

**ATTACHMENTS FOR: AGENDA NO. 2/14
Planning and Environment Committee**

Meeting Date: Tuesday 18 February 2014
Location: Committee Room 2, Level 5, Civic Centre, 1 Devlin Street, Ryde
Time: 5.00pm

ATTACHMENTS FOR PLANNING AND ENVIRONMENT COMMITTEE

Item		Page
3	191 WATERLOO ROAD, MARSFIELD - LOT 1 DP574519, LOT 1 DP574518, LOT 1 DP575331. Development Application for Installation of Playing Field Lighting at Waterloo Park. LDA2013/0311.	
	Attachment 7 Flora and Fauna Assessment Report prepared by Abel Ecology dated 14 December 2013 1



Abel Ecology

Flora and fauna assessment report

for

**Waterloo Park, Marsfield
Lot 1, DP 574518**

Proposed flood lighting

Date: 14 December 2012

Document No: 1103-REP-08-ISS-1

Prepared for: City of Ryde

Prepared by: Abel Ecology



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Final report	Issue 1	Becky Southwell	Margot de Regt	Email	14 Dec 12



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List of Abbreviations

d.b.h.	Diameter at breast height (~1.3 metres)
EEC	Endangered Ecological Community
NP	National Park
ROTAP	Rare or Threatened Australian Plant

Note regarding maps in this report

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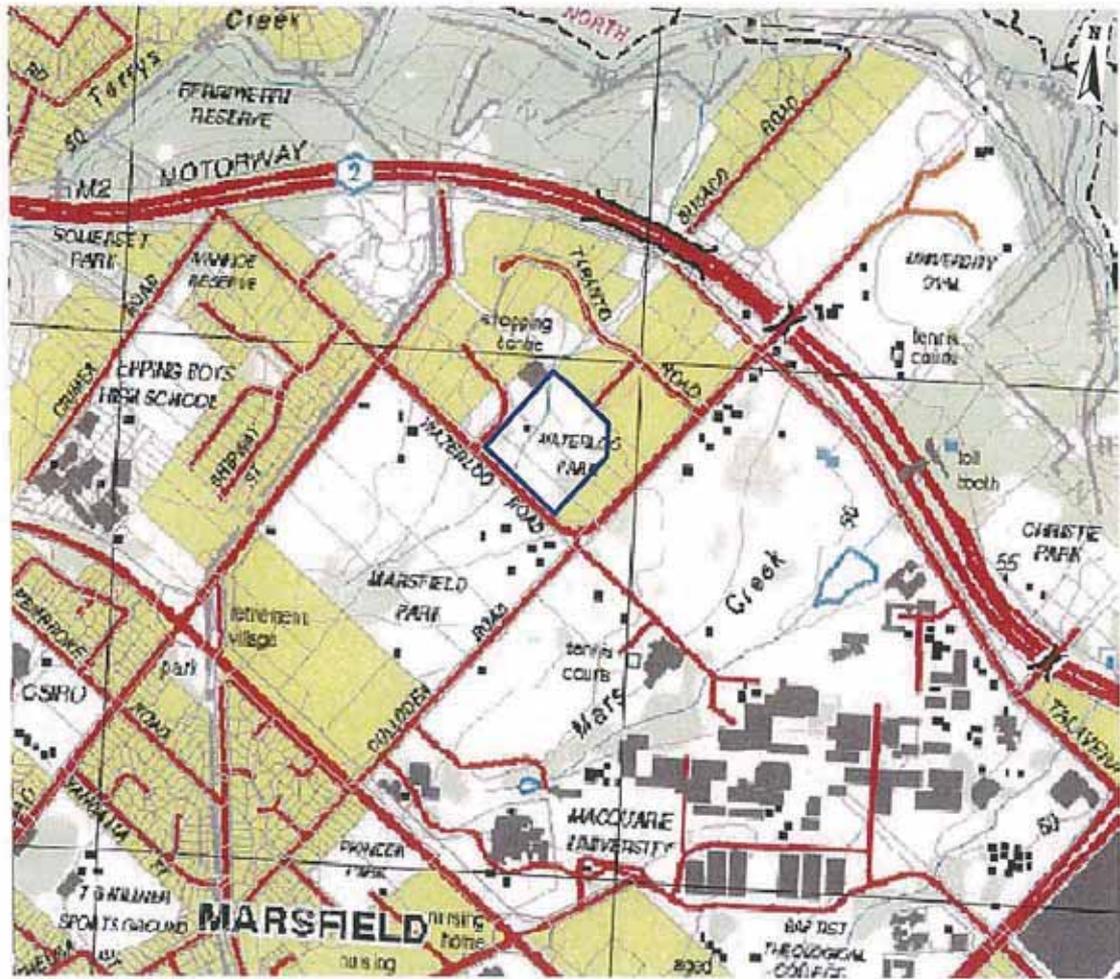


Figure 1. Locality map for Waterloo Park, Marsfield

 Site Locality

Scale: grid spacing = 1 km

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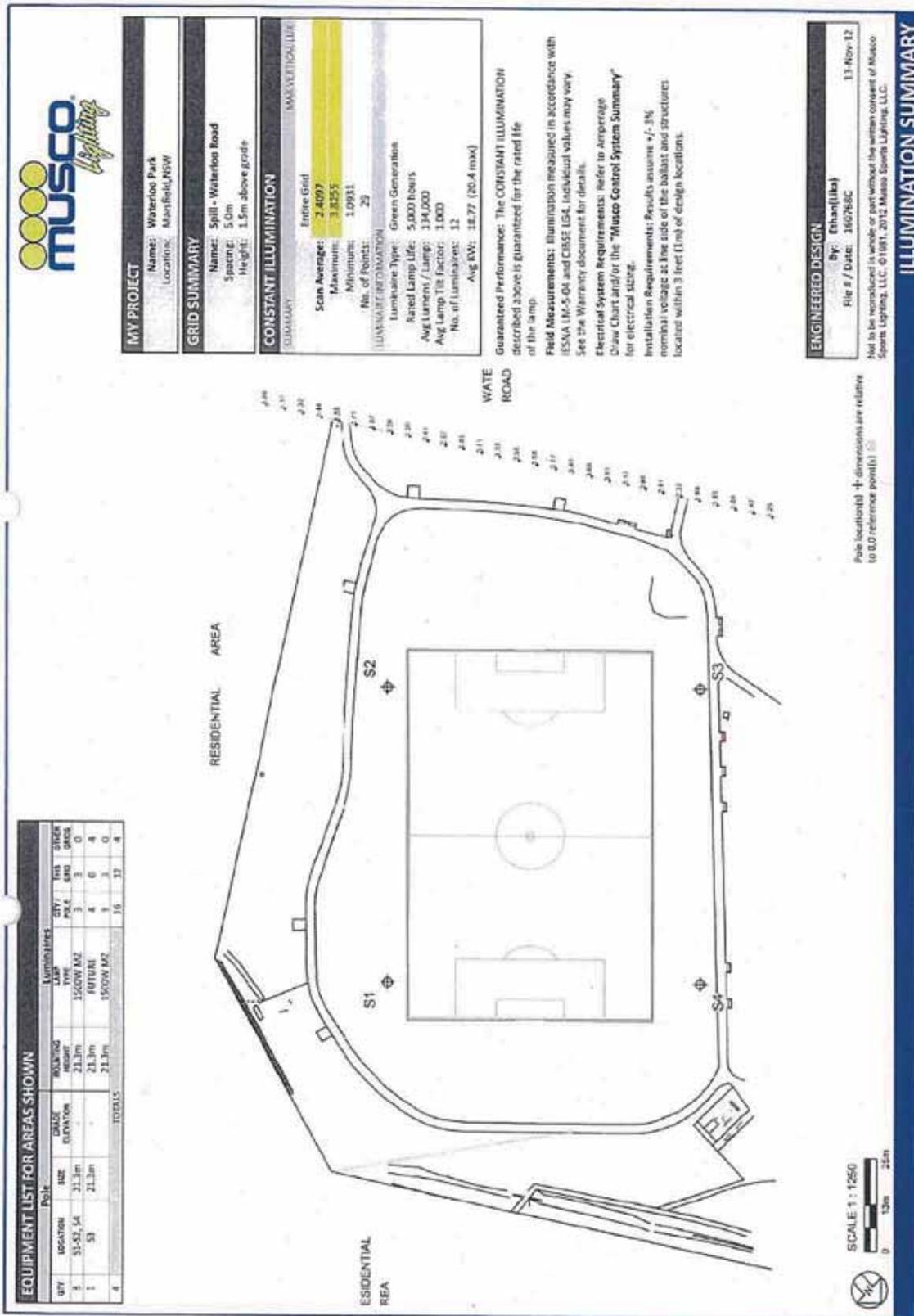


Figure 2. Proposal Diagram/Site Map



File Name:	23/11/2012
Date:	1-2700
Scale:	



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Figure 3. Air photo of the site and local area



Figure 4. Condition of site in 1943

 Site locality

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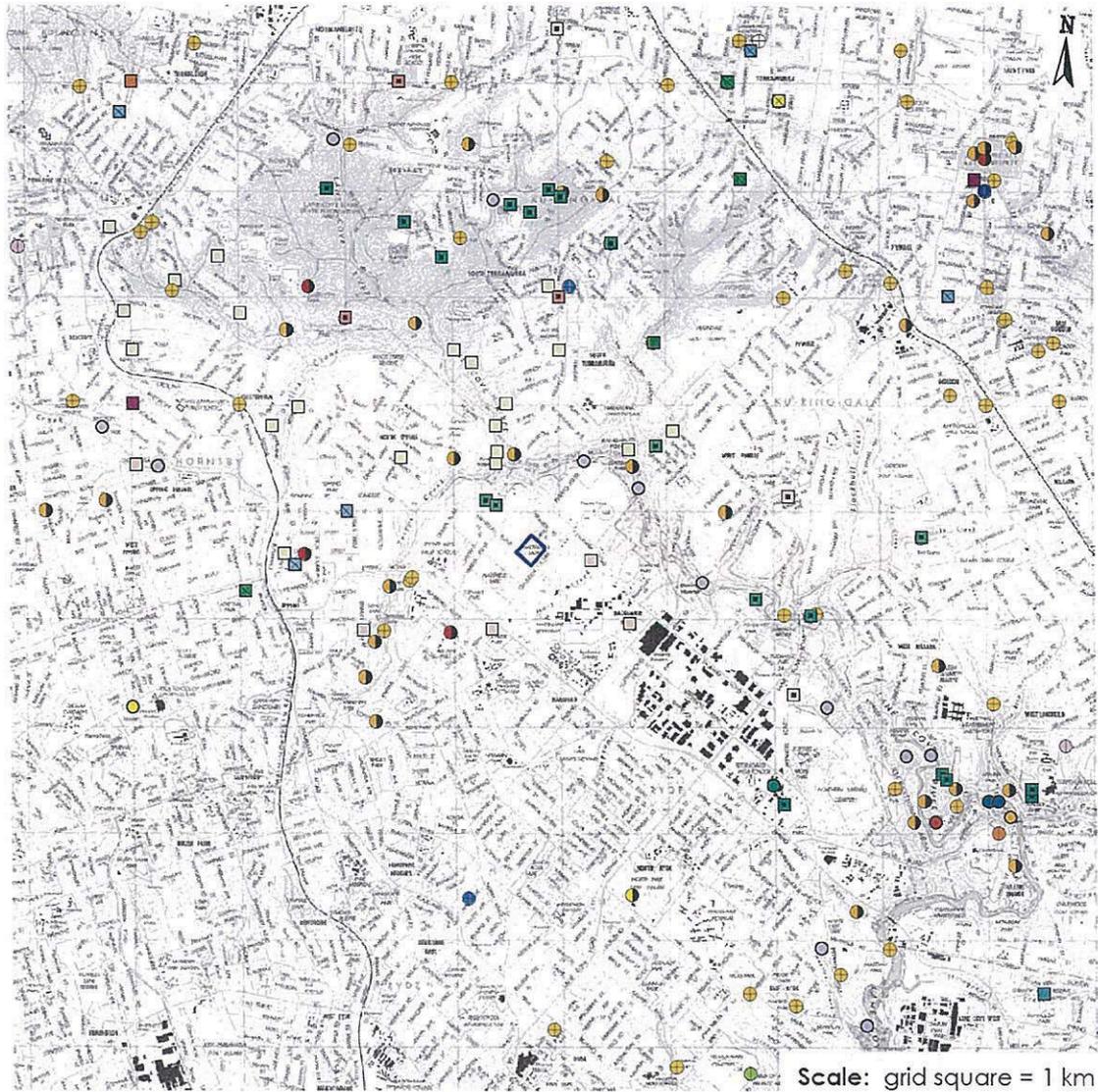


Figure 5. Threatened fauna species records within 5 km of the study site

- | | |
|--|--|
| <ul style="list-style-type: none"> □ Site locality ● Australasian Bittern (E1) ● Barking Owl (V) ● Black Bittern (V) ● Black-necked Stork (E1) ● Cotton Pygmy-Goose (E1) ○ Eastern Bentwing-bat (V) ■ Eastern Freetail-bat (V) ■ Eastern Pygmy-possum (V) ■ Gang-gang Cockatoo (V) ■ Glossy Black-cockatoo (V) ■ Green and Golden Bell Frog (E1) ■ Grey Falcon (E1) ■ Grey-headed Flying-fox (V) ⊕ Large-eared Pied Bat (V) | <ul style="list-style-type: none"> ● Little Eagle (V) ● Little Lorikeet (V) ● Osprey (V) ● Powerful Owl (V) ■ Red-crowned Toadlet (V) ■ Regent Honeyeater (E4A) ■ Scarlet Robin (V) ■ Spotted-tailed Quoll (V) ■ Superb Fruit-Dove (V) ■ Superb Parrot (V) ○ Swift Parrot (E1) ● Varied Sittella (V) ● Yellow-bellied Glider (V) ● Yellow-bellied Shearwater (V) |
|--|--|

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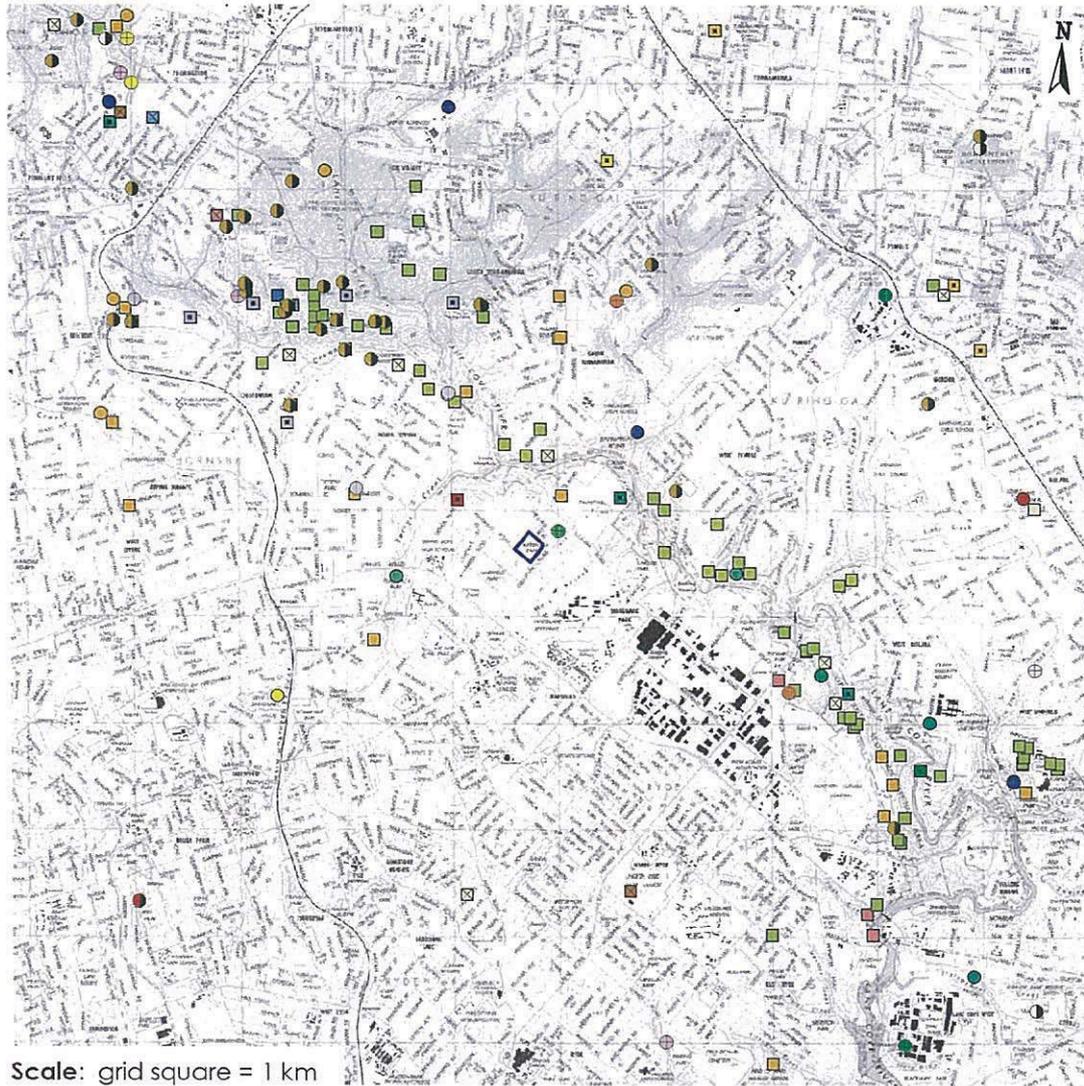


Figure 6. Threatened flora species records within 5 km of the study site

- | | |
|--|---|
| <ul style="list-style-type: none"> □ Site locality ● Acacia bynoeana (E1, 3VC-) ● Acacia pubescens (V, 3VCa) ● Amperea xiphioclada var. papillata (3KC-) ● Angophora crassifolia (2RCa) ● Boronia fraseri (2RC-) ■ Callistemon linearifolius (V, 2RCi) ■ Darwinia biflora (V, 2VCa) ■ Darwinia peduncularis (V, 3RCi) ■ Deyeuxia appressa (E1, 2E) ■ Epacris purpurascens var. purpurascens (V, 2KC-) ⊕ Eucalyptus camfieldii (V, 2VCI) ● Eucalyptus luehmanniana (2RCa) ● Eucalyptus nicholii (V, 3V) ⊕ Galium australe (E1) ● Genoplesium baueri (V, 3RC-) | <ul style="list-style-type: none"> ■ Grammitis stenophylla (E1) ■ Grevillea longifolia (2RC-) ■ Haloragodendron lucasii (E1, 2ECa) ■ Hibbertia nitida (2RC-) ■ Leptospermum deanei (V, 2VC-) ■ Lomandra brevis (2RC-) ■ Lomandra fluvialilis (3RCa) ■ Melaleuca biconvexa (V) ■ Melaleuca deanei (V, 3RC-) ■ Persoonia hirsuta (E1, 3KCi) ● Pimelea curviflora var. curviflora (V) ● Prostanthera marifolia (E4A, 2X) ● Pterostylis nigricans (V, 3VC-) ● Syzygium paniculatum (E1, 3VCi) ● Tetratheca glandulosa (V, 2VC-) ● Wilsonia backhousei (V) |
|--|---|

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Executive Summary

The proposal is to install lighting over the sports fields of Waterloo Park, Marsfield.

A flora and fauna survey was carried out at Waterloo Park to assess the likely impacts of lighting on species present on the site, and whether there is likely to be any significant effect on any endangered ecological community, endangered population, threatened species or their habitats, as per the listings in the Threatened Species Conservation Act 1995 (TSC Act 1995) (state legislation), the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999) (Commonwealth legislation) and other applicable local or regional policies.

The site is approximately 3.613 ha in size, of which canopy trees comprise approximately 1.2 ha. The remainder of the site is cleared and managed lands, occupied by amenities buildings and the sporting field. The canopy trees range from saplings to mature trees, however there are a few near to the boundary that are consistent with those of older (>50 years) vegetation. The groundlayer is suppressed under wood mulch and there is little to no understorey vegetation, with the exception of several planted shrubs, such as Tick Bush *Kunzea ambigua*, Dogwood *Ozothamnus diosmifolius* and Bottlebrush *Callistemon* sp.

There is little habitat value for small mammals, reptiles or frogs, but adequate habitat for birds is available on the site. The remaining vegetation forms a connective corridor to the remnant vegetation of Marsfield Park to the south and Lane Cove national Park to the north.

There were no threatened species or endangered ecological communities identified on the site during the survey.

The provisions of the EPBC Act 1999 do not apply to this proposal.

There is no impediment to this proposal in the scope of this report. There is not likely to be a significant effect on any endangered ecological community, threatened species or their habitats. A Species Impact Statement is not recommended.

Recommendations for this proposal include:

- a) Undertake a weed control program to remove all weed species from Class 1 to Class 5 categories, consistent with the provisions of the Noxious Weeds Act 1993.
- b) Install shielding to reduce the impact of stray light on the surrounding areas.
- c) Use of a timer would allow floodlighting to be controlled effectively so that lights are not illuminated un-necessarily.
- d) Re-instate the shrub layer to provide greater structural habitat and to assist in the screening of lights for the surrounding environment.
- e) Ensure that the floodlight positioning is providing maximum efficiency over the fields and minimises the stray light over the surrounding environment.



- f) Soil management during trenching works
 - i. Erosion and sediment control structures are to be installed prior to any earthworks commencing.
 - ii. Erosion and sediment control structures are to be cleared after any storm event.

Special considerations

- a) Site vegetation conditions detailed in this report are subject to change over time due to various factors, e.g. germination from seed bank, bushfire, etc. It is recommended that this report be submitted within 6 months, after which further fieldwork may be required.
- b) Ensure spill lighting from the floodlight lamps complies with the relevant Australian Standards.



1. Introduction

A fauna and flora survey of the proposed development site at Waterloo Park, Marsfield ('the site' – Figure 1) was undertaken on 29 November 2012.

The main aim of this survey was to determine whether the present proposal is likely to cause a significant effect on any endangered ecological community, endangered population, threatened species or their habitats. This assessment is based on the seven factors listed in Section 5A of the Environmental Planning and Assessment Act 1979, no. 203, (as amended), which are specifically addressed in Sections 8.6.1, and Appendix 1 of this report.

This assessment addresses both 'endangered' and 'vulnerable', as required by the Threatened Species Conservation Act, 1995 (TSC Act 1995). Throughout this report 'threatened' refers to those species and communities listed as 'endangered' or 'vulnerable' in Schedules 1 & 2 of the TSC Act 1995. 'Protected fauna' refers to any native bird, mammal (except the dingo), reptile or amphibian in NSW.

Other planning instruments addressed include SEPP 44 Koala Habitat Protection.

2. Description of the proposal and the site

2.1 The proposal

The proposal is to install flood lighting for the sports fields and consists of:

- a) Pole installation and light mountings,
- b) Trenching for electrical infrastructure

2.2 Site description

For the purposes of this report, the site is defined by the boundaries of Lot 1, DP574518, also known as 191 Waterloo Road, Marsfield. It is approximately 3.613 ha in size and the elevation is between 33 and 104 m above sea level.

The site is generally flat, sloping gently to the north-northeast. There is a watercourse identified on the topographical map, which flows from south to north through the site, and can be seen as a vegetation corridor with rough connectivity to Lane Cove National Park located to the north of the site across the M2 motorway.

The adjacent properties are residential and commercial, with shops to the north, a nursing home located to the south-south west and Macquarie University located south-south east.



The vegetation is described in detail in Section 5 below and fauna habitat is detailed in Section 4 below.

2.3 History of the site

The site has been historically cleared, which is evident in the 1943 Sydney suburbs image, depicting what appears to be market gardens and orchards Figure 3. This has altered the profile of the soil and the drainage, which would suggest that the original indigenous vegetation community no longer exists in any form, including soil seedbank.

The site in its current form is a sporting field, which is surrounded by planted native canopy species, of similar age classes, which are likely to be less than 30 years old.

2.4 Soils

Past grazing and agriculture uses of the site have altered the soils. It is unlikely that the profile or composition of the soils is similar to that which they would originally have been.

3. Methodology

3.1 Literature review

Literature reviewed in order to assess possible issues relating to this site include:

- Air photo
- Schedules to the TSC Act 1995
- Schedules to the EPBC Act 1999
- SEPP 44 Koala Habitat Protection
- ROTAP lists Briggs & Leigh
- NPWS Atlas of NSW Wildlife

3.2 Field work

Over the one day of fieldwork a total of 1.5 hours were spent undertaking survey work on the site and surrounding habitat areas.

Table 1. Survey dates and weather conditions

Date	Times	Weather (°C)	Task	Hours (hrs x no. people)
29 Nov12	12:45-14:15	Warm with 80% cloud cover and slight breeze temperature 27-29°C	Vegetation and fauna habitat assessment	(1 x 1.5) = 1.5
			Total	1.5 hours



Survey effort was concentrated within the site boundaries, although adjacent surrounding vegetation was noted.

3.3 Flora survey method

A comprehensive flora survey was conducted to compile vegetation descriptions and species lists for the site. ROTAPs (See Appendix 6) and threatened species were investigated on the basis of local species records and habitat availability (Figure 4). The habitat availability across the site for such listed species is very poor.

Class System for vegetation quality

Vegetation communities may be classified according to the grading system developed by Perkins for Cumberland Plain Woodland, and outlined by Berzins (1999). The Class system may also be used as the basis for classification of other vegetation communities and is used in this report in the description of the on-site vegetation.

Three main classes of vegetation quality are recognised, together with cleared and previously cleared areas constituting a fourth class. There is variation within each class, and in addition the class boundaries are somewhat fluid where one grades into the other.

CLASS 1 - areas consist of remnant or regenerating areas with a range of indigenous species and are representative of the description for the specific vegetation unit involved. Natural soils still dominate, and weed invasion is relatively minimal.

CLASS 2 - remnants and regenerating areas with a range of native canopy species, but with reduced native understorey and groundcover layers by comparison to Class 1.

CLASS 2 REGENERATING - similar to Class 2, but in the primary stages of regeneration after disturbance. Native understorey and groundcovers may be present, but assessment over time is needed to determine the abundance or otherwise of these species.

CLASS 3 - areas with a range of canopy species but native understorey and groundcover is generally absent. Weeds may be present, sometimes as dense cover. Natural soils are either absent or have been intensively and/or repeatedly disturbed. This Class does not meet the condition in the Final Determination that an area is likely to achieve a near-natural structure or a seral stage towards that structure under natural processes.

3.4 Fauna survey method

The methods of survey undertaken to detect the various faunal groups or their habitat are outlined below. Locations for specific survey methodologies are shown in Figure 4.



Roads and road verges were searched for road-kill fauna. Surveys for mammals, reptiles and frogs are generally run concurrently. Targeted searches were made for habitat of threatened birds, insectivorous bats and large forest owls on the basis of known local species records or habitat availability (Appendix 5).

Dates, weather and temperatures of all fieldwork were recorded and are tabulated in Section 3.2 above.

3.4.1 Diurnal fauna searches

Searching, opportunistic observations and call recording provides an indication of types of species using a site. These methods are used to identify and record live animals, or record indirect evidence of animal presence on the site. On occasions, specific surveys may be conducted for a targeted group or species, such as searching the margins of a dam for frogs. Generally though, birds, reptiles, frogs and mammals, or evidence of them, may all be present in the same habitat at the time of survey, therefore searching for these faunal groups is generally run concurrently. This involved:

- a) Searching shelter sites, basking sites, opportunistic observation, and assessment of shelter site diversity suitability for reptiles.
- b) Opportunistic observations and identification of calls of species, and search for indirect evidence such as nests, feathers, scratchings and feeding signs for birds.
- c) Searching for indirect evidence, such as diggings, droppings, runways and burrows, and opportunistic observations for mammals.

While rigorous surveys are likely to find more species, high species richness for birds can be recorded in a relatively short amount of time. Bird surveys are used as a simple indicator of other parameters, such as biodiversity and the functioning of the ecosystem.

3.5 Species likely to occur

Species to be listed as 'likely to occur' or 'expected' (see Appendix 4), are common species generally found in the region, which are likely to occur on site if suitable habitat is present.

Native flora may include species local to the area (occurring in local remnants). Structure and species composition will depend upon locally occurring communities.

Expected species are common and, by definition, are not threatened species.



3.6 Limitations of the survey

This survey was conducted in the warm spring season. This was suitable for most species that are likely to occur in the locality. An exception to this would be winter migrants or species of winter-flowering orchids that lose their aerial stems after fruiting.

The weather conditions were warm with heavy cloud cover becoming clear in the later part of the survey. The temperature ranged between 27 and 29°C and there was a slight breeze.

Species that may use the site were not detected during the survey for the following reasons:

- a) The species was present during the survey but was not detected due to dormancy, inactivity or cryptic habits.
- b) The species use the site at other times of the year, but was not present during the survey due to being nomadic or migratory.

4. Survey Results: Habitat

4.1 Site habitat descriptions

4.1.1 Planted native trees and shrubs

The majority of the site is lacking understorey, with wood mulch instead of shrubs and herbs. There are several species of native trees and shrubs that have been planted in the past, including *Eucalyptus* and *Allocasuarina*, *Hakea*, *Melaleuca*, *Callistemon*, *Banksia* and *Kunzea*. While these species are not likely to have been indigenous to the site, they provide valuable food resources for birds and other fauna in the region. The age of the trees is likely to be less than 30 years for most of them, however, there are a few older, more mature trees scattered along the boundaries of the site. There were no obvious large hollows in any of the trees located on the site and the age class would indicate it would be many years until significant hollows form; this can take in excess of 140 years.

4.1.2 Open playing fields

The largest portion of the site is cleared and managed as playing fields, comprising mown exotic grasses, which provide little to no habitat for fauna. Glossy Ibis were scavenging across the open areas and in proximity to the rubbish bins. Specific habitat features, rather than types, are listed below in Section 4.2.

4.2 Specific habitat features

Important habitat features that have significance for fauna occupation of the site are discussed below. These include both site disturbance and natural features.



There was no potential habitat trees of were observed on the site. There is generally a lack of fallen logs and dead wood/coarse woody debris.

Shelter/nesting/roosting sites and diversity	Habitat availability in the way of logs, leaf litter and coarse woody debris is limited. This has mostly been replaced with wood mulch, which provides shelter for invertebrates. The canopy trees provide suitable roosting habitat for birds, however no hollows were identified.
Food resources	The native species planted on the site provide a range of food resources for different species. <i>Banksia</i> , flowering <i>Melaleuca</i> , <i>Eucalyptus</i> and <i>Acacia</i> provide for nectivorous and blossom seeking species. While <i>Allocasuarina</i> and <i>Casuarina</i> species provide valuable seed resources. The understorey, which is lacking in structural habitat, provides shelter for invertebrate prey.
Vegetation layers and density of cover	The canopy covers approximately 1.2 ha of the site, which surrounds the sporting field and has limited structural habitat in the lower stratum. Small shrubs and planted ferns and grasses occupy the understorey with a scattered and patchy distribution.
Clearing	The site historically has been completely cleared. The current condition of the site is mostly cleared and managed lands surrounded by roads, residential and commercial buildings.
Fire damage and regrowth status	There is no evidence of recent fire.
Vehicle traffic and road mortality	Moderately busy roads surround the site, thus it is highly likely that mortality would occur.

4.3 Off-site habitat

Off site habitat consists of managed gardens and residential commercial dwellings. There is a reasonable amount of canopy vegetation within the region, including on the site of Macquarie University to the south-southeast. Further to this there is a green corridor that overlays the marked watercourse that flows from the south of the site to the north before discharging into the Lane Cove River, which is located approximately 683 m to the north. The vegetation in this riparian corridor appears to be generally intact once it clears the site and crosses Taranto Road, with the exception of the mown understorey at the road's edge.



5. Survey Results: Flora

5.1 Species and communities of conservation concern

There were no endangered ecological communities, threatened species or ROTAPs, identified on the site. The history of clearing and alteration of the soil profiles is likely to have removed any natural ecological community that had occurred on the site many decades ago.

5.2 Managed Lands

The vegetation on the site has been planted over past decades with a few different age classes present. Agline, used for watering, has installed at the bases of the many of the trees. The canopy vegetation occupies the outer boundaries of the site and part of the car park on the western side. The vegetation in the car park and along the northern section of the site includes Forest Oak *Allocasuarina torulosa*, River Oak *Casuarina cunninghamiana*, Sydney Peppermint *Eucalyptus piperita*, Spotted Gum *E. maculata*, Yellow Bloodwood *Corymbia eximia*, Tick Bush *Kunzea ambigua*, Hairpin Banksia *Banksia spinulosa* and *Melaleuca* sp.

The garden adjacent to the playground and amenities building contains various grass-like species, including *Lomandra gracilis*, Blue Flax Lily *Dianella caerulea*, Fountain Grass *Pennisetum* sp. and Gynea Lily *Doryanthes excelsior*. Other vegetation planted across the site includes a patch of predominantly Narrow-leaf Ironbark *E. crebra* on the western side, while, the remaining vegetation is of mixed species, including *Melaleuca decora*, Flax-leaved Paperbark *M. linariifolia*, Prickly leaved Tea-tree *M. styphelioides*, Broad-leaved Paperbark *M. quinquenervia*, Parramatta Wattle *Acacia parramattensis*, White Sally Wattle *A. floribunda*, Grey Box *Eucalyptus moluccana* and Dogwood *Ozothamnus diosmifolius*.

The sporting fields are low-mown exotic grasses and broad-leaf herbs, such as White Clover *Trifolium repens*.

Appendix 3 shows the list of flora found on the site.

5.3 Disturbance and Weeds

There were a few noxious weeds identified on the site, as listed below. These were in low numbers with scattered individuals observed in portions of the natural areas under the canopy cover.

Noxious weeds on the site include:

Asparagus fern	<i>Asparagus aethiopicus</i>	Class 4
Small-leaf Privet	<i>Ligustrum sinense</i>	Class 2
Wandering Jew	<i>Tradescantia fluminensis</i>	Class 3



In addition to the noxious weeds found on the site, there were several invasive species identified, including African Lily *Agapanthus praecox* subsp *orientalis*, Cootamundra Wattle *Acacia baileyana* and Wild Iris *Dietes grandiflora*, which do not require removal under the Noxious Weeds Act, 1993. However, due to the invasive nature of these species and the ability to encroach into surrounding natural bushland, their removal and replacement with more appropriate, less invasive species is recommended. This will help to enhance the conservation potential of the natural bushland on the site and reduce the impacts of these invasive species on surrounding natural bushland.

Weed Control Classes

- Class 1** - State Prohibited Weeds. "The plant must be eradicated from the land and the land must be kept free of the plant."
- Class 2** - Regionally Prohibited Weeds. "The plant must be eradicated from the land and the land must be kept free of the plant."
- Class 3** - Regionally Controlled Weeds. "The plant must be fully and continuously suppressed and destroyed."
- Class 4** - Locally Controlled Weeds. "The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority."
- Class 5** - Restricted Plants. "The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with."

Control objectives

The control objectives for each class is as follows:

- Class 1** is to prevent the introduction and establishment of those plants in NSW.
- Class 2** is to prevent the introduction and establishment of those plants in parts of NSW.
- Class 3** is to reduce the area and the impact of those plants in parts of NSW.
- Class 4** is to minimise the negative impact of those plants on the economy, community or environment of NSW.
- Class 5** is to prevent the introduction of those plants into NSW, the spread of those plants within NSW or from NSW to another jurisdiction.

Class 5 weeds are predominately weeds listed under the old Seeds Act, which has been repealed. There is no obligation to control Class 5 weeds. However Class 5 weeds are notifiable weeds. This means that the plant, or any animal or thing, which has the weed on it



or in it, cannot be sold, purchased or offered for sale in NSW. It cannot be removed from any land to another place and it cannot be scattered on land or water.

6. Survey results: Fauna

6.1 Species of conservation concern

There were no threatened species observed on the day of the survey.

6.2 Fauna results

A total of 10 species were detected, including birds and reptiles. Species listed as 'likely to occur' in the area are presented in Appendix 4. Note that the majority of the 'Expected Species' would not occur on the site due to the lack of habitat, (but do occur in the area). All the species listed as 'likely to occur' are common throughout the locality and the region. It is unlikely that protected species will be affected at a local, regional or state-wide scale by the proposal.

The habitats for threatened species that occur in the area are tabulated in Appendix 5.

Table 2. List of fauna detected on the site

Common Name	Scientific Name	Conservation Status	Recorded AE
Birds			
Galah	<i>Cacatua roseicapilla</i>		○
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>		○
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>		○
Red Wattlebird	<i>Anthochaera carnunculata</i>		○
Noisy Miner	<i>Manorina melanocephala</i>		○
Grey Butcherbird	<i>Cracticus torquatus</i>		○
Australian Magpie	<i>Gymnorhina tibicen</i>		○
Australian Raven	<i>Corvus coronoides</i>		○

Reptiles			
Grass Skink	<i>Lampropholis delicata</i>		
Garden Skink	<i>Lampropholis guichenoti</i>		

Key

- * = Introduced fauna
- = Observed
- W = Calls



6.3 Fauna Summary

The number of species from each faunal group, listed as 'likely to occur' can be seen in Appendix 4.

Mammals

There were no mammal species detected on the site. The site has limited available habitat for small mammals, which require large tree hollows for nesting or roosting. The lack of understorey is a limiting factor for occupation of this site by small mammals, as the exposure to predators is high. Many mammals are nocturnal and cryptic in their habit, thus a more detailed survey effort may detect species, such as Common Brushtail Possum and insectivorous bats, which are likely to forage on and off the site.

Reptiles

Two reptile species were detected on the site. Both Grass Skink and Garden Skink are common in an urban environment. These species were present in moderate numbers and could be seen foraging in the ground layer. Species not recorded during the survey but likely to occur on the site include Eastern Blue-tongue Lizard and Striped Skink.

Frogs

No frog species were detected on the site. There was limited habitat potential for frogs on the site. The marked watercourse is generally a dry drainage depression that extends off site into what appears to provide suitable frog habitat. The structural habitat for frogs in the form of ground layer litter and coarse woody debris or pondage areas does not exist on the site. It is possible that in periods of heavy prolonged rain water may collect across the site, which does not constitute quality habitat for frog species. Species not recorded during the survey but that could potentially occur on the site include Green Tree Frog.

Birds

Eight bird species were detected on the site, all of which occur commonly within the urban environment. Several White Ibis were seen scavenging on the sports field and in the surrounding developed areas. This species can become a nuisance in large numbers due to their boldness and size. Other species, such as the Noisy Miner and Australian Magpie, which were detected in moderate numbers of up to 15 individuals, are found in many urban environments.

Species not recorded during the survey but likely to occur on the site include Kookaburra and Eastern Spinebill.



6.4 Microbats

Foraging Habitat

This site provides potentially suitable foraging habitat for six of the eight possible threatened species. *Myotis macropus* (syn. *Myotis adversus*) has no suitable foraging habitat in the form of open water bodies. *Kerivoula papuensis* is only likely to forage in areas within a few kilometres of rainforest or rainforest gullies. The installation of lighting on the sports field may potentially increase the foraging opportunity for bats occurring in the region, as insectivorous bats are often noticed gleaning insects from the air around artificial lighting.

Roosting Habitat

This site has no suitable tree hollows to provide roosting habitat for *Falsistrellus tasmaniensis*, *Mormopterus norfolkensis*, *Scoteanax rueppellii*, *Myotis adversus* and *Saccolaimus flaviventris*. This site has no caves, bridges, buildings and other suitable (often human-made) structures that provide potentially suitable roosting habitat for *Chalinolobus dwyeri*, *Miniopterus schreibersii*, *Myotis adversus* and *Myotis macropus*. *Kerivoula papuensis* normally roosts in hanging bird nests or trees in rainforest gullies so is very unlikely to roost on the surveyed site.

6.5 Feral fauna

There were no feral fauna species identified on the day of the survey. The proximity to residential dwellings and the built-up environment of the greater region would indicate that it is likely that dogs and cats may visit the site. Other species that may potentially occur include House Mouse and Black Rat.

7. Discussion of results

The site has been historically cleared and used for agriculture and market gardens before coming to its current state. These agricultural practices have sufficiently altered the soil profile of the indigenous vegetation community to suggest that there are no elements of the original vegetation remaining, including the soil seedbank.

The current use of the site is that of a sporting field and playground, which provides recreational and natural areas for the Marsfield community. Residential and commercial establishments surround the sporting fields, with Macquarie University located approximately 100 m south east of the site. There is a green corridor starting in Marsfield Park, which is south west of Waterloo Park, forming connectivity to the Lane Cove National Park, which is located approximately 500 m to the north.



The canopy vegetation on the site is mostly planted *Eucalyptus*, *Melaleuca* and *Acacia* species, which have a limited understorey or shrub layer of selected native shrubs including *Banksia* and *Kunzea*. These planted trees appear to be of similar age class (<30 years) with some newer plantings along the boundaries. There is the occasional larger tree, with a d.b.h. of greater than 50 cm, however these are not common. The groundlayer is heavily mulched with woodchip, which helps suppress the weeds, which were therefore limited to isolated individuals across the site.

While no large hollow-bearing trees for nesting or roosting were identified on the day of the survey, there is some habitat value for native fauna, such as canopy trees for birds. These flowering *Eucalyptus*, *Acacia* and *Melaleuca* species provide a high value food resource for numerous species, including threatened species known to forage in the region, such as Grey-headed Flying-fox and Little Lorikeet. Other fauna species identified in the area are commonly found in urban environments and thus will likely adjust to disturbance, including illumination changes, more readily than other more cryptic species would. A grove of planted *Casuarina cunninghamiana* and *Allocasuarina torulosa* trees, on the south western side of the site adjacent to the car park, provide valuable food and shelter resources for cockatoos and other granivorous fauna in the region.

The proximity to residential dwellings suggests it would be highly likely that domestic animals would frequent the site, indicating that the diversity of native fauna is likely to be low. The off-site habitat in the riparian corridors of nearby watercourses appears to have a high diversity of native flora and fauna species. This forms a green corridor from the site to other areas of vegetation in the region including the Lane Cove National Park approximately 500 m to the north.

Ecological services for the site e.g. bioturbators, pollinators, seed dispersers are present, but not functioning at full potential, which is partly due to management practices and subsequent changes in the structural ecosystem features, such as mulching understorey and the mown open areas.

8. Impact on flora and fauna

8.1 Long-term prospects with no development or maintenance

The long-term prospects for the site without development or maintenance are likely to see the site fall into disrepair. There is no natural vegetation remaining, with the site having been heavily cleared and used as agriculture and market gardens as far back as the 1940's. The current use as a sporting field is not consistent with the recovery of the site's original natural vegetation. Thus with no site maintenance exotic species, including grass, would likely dominate the site. Other threats to the site include soil compaction, vandalism, runoff, feral fauna and domestic pets.



The management of the sporting fields has subjected the ground to frequent mowing and measures for grass growing. These, together with soil compaction as a result of the playing field, are not conducive to the natural recruitment of native species.

8.2 Possible long-term condition with maintenance and removal of threats

The best possible solution for this site is to continue to operate as a managed ground, which has open natural areas that provide food resources, screening opportunity and connectivity to adjacent vegetation. The conservation potential of the site is lower than that of other locations in the region, which have not undergone such dramatic changes to the soil profiles as well as the vegetation. The control of weed species would reduce the impact of invasive species on the natural bushland in the region, such as Asparagus Fern and Privet. It would take many decades and involve large-scale revegetation in order to return the site to a form of natural vegetation.

8.3 Proposal and impact

8.3.1 Short-term impact

The proposal is to install floodlighting for the operation of the sporting fields for longer periods of the year. This will include the illumination of the fields for a maximum of 26 hours per week, with less time required in the spring/summer seasons. This will in the short term produce dust and noise during the installation, and subsequent light rays into adjacent canopy trees for these periods. This may have an effect on roosting birds in the locality, which may be unsettled for the short term. This may also affect the neighbouring properties from stray light entering windows.

8.3.2 Long-term impact

The long-term impact will be additional light hours for the above mentioned periods, which may have an impact on the potential occupation of trees on the site by birds. On the other hand the addition of lighting, may increase the potential foraging habitat for small insectivorous bats, which are known to glean insects from the air in the proximity to outdoor lighting on sporting fields.

8.4 Measures to ameliorate impact

The installation of lighting will create minor disruption to the natural life cycles of the species occurring in the locality. Installation shielding to direct the light onto the sports field and thus reduce the risk of stray lighting will help minimise the impact to the surrounding natural areas. Additionally, ensure the lighting is only used when required; the use of a timer may eliminate the unnecessary use at other times.



8.5 Measures to enhance habitat

The structural habitat of the site is not consistent with a natural area. Replacing the shrublayer with locally indigenous species may provide additional opportunity for small birds and reptiles to occupy the site. The use of taller growing shrubs would also provide screening from light that may interrupt the natural routines of species occupying the site.

8.6 Impact on floral and faunal species, populations and communities

8.6.1 Seven-part test summary

Habitat requirements for locally occurring threatened faunal species, and the presence or absence of such habitat on the site, is tabulated in Appendix 5. Threatened plant species, listed in the TSC and EPBC Acts, are shown in Appendix 6.

Under Section 5A of the EP&A Act several factors (listed in Appendix 1) need to be considered in deciding whether there is likely to be a Significant effect on threatened species, populations or ecological communities, or their habitats. If there is likely to be a significant effect on threatened species, etc., a Species Impact Statement is recommended.

Table 3. Summary of the seven-part tests shown in full in Appendix 1

Species/Communities	Recorded on site	C'wealth listing EPBC Act '99	State listing TSC Act '95	Result	
Threatened Birds					
Varied Sittella		-	Sch. 2, Vul.		
<i>Daphoenositta chrysoptera</i>					
Swift Parrot <i>Lathamus discolor</i>		Endangered	Sch. 1, End.		
Regent Honeyeater		Endangered	Sch. 1, Crit. End.		
<i>Anthochaera phrygia</i>					
Little Lorikeet <i>Glossopsitta pusilla</i>	No	-	Sch. 2, Vul.	No significant effect	
Gang-gang Cockatoo		-	Sch. 2, Vul.		
<i>Callocephalon fimbriatum</i>					
Glossy Black-cockatoo		-	Sch. 2, Vul.		
<i>Calyptorhynchus lathamii</i>					
Superb Parrot <i>Polytelis swainsonii</i>		Vulnerable	Sch. 2, Vul.		
Insectivorous bats					
Eastern Bentwing-bat		-			
Eastern Freetail-bat	No	-	Sch. 2, Vul.	No significant effect	
Yellow-bellied Sheath-tail-bat		-			
Large-eared Pied Bat		Vulnerable			
Large Forest Owls					
Powerful Owl <i>Ninox strenua</i>	No	-	Sch. 2, Vul.	No significant effect	
Barking Owl <i>Ninox connivens</i>					
Grey-headed Flying-fox	No	Vulnerable	Sch. 2, Vul.	No significant effect	
<i>Pteropus poliocephalus</i>					

A Species Impact Statement is not recommended.



9. Planning Instruments

9.1 SEPP 44 Koala Habitat Protection

The site falls within the Koala Management Area No. 2 Central Coast.

The result is negative. Less than 15% of the trees on the site are Scheduled SEPP 44 species, therefore the site is not potential Koala habitat. The connectivity to the site and other areas of vegetation is limited and the availability of feed trees is low. Furthermore, Koalas are not known in the locality and dispersal opportunity is poor.

The following is a list of SEPP44 scheduled Koala feed tree species:

Bimble Box or Poplar Box (*Eucalyptus populnea*)
Broad-leaved Scribbly Gum (*Eucalyptus haemastoma*)
Forest Red Gum (*Eucalyptus tereticornis*)
Grey Gum (*Eucalyptus punctata*)
Ribbon or Manna Gum (*Eucalyptus viminalis*)
River Red Gum (*Eucalyptus camaldulensis*)
Scribbly Gum (*Eucalyptus signata*)
Swamp Mahogany (*Eucalyptus robusta*)
Tallowwood (*Eucalyptus microcorys*)
White Box (*Eucalyptus albens*)

A more detailed list of Koala feed tree species can be found in the Koala Draft Recovery Plan (NPWS, 2008).

9.2 Environment Protection and Biodiversity Conservation Act 1999

There were no Critically Endangered or Endangered species or communities, or Vulnerable species recorded on the site. The provisions of the EPBC Act do not apply to this proposal.

10. Recommendations

The following recommendations apply:

- a) Undertake a weed control program to remove all weed species from Class 1 to Class 5 categories, consistent with the provisions of the Noxious Weeds Act 1993.
- b) Install shielding to reduce the impact of stray light on the surrounding areas.
- c) Use of a timer would allow floodlighting to be controlled effectively so that lights are not illuminated un-necessarily.



- d) Re-instate the shrub layer to provide greater structural habitat and to assist in the screening of lights for the surrounding environment.
- e) Ensure that the floodlight positioning is providing maximum efficiency over the fields and minimises the stray light over the surrounding environment.
- f) Soil management during trenching works
 - i. Erosion and sediment control structures are to be installed prior to any earthworks commencing.
 - ii. Erosion and sediment control structures are to be cleared after any storm event.

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Appendix 1. Seven-part tests

While the overall proposal incorporates mitigating considerations and offsets, these are not taken into account in determining the outcome of the seven-part tests.

Insectivorous bats

Large-eared Pied Bat *Chalinolobus dwyeri*

Eastern Freetail-bat *Mormopterus norfolkensis*

Eastern Bentwing-bat *Miniopterus schreibersii*

Yellow-bellied Sheath-tail-bat *Saccolaimus flaviventris*

- a. in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

No. *Chalinolobus dwyeri* roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin, frequenting low to mid-elevation dry open forest and woodland close to these features. It remains loyal to the same cave over many years. It is found in well-timbered areas containing gullies.

Mormopterus norfolkensis is known to occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. It roosts mainly in tree hollows but will also roost under bark or in man-made structures.

Miniopterus schreibersii roosts primarily in caves, but also uses derelict mines, storm-water tunnels, buildings and other man-made structures. It hunts in forested areas, catching moths and other flying insects above the tree tops.

Saccolaimus flaviventris roosts in tree hollows and buildings; in treeless areas it is known to utilise mammal burrows. When foraging for insects, it flies high and fast over the forest canopy, but lower in more open country. It forages in most habitats across its very wide range, with and without trees and appears to defend an aerial territory.

Potential on-site roosting habitat for these species is very low, thus any that occur in the locality are likely to forage both on and off the site, due to suitable roosting habitat nearby in the Lane Cove National Park. The proposal will not require the removal of habitat for these species. However, it may alter the hours exposed to light by up to 26 hours a week, which will be less in the warmer periods of the year, when these species are more active. The installation of floodlighting over the sporting fields may have a beneficial effect on these species, as insectivorous bats are known to forage on insects congregating around artificial lighting. Therefore, the installation of floodlighting is not likely to have an adverse effect on the life cycles of individuals or populations that may occur in the locality such that they will be placed at risk of extinction.



- b. in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable. This test is for a group of threatened species.

- c. in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

Not applicable. This test is for a group of threatened species.

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

Not applicable. This test is for a group of threatened species.

- d. in relation to the habitat of a threatened species, population or ecological community:

- i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

There will be no habitat removed for the installation of the floodlighting. The area to be exposed to extra lighting for a maximum of 26 hours a week is approximately 1.5 ha, which could be considered potential foraging habitat. The introduction of lighting to these grounds could have a beneficial effect on these species, as food resources will concentrate in the vicinity of the lighting.

- ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

No. The habitat of these species will remain unchanged in structural composition and will not become fragmented or isolated from other areas of habitat in the region. The proposed addition of lighting will not affect this status.

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

Negligible. There is no habitat to be removed for the installation of the floodlighting. However, there will be a modification to approximately 1.5 ha for a maximum of 26 hours per week in the light exposure due to artificial lighting. The installation of the lighting is highly unlikely to have an adverse effect on the long-term survival of these species; and may in fact



have a beneficial effect by providing higher food resource by means of insects congregating at the floodlighting.

- e. **whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),**

No. Critical habitat has not been declared for these species.

- f. **whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,**

Yes. A national recovery plan exists for *Chalinolobus dwyeri*. Recovery plans currently do not exist for each of these species. However, a number of priority actions have been identified for each of these species, as indicated in brackets after each name: Large-eared Pied Bat (17), Eastern Freetail-bat (18), Eastern Bentwing-bat (25), Greater Broad-nosed Bat (18), Yellow-bellied Sheath-tail-bat (21) and Little Bentwing-bat (25).

The proposal does not require the removal of habitat for these species and is therefore consistent with the general objectives of these plans.

- g. **whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.**

No. The installation of floodlighting does not require the "removal of hollows" or "clearing of native vegetation" which are key threatening processes relevant to these species. Key threatening processes are listed under the TSC Act, 1995 and the Commonwealth's EPBC Act, 1999.

Conclusion

The proposed activity is unlikely to have a significant effect on Large-eared Pied Bat, Eastern Freetail-bat, Eastern Bentwing-bat, or Yellow-bellied Sheath-tail-bat. Therefore a Species Impact Statement is not recommended.



Large Forest Owls

Powerful Owl *Ninox strenua*

Barking Owl *Ninox connivens*

- a. in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

No. Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. It requires large tracts of habitat but can occur in fragmented landscapes, where it hunts in open or closed sclerophyll forests or woodlands and occasionally in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine *Syncarpia glomulifera*, Black She-oak *Allocasuarina littoralis*, Blackwood *Acacia melanoxylon*, Rough-barked Apple *Angophora floribunda*, Cherry Balart *Exocarpos cupressiformis* and a number of eucalypt species.

Barking Owl inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend into closed forest and more open areas. It roosts in shaded portions of tree canopies, including tall midstorey trees with dense foliage such as *Acacia* and *Casuarina* species. It preferentially hunts small arboreal mammals such as possums, but when loss of tree hollows reduces these prey populations, the owl becomes more reliant on birds, invertebrates and terrestrial mammals such as rodents and rabbits. It is capable of catching bats and moths on the wing, but typically hunts by striking from a tall perch. It requires very large permanent territories in most habitats due to sparse prey densities. Monogamous pairs hunt over as much as 6,000 ha, with 2,000 ha being more typical.

The proposal will not require the removal of habitat for these species. However, it may alter the hours exposed to light by up to 26 hours a week, which will be less in the warmer periods of the year, due to eastern daylight standard time. There are no large hollows on site to provide potential nesting sites for these species. However, there is suitable breeding habitat for these species in the nearby Lane Cove National Park, which is located approximately 500 m to the north. Thus due to the high mobility of these species it is likely that individuals that occur in the region may forage both on and off site. Therefore it is unlikely that the installation of floodlighting will have an adverse effect on the life cycles of these species such that any local population would be placed at risk of extinction.

- b. in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable. This test is for a group of threatened species.



c. in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed;

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

Not applicable. This test is for a group of threatened species.

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

Not applicable. This test is for a group of threatened species.

d. in relation to the habitat of a threatened species, population or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

There will be no habitat removed for the installation of the floodlighting. The area to be exposed to extra lighting for a maximum 26 hours a week is approximately 1.5 ha, which could be considered potential foraging habitat. Large forests owls have an extensive home range and are therefore likely to forage in other areas of the region. The modification to the area is likely to only be produced from the additional light phase.

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

No. The habitat of these species will remain unchanged in structural composition and will not become fragmented or isolated from other areas of habitat in the region. The proposed addition of lighting will not affect this status.

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

Negligible. There is no habitat to be removed for the installation of the floodlighting. However, there will be a modification to approximately 1.5 ha for a maximum of 26 hours per week in the light exposure due to artificial lighting. The installation of the lighting is highly unlikely to have an adverse effect on the long-term survival of these species; and may in fact have a beneficial effect by providing higher food resource by means of insects and insectivorous bats congregating at the floodlighting.

e. whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No. Critical habitat has not been declared for these species.



- f. **whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,**

Yes. A recovery plan exists for Large Forest Owls, which includes Powerful Owl, Sooty Owl and Masked Owl, and a draft Recovery Plan exists for Barking Owl. The structural habitat for prey will remain unchanged, and while some possums, if they exist near the site, may move further afield, there would be an increase in bat and insect activity.

- g. **whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.**

No. The installation of floodlighting does not require the "removal of hollows" or "clearing of native vegetation" which are key threatening processes for these species. Key threatening processes are listed under the TSC Act, 1995 and the Commonwealth's EPBC Act, 1999.

Conclusion

The proposed activity is unlikely to have a significant effect on Powerful Owl or Barking Owl. Therefore a Species Impact Statement is not recommended.



Threatened Forest Birds

Varied Sittella *Daphoenositta chrysoptera*

Swift Parrot *Lathamus discolor*

Regent Honeyeater *Anthochaera phrygia*

Little Lorikeet *Glossopsitta pusilla*

Gang-gang Cockatoo *Callocephalon fimbriatum*

Glossy Black-cockatoo *Calyptorhynchus lathami*

Superb Parrot *Lathamus discolor*

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

No. Varied Sittella occupies Eucalyptus forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. It feeds on arthropods gleaned from crevices in rough or decortivating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy.

Swift Parrot migrates to the Australian south-east mainland between March and October. Its favourite feed trees include winter flowering species, such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon* and White Box *E. albens*. It also frequents lerp-infested trees, such as Grey Box *E. moluccana* and Blackbutt *E. pilularis*.

Regent Honeyeater is a generalist forager, which mainly feeds on the nectar from a wide range of *Eucalyptus* and mistletoes. Some of the favourite species include Mugga Ironbark, *E. sideroxylon*, Blakely's Red Gum *E. blakelyi*, and Swamp Mahogany *E. robusta*. It also uses: Grey Gum *E. punctata*, Grey Box *E. moluccana*, Narrow leaf Ironbark *E. crebra*, Spotted Gum *Corymbia maculata*, Red Gum *E. macrorrhyncha* and Rough Barked Apple *Angophora floribunda*. Insects make up about 15% of its total diet, however nectar and fruit from mistletoes *Amyema* sp. are also eaten, as is lerp and honeydew when nectar is scarce. A shrubby understorey is an important source of insects and nesting material.

Little Lorikeet forages primarily in the canopy of *Eucalyptus*, *Angophora* and *Melaleuca* in open forest and woodland habitats. Riparian habitats are particularly used due to higher soil fertility and hence greater productivity. It feeds mostly on nectar and pollen, occasionally on native fruits such as mistletoe and roosts in treetops, often distant from feeding areas. It nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked *Eucalyptus*. The entrance is small (3 cm) and usually high above the ground (2–15 m). These nest sites are often used repeatedly for decades, suggesting that preferred sites are limited. Riparian trees are often chosen, including species like *Allocasuarina*.



Gang-gang Cockatoo in summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, it may occur at lower altitudes in drier more open Eucalypt forests and woodlands, and often found in urban areas. It moves to lower altitudes in winter, preferring more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. It favours old growth attributes for nesting and roosting.

Glossy Black-cockatoo occupies open forest and woodlands of the coast and the Great Dividing Range up to 1,000 m in which stands of She-oak species, particularly Black She-oak *Allocasuarina littoralis*, Forest She-oak *A. torulosa* or Drooping She-oak *A. verticillata* occur. It feeds almost exclusively on the seeds of several species of *Casuarina* and *Allocasuarina* species, shredding the cones with the massive bill. It is dependent on large hollow-bearing eucalypts for nest sites.

Superb Parrot inhabits Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. It may forage up to 10 km from nesting sites, primarily in grassy box woodland. It feeds in trees and understorey shrubs and on the ground and its diet consists mainly of grass seeds and herbaceous plants. It also eats fruits, berries, nectar, buds, flowers, insects and grain.

The proposal will not require the removal of habitat for these species. However, it may alter the hours exposed to light by up to 26 hours a week, which will be less in the warmer periods of the year, due to eastern daylight standard time. This extended light phase may interrupt the night-time roosting for diurnal species, however, this impact is not likely to be significant as the birds would move to other trees further away. There are no large hollows on site to provide potential nesting sites for many of these species. Conversely, there is suitable breeding habitat for these species in the nearby Lane Cove National Park, which is located approximately 500 m to the north. Thus due to the high mobility of these species it is likely that individuals that occur in the region may forage both on and off site. Therefore it is unlikely that the installation of floodlighting will have an adverse effect on the life cycles of these species so that individuals or populations in the locality will be placed at risk of extinction.

- b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,**

Not applicable. This test is for a group of threatened species.

- c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:**

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

Not applicable. This test is for a group of threatened species.



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

Not applicable. This test is for a group of threatened species.

d) in relation to the habitat of a threatened species, population or ecological community:

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

There will be no habitat removed for the installation of the floodlighting. The area to be exposed to extra lighting for a maximum of 26 hours a week is approximately 1.5 ha, which may effect the night-time roosting of these diurnal birds.

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

No. The habitat of these species will remain unchanged in structural composition and will not become fragmented or isolated from other areas of habitat in the region. The proposed addition of lighting will not affect this status.

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

Negligible. There is no habitat to be removed for the installation of the floodlighting. However, there will be a modification to approximately 1.5 ha in the light exposure due to artificial lighting for a maximum of 26 hours per week. The installation of the lighting is highly unlikely to have an adverse effect on the long-term survival of these species.

- e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),**

No. Critical habitat has not been declared for these species.

- f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,**

Yes. National recovery plans exist for Swift Parrot and Regent Honeyeater. Priority actions have been identified for the following species; Swift Parrot (13), Regent Honeyeater (41), Gang-gang Cockatoo (11), Glossy Black-cockatoo (10) and Superb Parrot (25). The key threat to all these species is the removal of habitat, which will not be affected by this proposal.



- g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.**

No. The installation of floodlighting does not require the "removal of hollows" or "clearing of native vegetation" which are key threatening processes for these species. Key threatening processes are listed under the TSC Act, 1995 and the Commonwealth's EPBC Act, 1999.

Conclusion

The proposed activity is unlikely to have a significant effect on Varied Sittella, Swift parrot, Regent Honeyeater, Little Lorikeet, Gang-gang Cockatoo, Glossy Black-cockatoo or Superb Parrot. Therefore a Species Impact Statement is not recommended.



Grey-headed Flying-fox *Pteropus poliocephalus*

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

No. Grey-headed Flying-fox occupies a range of habitats including subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. It roosts in camps, which are generally located within 20 km of a regular food source and is commonly found in gullies, close to water, in vegetation with a dense canopy. It exhibits a high site fidelity to camps; some camps have been used for over a century. Grey-headed Flying-fox can travel up to 50 km from the camp to forage; commuting distances are more often <20 km. It feeds on the nectar and pollen of native trees, in particular *Eucalyptus*, *Melaleuca* and *Banksia*, and fruits of rainforest trees and vines.

Opportunity for roosting camps on the site is very low for this species, thus any that occur in the locality are likely to forage both on and off the site, using suitable roosting habitat nearby in the Lane Cove National Park. The proposal will not require the removal of habitat for Grey-headed Flying-fox, however it may alter the hours exposed to light by up to 26 hours a week, which will be less in the warmer periods of the year, when these species are more active. Grey-headed Flying-fox is known to forage in urban environments, thus is adaptable to change, such that the installation of floodlighting is not likely to have an adverse effect on the life-cycles of individuals or populations that may occur in the locality so that they will be placed at risk of extinction.

- b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable. This test is for a threatened species.

- c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

Not applicable. This test is for a threatened species.

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

Not applicable. This test is for a threatened species.



d) in relation to the habitat of a threatened species, population or ecological community:

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

There will be no habitat removed for the installation of the floodlighting. The area to be exposed to extra lighting for a maximum 26 hours a week is approximately 1.5ha, which could be considered potential foraging habitat. The introduction of lighting to these grounds is unlikely to adversely impact Grey-headed Flying-fox due to its high mobility and opportunity to forage both on off site.

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

No. The habitat of this species will remain unchanged in structural composition and will not become fragmented or isolated from other areas of habitat in the region. The proposed addition of lighting will not affect this status.

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

Negligible. There is no habitat to be removed for the installation of the floodlighting. However, there will be a modification to approximately 1.5 ha for a maximum of 26 hours per week, in the light exposure due to artificial lighting. The installation of the lighting is highly unlikely to have an adverse effect on the long-term survival of this species.

- e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),**

No. Critical habitat has not been declared for this species.

- f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,**

Yes. A National Recovery Plan exists for Grey-headed Flying-fox, which lists habitat loss as one of the key threatening processes in the decline in this species. Furthermore 31 priority actions, relevant to the conservation of this species, have been defined. The relationship between Grey-headed Flying-fox and agricultural enterprises is another concern, with the impact on farming and the response to monetary losses seeing a decline in available habitat and distension from farmers. The proposal will not remove habitat or interfere with Grey-headed Flying-fox response to agriculture in the region.



- g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

No. The installation of floodlighting does not require the "removal of hollows" or "clearing of native vegetation" which are key threatening processes for this species. Key threatening processes are listed under the TSC Act, 1995 and the Commonwealth's EPBC Act, 1999.

Conclusion

The proposed activity is unlikely to have a significant effect on Grey-headed Flying-fox. Therefore a Species Impact Statement is not recommended.



Appendix 2. Final Determinations

The Scientific Committee, established by the Threatened Species Conservation Act 1995, has made a Final Determination to list the following processes, which are applicable to the proposal, as key threatening processes on Schedule 3 of the Act:

- a) Clearing of Native Vegetation
- b) Loss of Hollow-bearing Trees

A full profile of all listed key threatening processes can be seen at the NSW NPWS website:
http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/home_threats.aspx



Appendix 3. Flora species list

The grid reference for this locality is 324 753 East 6 261 653 North (AMG 1966)

FILICOPSIDA

Asplenium australasicum

DICOTYLEDONS

Acmena smithii

Allocasuarina torulosa

Angophora floribunda

Acacia parramattensis

Acacia implexa

Acacia floribunda

Acacia baileyana

Banksia spinulosa

Callistemon salignus

Casuarina cunninghamiana

Cayratia clematidea

Corymbia eximia

Cotula australis

Elaeocarpus reticulatus

Eucalyptus microcorys

Eucalyptus grandis

Eucalyptus punctata

Eucalyptus maculata

Eucalyptus piperita

Eucalyptus crebra

Eucalyptus moluccana

Eucalyptus tereticornis

Grevillea x hybrid

Hakea salicifolia

Kunzea ambigua

Melaleuca bracteata

Melaleuca linariifolia

Melaleuca styphelioides

Melaleuca quinquenervia

Melia azedarach

Ozothamnus diosmifolius

Pultenaea flexilis

Pittosporum undulatum

Tristaniopsis laurina

Tylophora barbata

* *Cyclosporum leptophyllum*

* *Gamochaeta* sp.

* *Hypochoeris radicata*

* *Ligustrum sinense* N4

* *Malva parviflora*

* *Nandina domestica*

* *Plantago lanceolata*

* *Portulaca oleracea*

* *Polycarpon tetraphyllum*

* *Senna* sp.

* *Sida rhombifolia*

* *Sonchus oleraceus*

* *Solanum nigrum*

* *Trifolium repens*



MONOCOTYLEDONS

**Cynodon dactylon*

Cyperus imbecillis

Dianella caerulea var. *producta*

Dianella caerulea var. *caerulea*

Dianella longifolia

Dichondra repens

Doryanthes excelsior

Lomandra gracilis

Xanthorrhoea sp.

* *Agapanthus praecox* subsp. *orientalis*

* *Asparagus aethiopicus* N4

* *Bromus catharticus*

* *Dietes grandiflora*

* *Ehrharta erecta*

* *Lolium perenne*

* *Pennisetum* sp.

* *Tradescantia fluminensis* N4

* = Exotic species (weeds).

= Non-local native species

N = Noxious weed



Appendix 4. Expected fauna species in the Sydney Basin

Mammals

Common name	Scientific name
White-striped Mastiff-bat	<i>Tadarida australis</i>
Gould's Wattled Bat	<i>Chalinolobus gouldii</i>
Chocolate Wattled Bat	<i>Chalinolobus morio</i>
Lesser Long-eared Bat	<i>Nyctophilus geoffroyi</i>
Gould's Long-eared Bat	<i>Nyctophilus gouldi</i>
Bush Rat	<i>Rattus fuscipes</i>
Swamp Rat	<i>Rattus lutreolus</i>
Long-nosed Bandicoot	<i>Perameles nasuta</i>
Brown Antechinus	<i>Antechinus stuartii</i>
Dusky Antechinus	<i>Antechinus swainsonii</i>
Yellow-footed Antechinus	<i>Antechinus flavipes</i>
Common Wombat	<i>Vombatus ursinus</i>
Common Ringtail Possum	<i>Pseudocheirus peregrinus</i>
Sugar Glider	<i>Petaurus breviceps</i>
Feather-tail Glider	<i>Acrobates pygmaeus</i>
Eastern Grey Kangaroo	<i>Macropus giganteus</i>
Large Forest Eptesicus	<i>Vespadelus darlingtoni</i>
Little Forest Eptesicus	<i>Vespadelus vulturnus</i>
Common Wallaroo	<i>Macropus robustus</i>
Red-necked Wallaby	<i>Macropus rufogriseus</i>
Swamp Wallaby	<i>Wallabia bicolor</i>
Common Brush-tail Possum	<i>Trichosurus vulpecula</i>
Greater Glider	<i>Petauroides volans</i>
Echidna	<i>Tachyglossus aculeatus</i>
Fox	<i>Vulpes vulpes</i>
Black Rat	<i>Rattus rattus</i>
Rabbit	<i>Oryctolagus cuniculus</i>

Frogs

Common Name	Scientific Name
Green Tree Frog	<i>Litoria caerulea</i>
Blue Mountains Tree Frog	<i>Litoria citropa</i>
Bleating Tree Frog	<i>Litoria dentata</i>
Eastern Dwarf Tree Frog	<i>Litoria fallax</i>
Jervis Bay Tree Frog	<i>Litoria jervisiensis</i>
Broad-palmed Frog	<i>Litoria latopalmata</i>
Peron's Tree Frog	<i>Litoria peronii</i>
Leaf Green Tree Frog	<i>Litoria phyllochroa</i>
Laughing Tree Frog	<i>Litoria tyleri</i>
Verreaux's Tree Frog	<i>Litoria verreauxii</i>
Common Eastern Froglet	<i>Crinia signifera</i>
Eastern Banjo Frog	<i>Limnodynastes dumerillii</i>
Ornate Burrowing Frog	<i>Limnodynastes ornatus</i>
Brown-striped Frog	<i>Limnodynastes peronii</i>
Spotted Grass Frog	<i>Limnodynastes tasmaniensis</i>
Haswell's Toadlet	<i>Paracrinia haswelli</i>
Smooth Toadlet	<i>Uperoleia laevigata</i>
Tyler's Toadlet	<i>Uperoleia tyleri</i>



Reptiles

Common Name	Scientific Name
Diamond Python	<i>Morelia spilota spilota</i>
Common Death Adder	<i>Acanthophis antarcticus</i>
Yellow-faced Whip Snake	<i>Demansia psammophis</i>
Green Tree Snake	<i>Dendrelaphis punctulata</i>
Golden Crowned Snake	<i>Cacophis squamulosus</i>
Eastern Small-eyed Snake	<i>Cryptophis nigrescens</i>
Red-naped Snake	<i>Furina diadema</i>
Marsh Snake	<i>Hemiaspis signata</i>
Eastern Tiger Snake	<i>Notechis scutatus</i>
Red-bellied Black Snake	<i>Pseudechis porphyriacus</i>
Eastern Brown Snake	<i>Pseudonaja textilis</i>
Black-headed Snake	<i>Suta spectabilis ssp dwyeri</i>
Bandy Bandy	<i>Vermicella annulata</i>
Blind Snake	<i>Ramphotyphlops nigrescens</i>
Stone Gecko	<i>Diplodactylus vittatus</i>
Lesueur's Velvet Gecko	<i>Oedura lesueurii</i>
Broad Tailed Gecko	<i>Phyllurus platurus</i>
Thick Tailed Gecko	<i>Underwoodisaurus millii</i>
Burton's Snake-lizard	<i>Lialis burtonis</i>
Scaly-foot Lizard	<i>Pygopus lepidopodus</i>
Jacky Lizard	<i>Amphibolurus muricatus</i>
Bearded Dragon	<i>Pogona barbata</i>
Swanson's Limbless Skink	<i>Anomalopus swansonii</i>
Eastern Blue-tongued Skink	<i>Tiliqua scincoides</i>
Rainbow Skink	<i>Carlia tetradactyla</i>
Fence Skink	<i>Cryptoblepharus virgatus</i>
Striped Skink	<i>Ctenotus robustus</i>
Coppertail Skink	<i>Ctenotus taeniolatus</i>
Eastern She-oak Skink	<i>Cyclodomorphus michaeli</i>
Pink-tongued Skink	<i>Cyclodomorphus gerrardii</i>
Cunningham's Skink	<i>Egernia cunninghami</i>
Black Crevice Skink	<i>Egernia saxatilis</i>
White's Rock Skink	<i>Egernia whittii</i>
Eastern Water Skink	<i>Eulamprus quoyii</i>
Banded Skink	<i>Eulamprus tenuis</i>
Grass Skink	<i>Lampropholis delicata</i>
Garden Skink	<i>Lampropholis guichenoti</i>
Weasel Shadskink	<i>Saproscincus mustelina</i>
Red-throated Skink	<i>Acritoscincus platynota</i>
Yellow-bellied Three-toed Skink	<i>Saiphos equalis</i>
Lace Monitor	<i>Varanus varius</i>
Eastern Snake-necked Turtle	<i>Chelodina longicollis</i>

Birds

Common Name	Scientific Name
Brown Quail	<i>Coturnix ypsilophora</i>
Black Swan	<i>Cygnus atratus</i>
Australian Wood Duck	<i>Chenonetta jubata</i>
Mallard	<i>Anas platyrhynchos</i>
Pacific Black Duck	<i>Anas superciliosa</i>
Grey Teal	<i>Anas gracilis</i>
Chestnut Teal	<i>Anas castanea</i>



Common Name	Scientific Name
Australasian Grebe	<i>Tachybaptus novaehollandiae</i>
Great Crested Grebe	<i>Podiceps cristatus</i>
Hoary-headed Grebe	<i>Poliocephalus poliocephalus</i>
Little Pied Cormorant	<i>Phalacrocorax melanoleucos</i>
Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>
Great Cormorant	<i>Phalacrocorax carbo</i>
Australian Pelican	<i>Pelecanus conspicillatus</i>
White-faced Heron	<i>Egretta novaehollandiae</i>
Little Egret	<i>Egretta garzetta</i>
White-necked Heron	<i>Ardea pacifica</i>
Great Egret	<i>Ardea alba</i>
Cattle Egret	<i>Ardea ibis</i>
Intermediate Egret	<i>Ardea intermedia</i>
Australian White Ibis	<i>Threskiornis molucca</i>
Straw-necked Ibis	<i>Threskiornis spinicollis</i>
Royal Spoonbill	<i>Platalea regia</i>
Black-shouldered Kite	<i>Elanus axillaris</i>
Whistling Kite	<i>Haliastur sphenurus</i>
Wedge-tailed Eagle	<i>Aquila audax</i>
White-bellied Sea-eagle	<i>Haliaeetus leucogaster</i>
Swamp Harrier	<i>Circus approximans</i>
Brown Goshawk	<i>Accipiter fasciatus</i>
Collared Sparrowhawk	<i>Accipiter cirrhocephalus</i>
Brown Falcon	<i>Falco berigora</i>
Australian Hobby	<i>Falco longipennis</i>
Nankeen Kestrel	<i>Falco cenchroides</i>
Buff-banded Rail	<i>Gallinallus philippensis</i>
Purple Swamphen	<i>Porphyrio porphyrio</i>
Dusky Moorhen	<i>Gallinula tenebrosa</i>
Eurasian Coot	<i>Fulica atra</i>
Latham's Snipe	<i>Gallinago hardwickii</i>
Black-winged Stilt	<i>Himantopus himantopus</i>
Black-fronted Dotterel	<i>Eseyornis melanops</i>
Masked Lapwing	<i>Vanellus miles</i>
Silver Gull	<i>Larus novaehollandiae</i>
Rock Dove	<i>Columba livia</i>
White-headed Pigeon	<i>Columba leucomela</i>
Spotted Turtle-dove	<i>Streptopelia chinensis</i>
Brown Cuckoo-dove	<i>Macropygia amboinensis</i>
Emerald Pigeon	<i>Chalcophaps indica</i>
Common Bronzewing	<i>Phaps chalcoptera</i>
Crested Pigeon	<i>Ocyphaps lophotes</i>
Bar-shouldered Dove	<i>Geopelia humeralis</i>
Wonga Pigeon	<i>Leucosarcia melanoleuca</i>
Topknot Pigeon	<i>Lopholaimus antarcticus</i>
Yellow-tailed Black-cockatoo	<i>Calyptorhynchus funereus</i>
Galah	<i>Cacatua roseicapilla</i>
Little Corella	<i>Cacatua sanguinea</i>
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>
Scaly-breasted Lorikeet	<i>Trichoglossus chlorolepidotus</i>
Australian King-parrot	<i>Alisterus scapularis</i>
Crimson Rosella	<i>Platycercus elegans</i>
Eastern Rosella	<i>Platycercus eximius</i>
Fan-tailed Cuckoo	<i>Cacomantis flabelliformis</i>
Horsfield's Bronze-cuckoo	<i>Chrysococcyx basalis</i>
Channel-billed Cuckoo	<i>Scythrops novaehollandiae</i>



Common Name	Scientific Name
Common Koel	<i>Eudynamys scolopacea</i>
Southern Boobook	<i>Ninox novaeseelandiae</i>
Barn Owl	<i>Tyto alba</i>
Tawny Frogmouth	<i>Podargus strigoides</i>
White-throated Nightjar	<i>Eurostopodus mystacalis</i>
Australian Owlet-nightjar	<i>Aegotheles cristatus</i>
White-throated Needletail	<i>Hirundapus caudacutus</i>
Laughing Kookaburra	<i>Dacelo novaeguineae</i>
Sacred Kingfisher	<i>Todiramphus sanctus</i>
Rainbow Bee-eater	<i>Merops ornatus</i>
Dollarbird	<i>Eurystomus orientalis</i>
Superb Lyrebird	<i>Menura novaehollandiae</i>
Satin Bowerbird	<i>Ptilonorhynchus violaceus</i>
Superb Fairy-wren	<i>Malurus cyaneus</i>
Variegated Fairy-wren	<i>Malurus lamberti</i>
Spotted Pardalote	<i>Pardalotus punctatus</i>
White-browed Scrubwren	<i>Sericornis frontalis</i>
Long-billed Scrubwren	<i>Sericornis magnirostris</i>
Brown Gerygone	<i>Gerygone mouki</i>
White-throated Gerygone	<i>Gerygone olivacea</i>
White-throated Treecreeper	<i>Cornobates leucophaea</i>
Brown Thornbill	<i>Acanthiza pusilla</i>
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>
Yellow Thornbill	<i>Acanthiza nana</i>
Striated Thornbill	<i>Acanthiza lineata</i>
Red Wattlebird	<i>Anthochaera carnunculata</i>
Little Wattlebird	<i>Anthochaera chrysoptera</i>
Noisy Friarbird	<i>Philemon conicalutus</i>
Bell Miner	<i>Manorina melanophrys</i>
Noisy Miner	<i>Manorina melanocephala</i>
Lewin's Honeyeater	<i>Meliphaga lewinii</i>
Yellow-faced Honeyeater	<i>Lichenostromus chrysops</i>
White-plumed Honeyeater	<i>Lichenostromus penicillatus</i>
Brown-headed Honeyeater	<i>Melithreptus brevirostris</i>
White-naped Honeyeater	<i>Melithreptus lunatus</i>
New Holland Honeyeater	<i>Phylidonyris novaehollandiae</i>
Eastern Spinebill	<i>Acanthorhynchus tenuirostris</i>
Scarlet Honeyeater	<i>Myzomela sanguinolenta</i>
White-fronted Chat	<i>Epthianura albifrons</i>
Jacky Winter	<i>Microeca fascinans</i>
Rose Robin	<i>Petroica rosea</i>
Eastern Yellow Robin	<i>Eopsaltria australis</i>
Eastern Whipbird	<i>Psophodes olivaceus</i>
Crested Shrike-tit	<i>Falcunculus frontatus</i>
Golden Whistler	<i>Pachycephala pectoralis</i>
Rufous Whistler	<i>Pachycephala rufiventris</i>
Grey Shrike-thrush	<i>Colluricincla harmonica</i>
Black-faced Monarch	<i>Monarcha melanopsis</i>
Leaden Flycatcher	<i>Myiagra rubecula</i>
Restless Flycatcher	<i>Myiagra inquieta</i>
Magpie-lark	<i>Grallina cyanoleuca</i>
Rufous Fantail	<i>Rhipidura rufifrons</i>
Grey Fantail	<i>Rhipidura fuliginosa</i>
Willie Wagtail	<i>Rhipidura leucophrys</i>
Spangled Drongo	<i>Dicrurus bracteatus</i>
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>
White-bellied Cuckoo-shrike	<i>Coracina papuensis</i>



Common Name	Scientific Name
Olive-backed Oriole	<i>Oriolus sagittatus</i>
Dusky Woodswallow	<i>Artamus cyanopterus</i>
Grey Butcherbird	<i>Cracticus torquatus</i>
Australian Magpie	<i>Gymnorhina tibicen</i>
Pied Currawong	<i>Strepera graculina</i>
Australian Raven	<i>Corvus coronoides</i>
White-winged Chough	<i>Corcorax melanorhamphos</i>
Apostlebird	<i>Struthidea cinerea</i>
Skylark	<i>Alauda arvensis</i>
Richard's Pipit	<i>Anthis novaeseelandiae</i>
House Sparrow	<i>Passer domesticus</i>
Red-browed Finch	<i>Neochmia temporalis</i>
Double-barred Finch	<i>Taeniopygia bichenovii</i>
Mistletoebird	<i>Dicaeum hirundinaceum</i>
Welcome Swallow	<i>Hirundo noexena</i>
Tree Martin	<i>Hirundo nigricans</i>
Fairy Martin	<i>Hirundo ariel</i>
Cicada-bird	<i>Coracina tenuirostris</i>
Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>
Clamorous Reed-Warbler	<i>Acrocephalus stentoreus</i>
Little Grassbird	<i>Megalurus gramineus</i>
Golden-headed Cisticola	<i>Cisticola exilis</i>
Silvereye	<i>Zosterops lateralis</i>
Common Blackbird	<i>Turdus merula</i>
Common Starling	<i>Sturnus vulgaris</i>
Common Myna	<i>Acridotheres tristis</i>



Appendix 5. Habitat requirements for locally-occurring threatened fauna species

Invertebrates

Common Name Scientific Name Schedule Listing	Preferred Habitat	Comments
Cumberland Plain Land Snail <i>Meridolum carneovirens</i> TSC Act, Sch. 1, End. EPBC Act, Vul.	Found amongst logs and debris in Cumberland Plain and Castlereagh woodlands.	No suitable natural habitat occurs on the site.

Mammals

Common Name Scientific Name Schedule Listing	Preferred Habitat	Comments
Large-eared Pied Bat <i>Chalinolobus dwyeri</i> TSC Act, Sch. 2, Vul. EPBC Act, Vul.	Found in drier habitats including dry sclerophyll and woodlands. Roosts in caves and abandoned Fairy Martin nests. Does not roost in tree hollows.	No suitable natural foraging habitat occurs on the site.
Eastern False Pipistrelle <i>Falsistrellus tasmaniensis</i> TSC Act, Sch. 2, Vul.	Little known of habitat. Has been found roosting in stem holes of living Eucalypts	No suitable natural foraging habitat occurs on the site.
Golden-tipped Bat <i>Kerivoula papuensis</i> TSC Act, Sch. 2, Vul. EPBC Act, Lower risk (near threatened)	Unclear, but probably coastal wet forests, often in areas where wet and dry forests meet. Sometimes roosts in tree hollows, but mainly in disused bird nests.	No suitable natural habitat occurs on the site.
Eastern Freetail-bat <i>Mormopterus norfolkensis</i> TSC Act, Sch. 2, Vul.	Unclear, but most records from dry Eucalypt forests and woodlands. Roosts in tree hollows.	Suitable natural foraging habitat occurs on the site.
Eastern Bentwing-bat <i>Miniopterus schreibersii</i> TSC Act, Sch. 2, Vul.	Well-timbered valleys. Roosts in caves and storm-water channels and similar structures. Does not roost in tree hollows.	No suitable natural foraging habitat occurs on the site.
Large-footed Myotis <i>Myotis adversus</i> TSC Act, Sch. 2, Vul.	Requires open areas of water over which it hunts. Roosts in caves, under bridges and buildings and sometimes in dense foliage in rainforests. May roost in tree hollows.	No suitable natural habitat occurs on the site.
Greater Broad-nosed Bat <i>Scoteanax rueppellii</i> TSC Act, Sch. 2, Vul. EPBC Act, Lower risk (near threatened)	Found in woodlands, moist and dry sclerophyll forests and rainforests. Prefers gullies. Roosts in tree hollows only.	No suitable natural habitat occurs on the site.
Yellow-bellied Sheath-tail-bat <i>Saccolaimus flaviventris</i> TSC Act, Sch. 2, Vul.	Found in a variety of Eucalypt habitats including tall forests and mallee. Roosts in tree hollows and occasionally abandoned Sugar Glider nests	Suitable natural foraging habitat occurs on the site.



Common Name Scientific Name Schedule Listing	Preferred Habitat	Comments
Grey-headed Flying-fox <i>Pteropus poliocephalus</i> TSC Act, Sch. 2, Vul. EPBC Act, Vul.	Found in rainforest, wet and dry sclerophyll forest and mangroves. Camps are usually in gullies, close to water and in vegetation with a dense canopy. Feeds on a wide variety of flowering and fruiting plants.	Suitable natural foraging habitat occurs on the site.
Koala <i>Phascolarctos cinereus</i> TSC Act, Sch. 2, Vul.	Eucalypt forests rich in Swamp Mahogany (<i>E. robusta</i>), Forest Red Gum (<i>E. tereticornis</i>), and Grey Gum (<i>E. punctata</i>).	No suitable natural habitat occurs on the site. Poor connectivity.
Spotted-tailed Quoll <i>Dasyurus maculatus</i> TSC Act, Sch. 2, Vul. EPBC Act, End.	Occurs mostly in sclerophyll forest and woodlands as well as coastal heath lands and rainforests. Requires suitable den sites such as hollows or caves and large areas of intact vegetation.	No suitable natural habitat occurs on the site. Poor connectivity.
Eastern Pygmy-possum <i>Cercartetus nanus</i> TSC Act, Sch. 2, Vul.	Found in a variety of habitats from rainforests through sclerophyll forests to tree heath. Favours areas with abundant Banksias and Myrtaceous shrubs.	No suitable natural habitat occurs on the site.
Yellow-bellied Glider <i>Petaurus australis</i> TSC Act, Sch. 2, Vul.	Restricted to tall, mature sclerophyll forests in regions of high rainfall. Requires nesting hollows and a year-round supply of flowering trees.	No suitable natural habitat occurs on the site.
Squirrel Glider <i>Petaurus norfolcensis</i> TSC Act, Sch. 2, Vul.	Inhabits dry sclerophyll forest and woodland. Requires abundant hollow-bearing trees and a mix of Eucalypts, acacias and Banksias. At least one floral species should flower heavily in the winter and one or more species of Eucalypts need to be smooth-barked.	No suitable natural habitat occurs on the site.
Southern Brown Bandicoot <i>Isodon obesulus</i> TSC Act, Sch. 1, End EPBC Act, End.	Inhabits heath, healthy forest, shrubland and woodland which is usually supported by well-drained soils. It is dependent on the diversity of vegetation that results from recent fires and the associated abundance of insects as a food source.	No suitable natural habitat occurs on the site.
Brush-tailed Phascogale <i>Phascogale tapoatafa</i> TSC Act, Sch. 2, Vul.	Inhabits dry sclerophyll open forest, with a sparse ground cover of herbs, grasses, scleromorphic shrubs or leaf litter. May also inhabit heathland, swamps, rainforest and wet sclerophyll forest, primarily where the annual rainfall exceeds 500 mm.	No suitable natural habitat occurs on the site.



Frogs

Common Name Scientific name Schedule Listing	Preferred Habitat	Comments
Red-crowned Toadlet <i>Pseudophryne australis</i> TSC Act, Sch. 2, Vul.	Almost totally confined to the Hawkesbury sandstone formation. Found in damp situations but not usually associated with permanent water.	No suitable natural habitat occurs on the site.
Heath Frog <i>Litoria littlejohni</i> TSC Act, Sch. 2, Vul. EPBC Act, Vul.	Wet or dry sclerophyll forest associated with sandstone outcrops at altitudes of 280-1000m on the eastern slopes of the Great Dividing Range. Prefers flowing rocky streams.	No suitable natural habitat occurs on the site
Giant Burrowing Frog <i>Heleioporus australiacus</i> TSC Act, Sch. 2, Vul. EPBC Act, Vul.	Most common on Hawkesbury Sandstone. Males call from burrows which are situated in sandy banks close to water. They are usually associated with crayfish burrows.	No suitable natural habitat occurs on the site
Green and Golden Bell Frog <i>Litoria aurea</i> TSC Act, Sch. 1, End. EPBC Act, Vul.	Permanent water sources with vegetated margins in dams, lagoons, streams, swamps or ornamental ponds.	No suitable natural habitat occurs on the site.

Reptiles

Common Name Scientific Name Schedule Listing	Preferred Habitat	Comments
Broad-headed Snake <i>Hoplocephalus bungaroides</i> TSC Act, Sch. 1, End. EPBC Act, Vul.	Preferred habitat is exposed sandstone outcrops and benching in vegetation that is mainly woodland, open woodland and heath.	No suitable natural habitat occurs on the site.
Heath Monitor <i>Varanus rosenbergi</i> TSC Act, Sch. 2, Vul.	Found in coastal heaths, humid woodlands and both wet and dry sclerophyll forests. Shelters in burrows, hollow logs and rock crevices.	No suitable natural habitat occurs on the site.

Birds

Common Name Scientific Name Schedule Listing	Preferred Habitat	Comments
Australasian Bittern <i>Botaurus poiciloptilus</i> TSC Act, Sch. 2, Vul.	Inhabits wetlands that generally have permanent fresh water and dense vegetation of sedges, rushes and reeds.	No suitable natural habitat occurs on the site.
Black Bittern <i>Ixobrychus flavicollis</i> TSC Act, Sch. 2, Vul.	Both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation.	No suitable natural habitat occurs on the site.



Common Name Scientific Name Schedule Listing	Preferred Habitat	Comments
Blue-billed Duck <i>Oxyura australis</i> TSC Act, Sch. 2, Vul.	Mostly found on large, well vegetated, deep fresh-water dams and lakes, especially those with beds of cumbungi	No suitable natural habitat occurs on the site
Bush Stone-curlew <i>Burhinus grallarius</i> TSC Act, Sch. 1 Endangered	. Found in lightly timbered open forest or woodlands. Preferred habitat is often associated with woodlands of casuarina, eucalyptus, acacia and epolycarpa.	No suitable natural habitat occurs on the site.
Diamond Firetail <i>Stagonopleura guttata</i> TSC Act Sch. 2, Vul	Mostly inhabits grassy eucalypt woodlands, also occurring in open forest and riparian areas within these. Feeds exclusively on the ground, occurring in flocks between five to 40+ birds	No suitable natural habitat occurs on the site.
Eastern Bristlebird <i>Dasyornis brachypterus</i> TSC Act, Sch. 1, EPBC Act. Endangered	Inhabits most habitats so long as there is a low dense cover of vegetation. This species is particularly fire-sensitive and studies have shown they tend to avoid or have very low densities in areas that have had a fire in the past 7 years.	No suitable natural habitat occurs on the site.
Flame Robin <i>Petroica phoenicea</i> TSC Act Sch. 2, Vul	In NSW it breeds in upland moist eucalypt forests and woodlands, often on ridges and slopes, in areas of open understorey. It migrates in winter to more open lowland habitats such as grassland with scattered trees and open woodland on the inland slopes and plains	No suitable natural habitat occurs on the site.
Freckled Duck <i>Stictonetta naevosa</i> TSC Act, Sch. 2, Vul.	Inhabits a variety of plankton-rich wetlands including vegetated swamps, large open lakes, farm dams and flood waters. Aggregate in the non-breeding season on large deep water lakes or dams (fresh or saline).	No suitable natural habitat occurs on the site.
Gang-gang Cockatoo <i>Callocephalon fimbriatum</i> TSC Act, Sch. 2, Vul.	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands – also in urban areas including parks and gardens. Requires tree hollows for nesting	Suitable natural foraging habitat occurs on the site.
Glossy Black-cockatoo <i>Calyptrorhynchus lathamii</i> TSC Act, Sch. 2, Vul.	Found in open forests with <i>Allocasuarina</i> species and hollows for nesting.	Suitable natural foraging habitat occurs on the site.
Little Eagle <i>Hieraaetus morphnoides</i> TSC Act Sch. 2, Vul	Occupies open Eucalypt forest, woodland or open woodland. She-oak or acacia woodlands and riparian woodlands are also used. Builds a stick nests in winter in tall living trees within remnant patches	No suitable natural habitat occurs on the site.
Little Lorikeet <i>Glossopsitta pusilla</i> TSC Act, Sch. 2, Vul	Inhabits the open forests and dead timber alongside watercourses. Also occurs in eucalypt forest in mountainous regions.	Suitable natural habitat occurs on the site.



Common Name Scientific Name Schedule Listing	Preferred Habitat	Comments
Painted Honeyeater <i>Grantiella picta</i> TSC Act, Sch. 2, Vul.	Found in Eucalypt forests and woodlands. Prefers areas with high densities of mistletoe.	No suitable natural habitat occurs on the site.
Pink Robin <i>Petroica rodinogaster</i> TSC Act Sch. 2, Vul.	Inhabits rainforest and tall, open eucalypt forest, particularly in densely vegetated gullies. General distribution Tasmania to South-eastern NSW; in winter may be found as far north as the Central Coast NSW.	No suitable natural habitat occurs on the site.
Regent Honeyeater <i>Xanthomyza phrygia</i> TSC Act, Sch. 1, Endangered.	Occurs in temperate Eucalypt woodlands and open forests. Has a particular liking for Box and Ironbark Eucalypts as well as Swamp Mahogany and Spotted Gum.	Suitable natural foraging habitat occurs on the site.
Scarlet Robin <i>Petroica boodang</i> TSC Act Sch. 2, Vul.	Inhabits dry Eucalypt forests and woodlands, usually prefers grassy understorey with scattered shrubs. Occasionally occurs in mallee or wet forest communities	No suitable natural habitat occurs on the site.
Speckled Warbler <i>Pyrholaemus sagittatus</i> TSC Act Sch. 2, Vul.	Inhabits Eucalypt dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy	No suitable natural habitat occurs on the site.
Spotted Harrier <i>Circus assimilis</i> TSC Act Sch. 2, Vul.	Occurs in grassy open woodland including acacia and mallee remnants, inland riparian woodland, grassland. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	No suitable natural habitat occurs on the site.
Square-tailed Kite <i>Lophoictinia isura</i> TSC Act, Sch. 2, Vul.	Inhabits coastal forest and woodlands. Most commonly associated with ridge and gully forests dominated by Woollybutt, Spotted Gum or Peppermint Gum.	No suitable natural habitat occurs on the site.
Swift Parrot <i>Lathamus discolor</i> TSC Act, Sch. 2, Vul. EPBC Act, End.	Occurs in a variety of Eucalypt forests. Migrates from Tasmania to the mainland during the winter/autumn months to feed mostly on winter flowering Eucalypts	Suitable natural habitat occurs on the site.
Turquoise Parrot <i>Neophema pulchella</i> TSC Act, Sch. 2, Vul.	Occurs in eucalyptus woodlands and open forests with a ground cover of grasses and low understorey of shrubs.	No suitable natural habitat occurs on the site.
Varied Sittella <i>Daphoenositta chrysoptera</i> TSC Act Sch. 2, Vul.	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland	Suitable natural habitat occurs on the site. Poor connectivity.



Common Name Scientific Name Schedule Listing	Preferred Habitat	Comments
Powerful Owl <i>Ninox strenua</i> TSC Act, Sch. 2, Vul.	Pairs occupy permanent territories in mountain forests, gullies and forest margins, sparser hilly woodlands, coastal forests, woodlands and scrubs.	No suitable natural habitat occurs on the site.
Barking Owl <i>Ninox connivens</i> TSC Act, Sch. 2, Vul.	Found in open forests, woodlands, dense scrubs, river red gums and other large trees near watercourses.	No suitable natural habitat occurs on the site. Poor connectivity.
Sooty Owl <i>Tyto tenebricosa</i> TSC Act, Sch. 2, Vul.	Tall, wet forests in sheltered mountain gullies, usually with an east and Southeast aspect.	No suitable natural habitat occurs on the site.
Masked Owl <i>Tyto novaehollandiae</i> TSC Act, Sch. 2, Vul.	Forests, open woodlands and farms with large trees, e.g. river red gums adjacent to cleared country.	No suitable natural habitat occurs on the site.



Appendix 6. Habitat requirements for locally-occurring threatened plant species

Botanical name conservation status	Habitat description	Suitable habitat on site
<i>Acacia bynoeana</i> ROTAP, 3VC - TSC Act, Sch. 1, End. EPBC Act, Vul.	Grows mainly in heath and dry sclerophyll forest, in sandy soils.	No
<i>Acacia pubescens</i> ROTAP, 3VCa TSC Act, Sch. 2, Vul. EPBC Act, Vul.	Usually grows in dry sclerophyll forest and woodland in clay soils. Often in roadside and railside bushland remnants.	No
<i>Amperea xiphioclada</i> var. <i>papillata</i> ROTAP, 3KC	Grows with other native sedges and rushes in swamps on sandstone at altitudes of greater than 600 m.	No
<i>Angophora crassifolia</i> ROTAP, 2RCa	Locally frequent but restricted to the Ku-ring-gai Plateau region.	No
<i>Boronia fraseri</i> ROTAP, 2RCa (UBBS 97 Recommend)	Grows mainly in wet sclerophyll forest and in rainforest in gullies on sandstone, chiefly in the Sydney region.	No
<i>Boronia serrulata</i> ROTAP, 2RC -	Grows in moist heath in sandy situations, chiefly in a coastal band in the Sydney district; record for the SWS in Jacobs & Pickard (1981) not substantiated.	No
<i>Callistemon linearifolius</i> ROTAP, 2RCi TSC Act, Sch. 2, Vul.	Grows in dry sclerophyll forest on the coast and adjacent ranges, chiefly from Georges R. to the Hawkesbury R.	No
<i>Darwinia biflora</i> ROTAP, 2VCa TSC Act, Sch. 2, Vul. EPBC Act, Vul.	Grows in heath on sandstone or in the understorey of woodland on shale-capped ridges; Cheltenham to Hawkesbury R., rare.	No
<i>Darwinia peduncularis</i> ROTAP, 3RCi TSC Act, Sch. 2, Vul.	Grows in dry sclerophyll forest on sandstone hillsides and ridges; Hornsby to Hawkesbury R. and west to Glen Davis, rare.	No
<i>Deyeuxia appressa</i> ROTAP, 2E TSC Act, Sch. 1, End. EPBC Act, End.	Grows on wet ground; in the Hornsby area.	No
<i>Epacris purpurascens</i> var. <i>purpurascens</i> TSC Act, Sch. 2, Vul.	Grows in sclerophyll forest, scrubs and swamps on sandstone from Gosford and Sydney districts.	No
<i>Eucalyptus camfieldii</i> ROTAP, 2VCi TSC Act, Sch. 2, Vul. EPBC Act, Vul.	Rare and localized, in coastal shrub heath on sandy soils on sandstone, often of restricted drainage; from Gosford to Royal N.P.	No
<i>Eucalyptus leuhmanniana</i> ROTAP, 2RCa	Locally abundant but restricted, in mallee heath on shallow infertile sandy soils of poor drainage on sandstone; confined to coastal plateau between the Hawkesbury R. and Bulli.	No
<i>Grevillea longifolia</i> ROTAP, 2RC -	Grows in moist areas of sclerophyll forest, often near creeks, on Hawkesbury sandstone; chiefly the southern half of Sydney Basin, and Woronora Plateau; possibly also in Lawson area.	No



Botanical name conservation status	Habitat description	Suitable habitat on site
<i>Haloragcdendron lucasii</i> TSC Act, Sch. 1, End. EPBC Act, End.	Grows in dry sclerophyll open forest on sheltered slopes near creeks on sandstone; confined to Sydney area, rare.	No
<i>Hibbertia nitida</i> ROTAP, 2RC -	Widespread on sandstone in the Sydney district.	No
<i>Melaleuca deanei</i> ROTAP, 3RC- TSC Act, Sch. 2, Vul. EPBC Act, Vul.	Grows in wet heath on sandstone; uncommon, in coastal districts from Berowra to Nowra.	No
<i>Persoonia hisuta/evoluta</i> ROTAP, 3KCi TSC Act, Sch. 1, End. EPBC Act, End.	Grows in woodland to dry sclerophyll forest on sandstone; both subspecies occurring as isolated individuals or very small populations.	No
<i>Persoonia nutans</i> ROTAP, 2ECi TSC Act, Sch. 1, End. EPBC Act, End.	Grows in woodland to dry sclerophyll forest on laterite and alluvial sand; confined to the Cumberland Plain.	No
<i>Pimelea curviflora</i> var. <i>curviflora</i> TSC Act, Sch. 2, Vul. EPBC Act, Vul.	Confined to coastal areas around Sydney on sandstone.	No
<i>Tetralthea glandulosa</i> ROTAP, - 2VC - TSC Act, Sch. 2, Vul. EPBC Act, Vul.	Grows in sandy or rocky heath or scrub, from Mangrove Mtn to the Blue Mtns and Sydney.	No

Species of national/state significance with unsubstantiated records in western Sydney

Acacia mathewii (Cattai NP)
Atkinsonia ligustrina (Grose Vale)
Boronia serrulata (Baulkham Hills)
Deyeuxia appressa (Duck River, Auburn)
Haloragis exalata var. *exalata* (Maroota, Baulkham Hills)
Syzygium paniculatum (Cornelia, Baulkham Hills)

Key

TSC Act 1995:

Sch1 = Schedule 1: Endangered species
 Part 1: endangered species
 Part 2: endangered populations
 Part 3: endangered ecological communities
 Part 4: species presumed extinct
 Sch2 = Schedule 2: Vulnerable species

EPBC Act 1999:

CE = Critically Endangered
 E = Endangered
 V = Vulnerable
 EP = Endangered Population

W-Syd End = Western Sydney endemic species
 X - WSyd = Extinct in western Sydney

ROTAP Codes

1 Known by one collection only
 2 Geographic range in Australia < 100Km
 3 " " " " " > 100Km
 E Endangered
 V Vulnerable
 R Rare
 X Extinct
 K Poorly known
 C Reserved
 a > or = 1000 plants reserved
 i < 1000 plants reserved
 † Total known population reserved
 - Reserved population size unknown
 + Overseas occurrence



Appendix 7. Company Profile

Abel Ecology has been in the flora and fauna consulting business since 1991, starting in the Sydney Region, and progressively more state wide in New South Wales since 1998, and now also in Victoria. During this time extensive expertise has been gained with regard to Master Planning, Environmental Impact assessments including flora and fauna, bushfire reports, Vegetation Management Plans, Management of threatened species, Review of Environmental Factors, Species Impact Statements and as Expert Witness in the Land and Environment Court. We have done consultancy work for industrial and commercial developments, golf courses, civil engineering projects, tourist developments as well as residential and rural projects. This process has also generated many connections with relevant government departments and city councils in NSW. Our team consists of four scientists and two administrative staff, plus casual assistants as required.

Licences

NPWS s132C Scientific licence number is SL100780 expires 30 April 2013

NPWS GIS data licence number is CON95034

DG NSW Agriculture Animal Care and Ethics Committee approval AW 95/082

DG NSW Agriculture Animal Research Authority AW 95/082

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