hooded Robin (south-eastern form) | V | | 1 | Occurs in lightly timbered woodland, mainly dominated by acacia and/or eucalypts. | Unlikely to occur. Highly marginal suitable habitat present on the subject site. Not commonly known from the locality and |

Table C.1 Likelihood of occurrence for threatened and migratory fauna species

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|-------------|-----------------------------|-----------------|---------------|-----------------|---------|---|--|
| Petroicidae | <i>Petroica boodang</i> | Scarlet Robin | V | | 3 | 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. | would more likely utilise larger areas of intact forest. Unlikely to occur. No suitable habitat present on the subject site. |
| Psittacidae | <i>Glossopsitta pusilla</i> | Little Lorikeet | V | | 8 | 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 | Unlikely to occur. Some suitable habitat present on the subject site, but species is not commonly known from the locality and would likely occur in larger tracts of native vegetation. |

Table C.1 Likelihood of occurrence for threatened and migratory fauna species

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|---------------|-----------------------------|--------------------------|---------------|-----------------|---------|---|---|
| Psittacidae | <i>Lathamus discolor</i> | Swift Parrot | E | CE | 2 | smooth-barked Eucalypts. Occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. | Unlikely to occur. Highly marginal suitable habitat present on the subject site. Not commonly known from the locality. |
| Psittacidae | <i>Neophema pulchella</i> | Turquoise Parrot | V | | 1 | Found at the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland, nests in tree hollows, logs or posts. | Unlikely to occur. Highly marginal suitable habitat present on the subject site. Not commonly known from the locality. |
| Rhipiduridae | <i>Rhipidura rufifrons</i> | Rufous Fantail | | M | 0 | Inhabits rainforest, dense wet forests, swamp woodlands and mangroves, preferring deep shade, and is often seen close to the ground. | Unlikely to occur. No suitable habitat present on the subject site. |
| Rostratulidae | <i>Rostratula australis</i> | Australian Painted Snipe | E | E | 0 | Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. | Unlikely to occur. No suitable habitat present on the subject site. |

Table C.1 Likelihood of occurrence for threatened and migratory fauna species

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|--------------|----------------------------------|------------------------|---------------|-----------------|---------|--|--|
| Scolopacidae | <i>Calidris ruficollis</i> | Red-necked Stint | | C,J,K | 1 | Species occurs in coastal areas including sheltered inlets, bays, lagoons, mudflats, shallow wetlands, swamps and other waterbodies. Species roosts in primarily near waterbodies listed above, but also recorded at inland clay pans. | Unlikely to occur. No suitable habitat present on the subject site. |
| Scolopacidae | <i>Calidris ferruginea</i> | Curlew Sandpiper | E | CE,C,J,K | 0 | Inhabits intertidal mudflats of estuaries, lagoons, mangroves, as well as beaches, rocky shores and around lakes, dams and floodwaters. | Unlikely to occur. No suitable habitat present on the subject site. |
| Scolopacidae | <i>Numenius madagascariensis</i> | Eastern Curlew | | CE,C,J,K | 0 | 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. | Unlikely to occur. No suitable habitat present on the subject site. |
| Scolopacidae | <i>Actitis hypoleucos</i> | Common Sandpiper | | C,J,K | 0 | Inhabits coastal or inland wetlands, both saline or fresh. It is more commonly found on muddy edges or rocky shores. | Unlikely to occur. No suitable habitat present on the subject site. |
| Scolopacidae | <i>Calidris acuminata</i> | Sharp-tailed Sandpiper | | C,J,K | 0 | Prefers the grassy edges of shallow inland freshwater wetlands, but also occurs at other habitats including mangroves, beaches, mudflats and sewage farms. | Unlikely to occur. No suitable habitat present on the subject site. |

Table C.1 Likelihood of occurrence for threatened and migratory fauna species

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|--------------|-----------------------------|--------------------|---------------|-----------------|---------|--|---|
| Scolopacidae | <i>Calidris melanotos</i> | Pectoral Sandpiper | | J,K | 0 | Prefers shallow fresh to saline wetlands with open fringing mudflats and low, emergent or fringing vegetation. | Unlikely to occur. No suitable habitat present on the subject site. |
| Scolopacidae | <i>Tringa nebularia</i> | Common Greenshank | | C,J,K | 0 | Inhabits inland wetlands and sheltered coastal habitats. | Unlikely to occur. No suitable habitat present on the subject site. |
| Scolopacidae | <i>Gallinago hardwickii</i> | Latham's Snipe | | C,J,K | 3 | Inhabit open, freshwater wetlands with low, dense vegetation. | Unlikely to occur. No suitable habitat present on the subject site. |
| Strigidae | <i>Ninox strenua</i> | Powerful Owl | V | | 15 | Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. Also occurs in fragmented habitats. Nests in hollows of large, old eucalypts | Potential to occur. Known to utilise fragmented landscapes, may utilise the subject site as part of a larger foraging area. No breeding habitat present. |
| Tytonidae | <i>Tyto novaehollandiae</i> | Masked Owl | V | | 1 | Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes | Unlikely to occur. Highly marginal |

Table C.1 Likelihood of occurrence for threatened and migratory fauna species

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|----------------|---------------------------------|-------------------------------|---------------|-----------------|---------|--|--|
| | | | | | | caves for nesting. Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. | suitable habitat present on the subject site. Not commonly known from the locality. |
| Mammalia | | | | | | | |
| Dasyuridae | <i>Dasyurus maculatus</i> | Spotted-tail Quoll | V | E | 0 | Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites. Females occupy home ranges up to about 750 hectares and males up to 3500 hectares; usually traverse their ranges along densely vegetated creek lines. | Unlikely to occur. No suitable habitat present on the subject site. |
| Emballonuridae | <i>Saccolaimus flaviventris</i> | Yellow-bellied Sheathtail Bat | V | | 6 | Found in a large variety of habitats including treed and treeless areas. Inhabits tree hollows or mammal burrows in treeless areas. | Potential to occur. Highly mobile, aerial species that may pass over the subject site as part of a larger foraging range. Could potentially roost in the subject site within |

Table C.1 Likelihood of occurrence for threatened and migratory fauna species

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|--------------|----------------------------------|---------------------------|---------------|-----------------|---------|---|--|
| Macropodidae | <i>Petrogale penicillata</i> | Brush-tailed Rock-wallaby | E | V | 0 | Occupies rock outcrops, escarpments and cliffs with features such as caves, fissures and ledges. Browses on adjacent vegetation. Has a home range of about 15 ha and shelters in caves. | existing sheds, buildings or tree hollows. Unlikely to occur. No suitable habitat present on the subject site. |
| Molossidae | <i>Mormopterus norfolkensis</i> | Eastern Freetail Bat | V | | 21 | Occur in dry sclerophyll forest and woodland east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures. | Potential to occur. Highly mobile, aerial species that may pass over the subject site as part of a larger foraging range. Could potentially roost in the subject site within existing sheds, buildings or tree hollows. |
| Muridae | <i>Pseudomys novaehollandiae</i> | New Holland Mouse | | V | 0 | 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. | Unlikely to occur. No suitable habitat present on the subject site. |

Table C.1 Likelihood of occurrence for threatened and migratory fauna species

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|-----------------|-------------------------------|------------------------|---------------|-----------------|---------|--|---|
| Petauridae | <i>Petaurus australis</i> | Yellow-bellied Glider | V | | 3 | Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Requires large hollows for denning habitat. | Unlikely to occur. No suitable habitat present on the subject site. |
| Phascolarctidae | <i>Phascolarctos cinereus</i> | Koala | V | V | 0 | 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 browse species. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size. | Unlikely to occur. While a food species is present, habitat is likely to be too fragmented for this species, and there are no local records |
| Pseudocheiridae | <i>Petauroides volans</i> | Greater Glider | | V | 0 | Occurs in eucalypt forests and woodlands from north-eastern Queensland to the Central Highlands of Victoria. The species has a relatively small home range which consists of numerous tree hollows. Prefers large hollows in old, large trees. | Unlikely to occur. No suitable habitat present on the subject site. |
| Pteropodidae | <i>Pteropus poliocephalus</i> | Grey-headed Flying-fox | V | V | 8 | Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. | Potential to occur. Highly mobile, aerial species that may pass over the subject site as part of a larger foraging range. No |

Table C.1 Likelihood of occurrence for threatened and migratory fauna species

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|------------------|-----------------------------------|---------------------------|---------------|-----------------|---------|---|---|
| Vespertilionidae | <i>Chalinolobus dwyeri</i> | Large-eared Pied Bat | V | V | 3 | Found in well-timbered areas containing gullies. Roosts in caves, crevices in cliffs and old mine workings frequenting low to mid-elevation dry open forest and woodland close to these features. | roost camps present on or adjacent to the subject site. Unlikely to occur. No suitable habitat present on the subject site. No suitable roost habitat present nearby. |
| Vespertilionidae | <i>Falsistrellus tasmaniensis</i> | Eastern False Pipistrelle | V | | 15 | Prefers moist habitats, with trees taller than 20 m. Roost in eucalypt hollows, under loose bark or in old buildings. | Potential to occur. Highly mobile, aerial species that may pass over the subject site as part of a larger foraging range. Could potentially roost in the subject site within existing sheds, buildings or tree hollows. |
| Vespertilionidae | <i>Miniopterus australis</i> | Little Bentwing-bat | V | | 6 | 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 | Potential to occur. Highly mobile, aerial species that may pass over the subject |

Table C.1 **Likelihood of occurrence for threatened and migratory fauna species**

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|------------------|--|----------------------|---------------|-----------------|---------|--|---|
| | | | | | | insects beneath the canopy of densely vegetated habitats. | site as part of a larger foraging range. Could potentially roost in the subject site within tree hollows. |
| Vespertilionidae | <i>Miniopterus schreibersii oceanensis</i> | Eastern Bentwing-bat | V | | 26 | 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. | Potential to occur. Highly mobile, aerial species that may pass over the subject site as part of a larger foraging range. Could potentially roost in the subject site within buildings. |
| Vespertilionidae | <i>Myotis macropus</i> | Southern Myotis | V | | 18 | Roosts close to water in caves, mines, tree hollows, storm water channels, bridges, buildings or in dense foliage. Forages over streams and pools catching insects and fish. | Potential to occur. Highly mobile, aerial species that may pass over the subject site as part of a larger foraging range (small dam provides forage habitat as well as nearby watercourses. |

Table C.1 Likelihood of occurrence for threatened and migratory fauna species

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|------------------|------------------------------|-------------------------|---------------|-----------------|---------|---|---|
| | | | | | | | Could potentially roost in the subject site within existing sheds, buildings or tree hollows. |
| Vespertilionidae | <i>Scoteanax rueppellii</i> | Greater Broad-nosed Bat | V | | 10 | 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. | Potential to occur. Highly mobile, aerial species that may pass over the subject site as part of a larger foraging range. Could potentially roost in the subject site within existing sheds, buildings or tree hollows. |
| Vespertilionidae | <i>Vespadelus troughtoni</i> | Eastern Cave Bat | V | | 1 | A cave-roosting species which inhabits dry open forest and woodland. Normally near rocky overhangs and cliffs, but has also been recorded in disused mines. Occasionally found in rainforest and wet sclerophyll forest. | Unlikely to occur. No suitable habitat present on the subject site. No suitable roost habitat present nearby. |
| Fish | | | | | | | |

Table C.1 Likelihood of occurrence for threatened and migratory fauna species

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|----------------|-------------------------------|-----------------------------|---------------|-----------------|---------|--|---|
| Percichthyidae | <i>Macquaria australasica</i> | 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 | Unlikely to occur. No suitable habitat present on the subject site. |
| Retropinnidae | <i>Prototroctes maraena</i> | Australian Grayling | | V | | 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 | Unlikely to occur. No suitable habitat present on the subject site. |
| Gastropoda | | | | | | | |
| Camaenidae | <i>Meridolum comeovirens</i> | Cumberland Plain Land Snail | E | | 42 | Primarily inhabits Cumberland Plain Woodland (an endangered ecological community). This community is a grassy, open woodland with occasional dense patches of shrubs. Lives under litter of bark, leaves and logs, or shelters in loose soil around grass clumps. Occasionally shelters under rubbish. | Unlikely to occur. No suitable habitat present on the subject site. The site has been extensively disturbed and is predominantly exotic dominated grassland which is unsuitable habitat. |
| Camaenidae | <i>Pommerhelix</i> - | Dural Woodland | E | E | 11 | Occurs in shale-influenced-habitats, sheltering | Unlikely to occur. |

Table C.1 **Likelihood of occurrence for threatened and migratory fauna species**

| Family | Scientific Name | Common Name | BC Act Status | EPBC Act Status | Records | Habitat Requirements | Likelihood of Occurrence |
|--------|-------------------|-------------|---------------|-----------------|---------|--|---|
| | <i>duralensis</i> | Snail | | | | under rocks or inside curled-up bark. Requires forested habitats that have good native cover and woody debris. | No suitable habitat present on the subject site. The site has been extensively disturbed and is predominantly exotic dominated grassland which is unsuitable habitat. |

Status: CE = Critically Endangered; E= Endangered; V = Vulnerable; M = Migratory; C = CAMBA; J = JAMBA; K = ROKAMBA