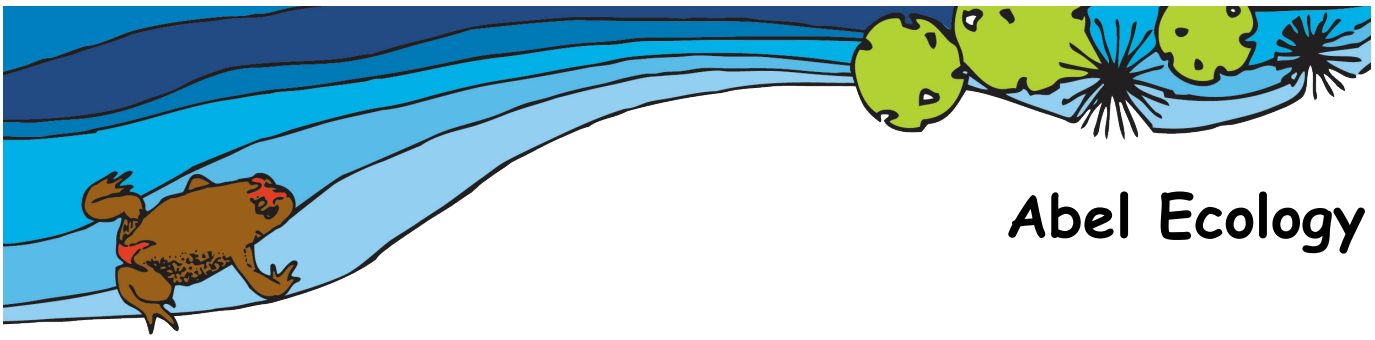

Abel Ecology

Flora and fauna assessment report

for

Lots 5 -14 in DP 232658
Lots 16 -19 in DP 237030

Proposed higher density residential development

Date: 21 March 2016

Document No: 1527-REP-25-ISS-1

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Document history

Report	Version	Prepared by	Checked by	Submission	
				Method	Date
Draft report	Draft A	Dr Daniel McDonald	Venetia Keane	Email	28 Jan 16
Final report	Issue 1	Dr Daniel McDonald	Venetia Keane	Email	21 Mar 16

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List of Abbreviations

d.b.h.	Diameter at breast height (~1.4 metres)
EEC	Endangered Ecological Community
ESD	Ecologically Sustainable Development
LEP	Local Environmental Plan
LGA	Local Government Area
NR	Nature Reserve
PDA	Principal Development Area

Note regarding maps in this report

The diagrams/site maps used in this report have been supplied by and are used with the permission of Michael Gee (Castle Larool DM Pty Ltd).

With regard to maps provided by the Land Information Centre, Topographic maps used with the permission of © Land and Property Information, NSW.

Executive Summary

The proposal is to demolish existing residentilal houses and to construct increased density residental buildings. It is presumed all existing buildings and vegetation present on the site will be cleared for the proposal.

A flora and fauna survey was carried out at Carramarr Street and Larool Crescent, Castle Hill to assess the likely impacts of the proposal 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).

The site is an existing group of residential houses with lawns and domestic gardens. Two Sydney Blue Gums, two Thin-leaved Stringybarks and possibly one Smooth-barked Apple are present on the site and may be remnants of native vegetation. The site provides habitat for common species typicaly of urban areas.

Table 1. Endangered ecological communities found on the site[1].

Species/ Communities	C'wealth listing EPBC Act '99	State listing TSC Act '95	Local listing	Result
Sydney Turpentine Ironbark Forest	Critically Endangered	Schedule 1, Endangered	-	No significant effect

[1]Note: A precautionary approach has been taken and the remnant trees and small scattered areas of local indigenous groundcovers are considered to be remnants of the Endangered Ecological Community Sydney Turpentine Ironbark Forest. The small patches are in Class 2/3 to Class 3 condition.

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 the endangered ecological community, threatened species or their habitats. A Species Impact Statement is not recommended.

Recommendations for this proposal include:

a) Landscaping

i. A weed control programme is to be undertaken to remove all weed species from Class 1 to Class 5 categories, consistent with the provisions of the Noxious Weeds Act 1993. On this site it is assumed that all weeds will be controlled during clearing works.

ii. As an offset for the loss of potential indigenous vegetation, presumably remnants of the Endangered Ecological Community Sydney Turpentine Ironbark Forest. The landscape plan and landscaping for the site must include at least some of the

following local indigenous species found in Sydney Turpentine Ironbark Forest. At least ten shorter trees and shrubs as well as climbers and groundcovers must be used to offset the loss of the existing trees.

a. Tall trees[1]

Angophora costata

Eucalyptus eugenoides

Eucalyptus fibrosa

Eucalyptus globoidea

Eucalyptus paniculata

Eucalyptus pilularis

Eucalyptus punctata

Eucalyptus resinifera

Syncarpia glomulifera

b. Shorter trees and shrubs

Acacia implexa

Allocasuarina torulosa

Dodonaea triquetra

Elaeocarpus reticulatus[2]

Glochidion ferdinandi

Kunzea ambigua

Ozothamnus diosmifolius

Pittosporum undulatum

Rapanea variabilis

c. Climbers and scramblers

Kennedia rubicunda

Pandorea pandorana

d. Groundcovers

Adiantum aethiopicum

Dianella caerulea

Dianella longifolia

Dichondra repens

Imperata cylindrica

Lomandra longifolia

Pratia purpurascens

Themeda australis

[1]A list of local indigenous tall trees has been provided if adequate space allows the planting of one of a small number of individuals of these species. However, it is reasonably likely the available space for tall trees in the development may be negligible it may not be appropriate to plant any of these species. Some of these species may eventually grow to 20 – 30 m tall.

[2]Elaeocarpus is not commonly found in Sydney Turpentine Ironbark Forest according to Tozer *et al.* 2010. However, it is common in the locality and often found in adjoining areas.

b) Soil management

iii. Erosion and sediment control structures are to be installed prior to any earthworks commencing.

iv. Erosion and sediment control structures are to be cleared after any storm event.

Special considerations

c) 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.

d) With regard to any clearing of native vegetation on the property, it is the responsibility of the landowner to check whether all required permissions from local and statutory authorities are in place. This may include Parts 4 and 5 of the EP&A Act; s.91 and s.95 licences or joint management agreements under the TSC Act; licence or conservation agreement under the NP&W Act; and approved Property Vegetation Plan under the Native Vegetation Act.

1. Figures

Figure 1. Air photo of the site and surrounding area

Site Location

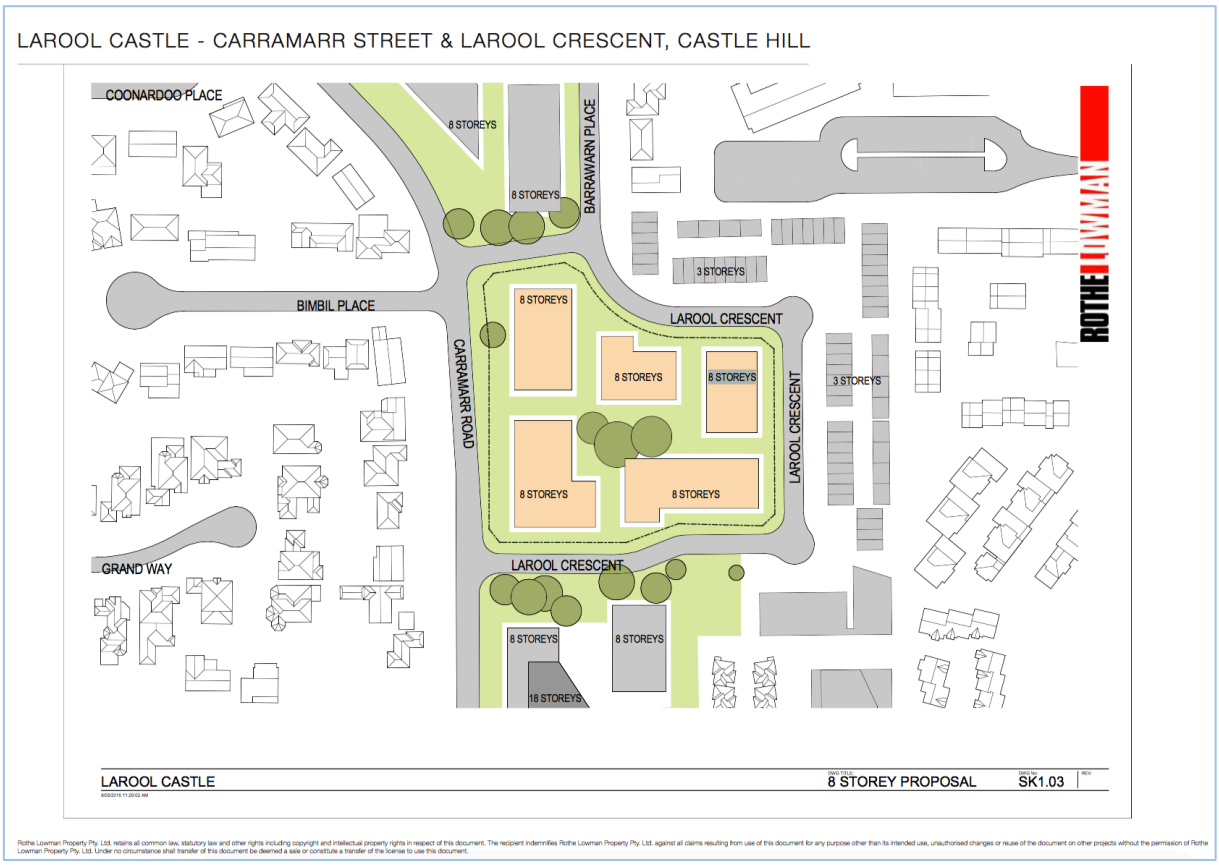

Figure 2. Proposal Diagram

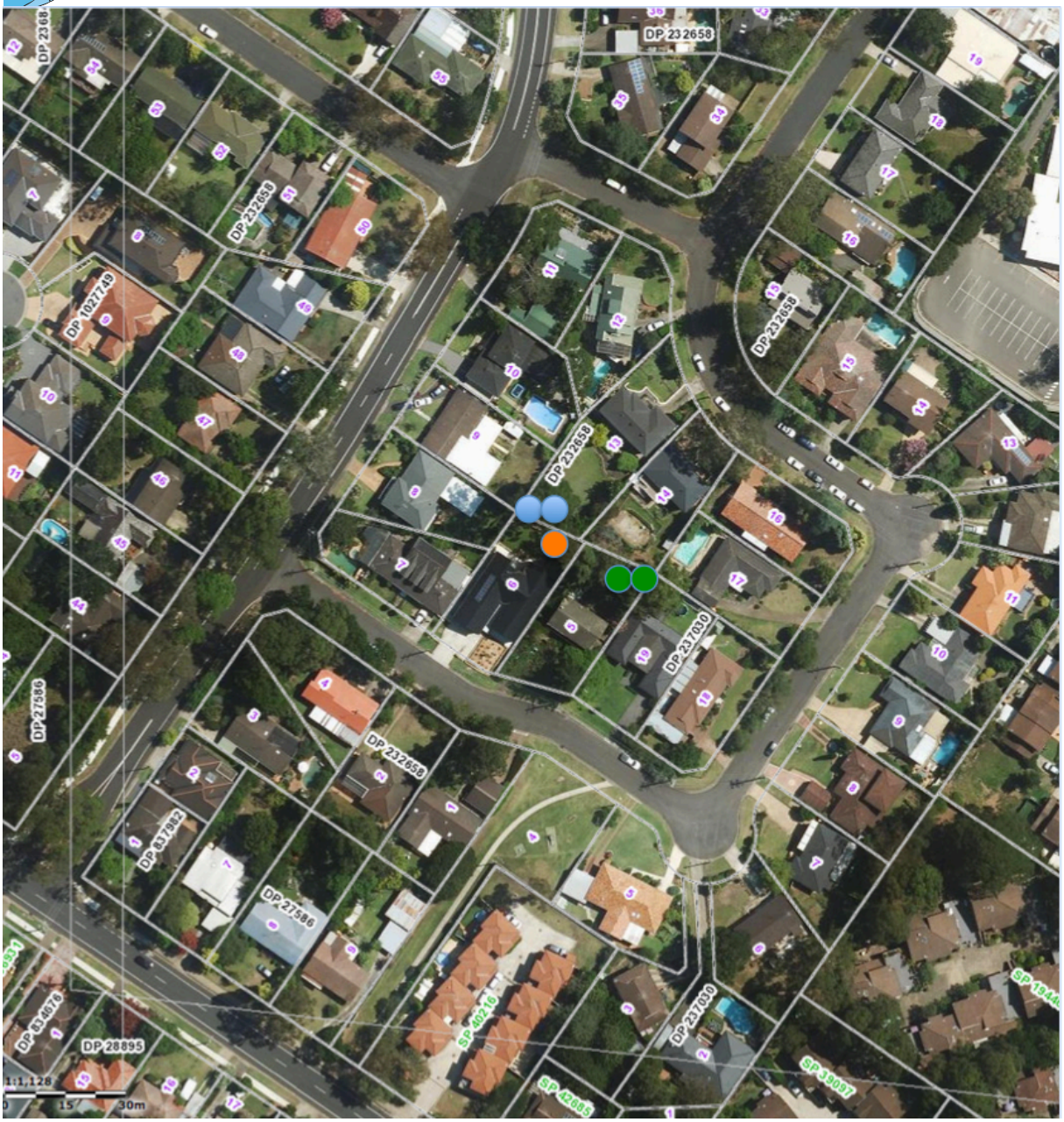

Figure 3. Site vegetation and fauna habitat map

The coloured circles represent the locations of the putative remnant trees: blue circles represent Sydney Blue Gums *Eucalyptus saligna,* orange circle Smooth-barked Apple *Angophora costata* and green circles Thin-leaved Stringybark *Eucalyptus eugenoides.*

The eastern Blue Gum (blue circle on the right) contains the putative hollow and also a bracket fungus was observed near the hollow.

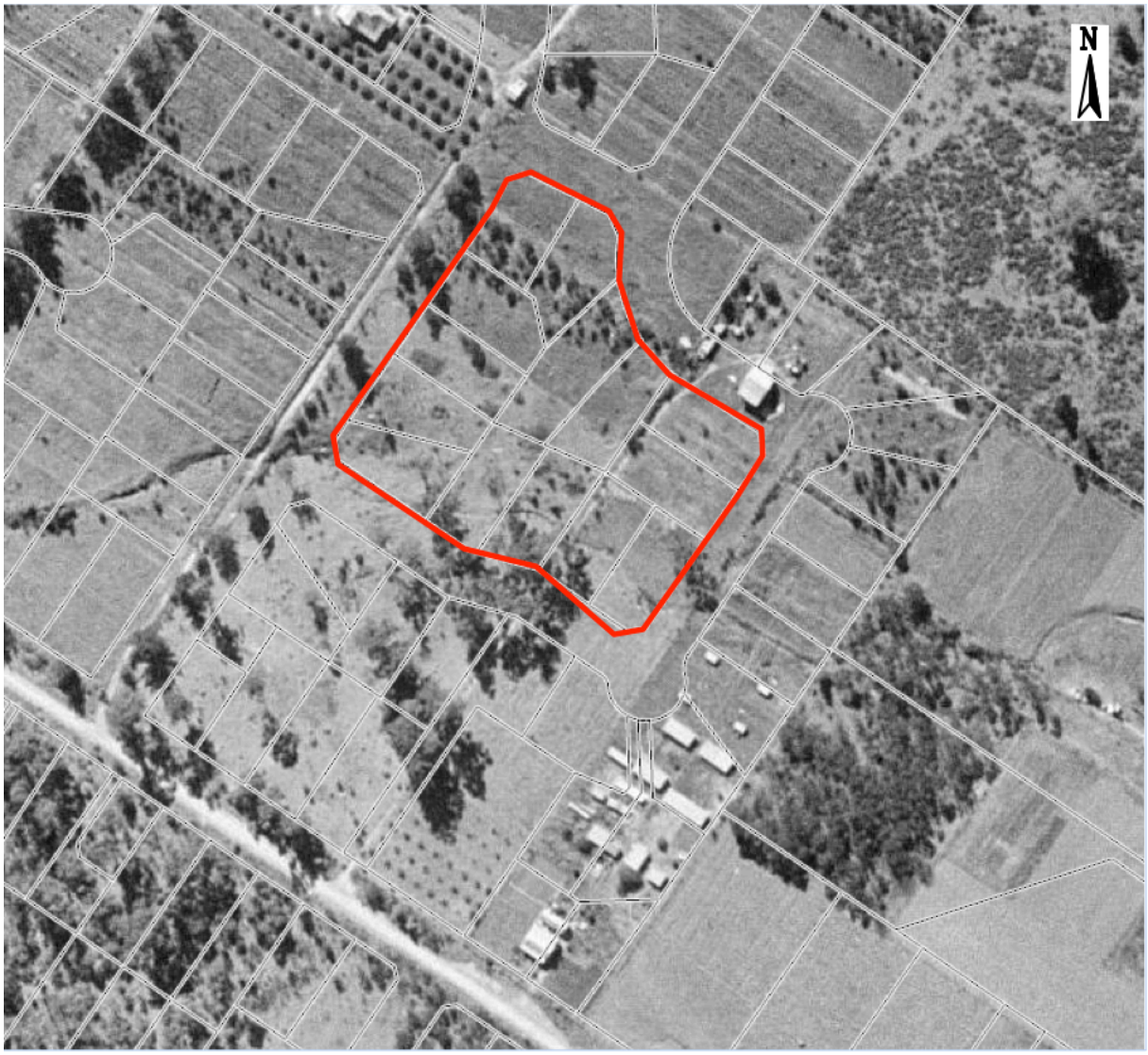

Figure 4. Air photo of the site and local area

Site Location

Figure 5. Photo of the Sydney Blue Gum displaying the putative hollow (red arrow) and the location of the bracket fungus (yellow arrow). The photos was taken from the south side of the tree.

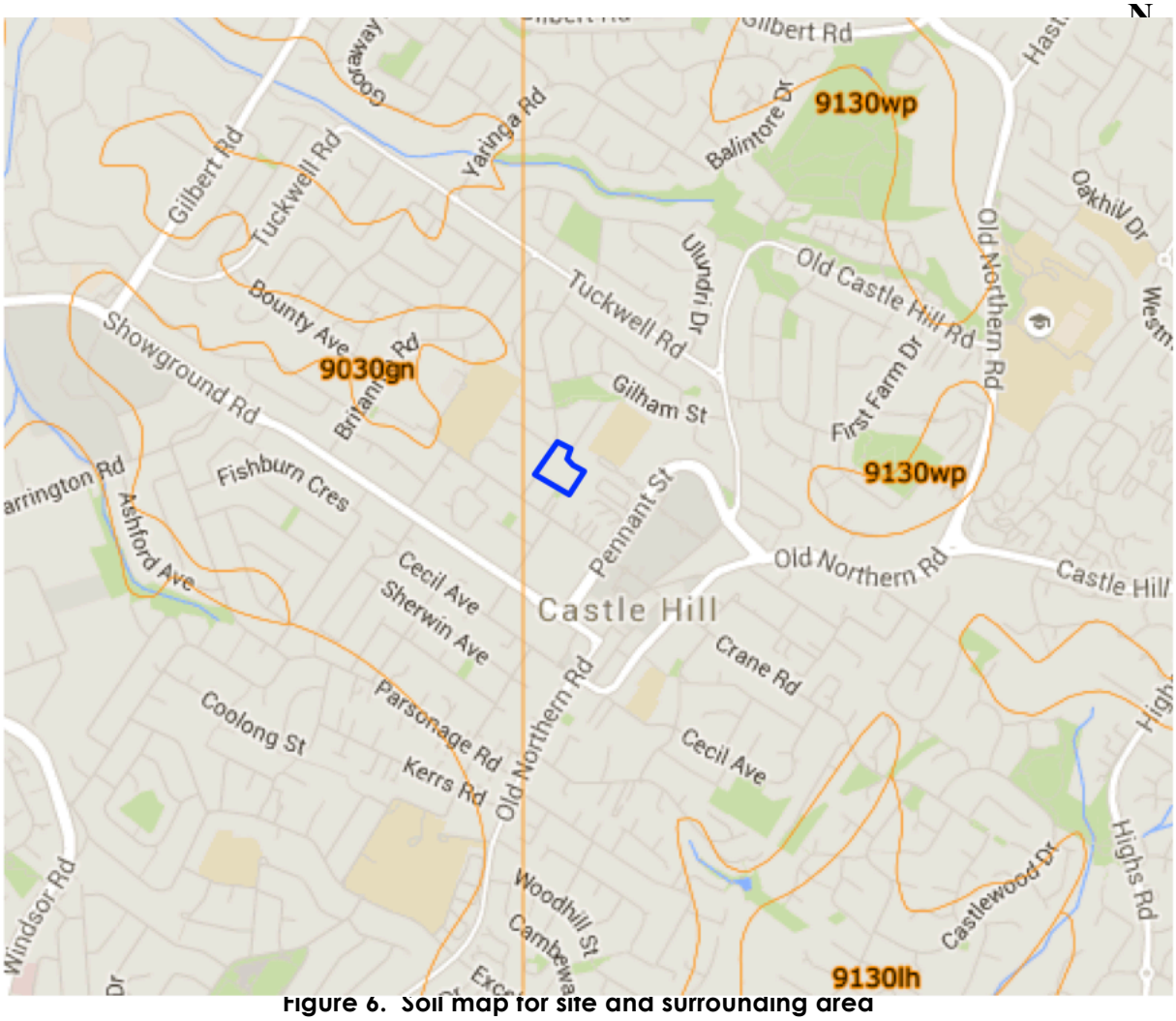

Figure 6. Soil map for site and surrounding area

Site Location **Scale:** grid square = 1 km

KEY

EROSIONAL

9030gn (Glenorie) - Undulating to rolling low hills on Wianamatta Group shales.

Note: The site is located on Glenorie soil

COLLUVIAL

9130wp (West Pennant Hills) - rolling to steep sideslopes on Wianamatta Group shales and shale colluvium. Local relief 40-100 m, slopes >20%. Partially cleared, tall, open-forest (wet sclerophyll).

RESIDUAL

9130lh (Lucas Heights) - Gently undulating crests and ridges on plateau surfaces of the Mittagong Formation.

Source: eSpade (NSW soil and land information – (online 12 January 2016)

2. Introduction

A fauna and flora survey of the proposed development site at Carramarr Street and Larool Crescent, Castle Hill ('the site' –Figure 1) was undertaken on the 7 December 2015.

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 9.4.1, 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.

3. Description of the proposal and the site

3.1 The proposal

The proposal is to demolish existing residentilal houses and to construct increased density residental buildings. It is assumed there may be significant earthworks on the site and all large trees, including the potentially local indigenous trees will be removed.

3.2 Site description

For the purposes of this report, the site is defined by Figure 1. It is approximately one hectare in size and the elevation is approximately 100 – 120 m above sea level.

The site is sloped down to the south-west. No natural water bodies or drainage lines are present on site.

The adjacent properties are residental.

3.3 History of the site

The locality is comprised of residential houses which appear to have been first built in the 1960s and 1970s. The 1943 aerial photo indicates the site was previously used for agriculture.

3.4 Soils

The site is located on a mapped Glenorie soil type which is defined as undulating to rolling hills on Wianamatta group shales (Figure 6).

4. Methodology

4.1 Literature review

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

Air photo
Proposal diagram – Caslte Larool DM Pty Ltd
Vegetation map (Tozer)
Schedules to the TSC Act 1995
Schedules to the EPBC Act 1999
OEH Atlas of NSW Wildlife

Other flora and fauna survey reports in the local area, including:

Abel Ecology (2014). Bushfire assessment report for 44 Shoplands Road, Annangrove. Lot 1, DP 259608. Proposed alteration and additions to existing dwelling. Springwood, Abel Ecology.

Abel Ecology (2014). Bushfire assessment report for 52 Annangrove Road, Kenthurst. Lot 7, DP 234053. Proposed construction of storage shed. Springwood, Abel Ecology.

Abel Ecology (2014). Vegetation management plan for part of 19 Adey Place, Castle Hill Lot 21 DP270304

Abel Ecology (2013). Flora and fauna assessment report for 8 Nicholii Place, Kenthurst, Lot 9, DP 260519, Proposed additions to existing dwelling. Springwood, Abel Ecology.

Abel Ecology (2013). Flora and fauna assessment report for 43 Kenthurst Road, Kenthurst, Lot 1, DP 1098878, Proposed Early Childhood Centre. Springwood, Abel Ecology.

Abel Ecology (2013). Flora and fauna assessment report for Address 214a Pitt Town Road, Kenthurst, Lot 4, DP 605278, Proposed cluster sub division. Springwood, Abel Ecology.

Abel Ecology (2013). Tree assessment report for 43 Kenthurst Road, Kenthurst, Lot 1, DP 1098878, Proposed Early Childhood Centre. Springwood, Abel Ecology.

Abel Ecology (2013). Vegetation management plan for Address 214a Pitt Town Road, Kenthurst, Lot 4, DP 605278, Proposed cluster subdivision. Springwood, Abel Ecology.

Abel Ecology (2013). Tree report 64-66 Chepstow Drive, Castle Hill Development Application Kavanagh. Springwood NSW, Abel Ecology.

Abel Ecology (2013). Vegetation Management Plan for 115 Old Castle Hill Road, Castle Hill, Proposed two into 4 Lot subdivision. Springwood, Abel Ecology.

Abel Ecology (2012). Concept Landscape Plan for 115 Old Castle Hill Road, Castle Hill. Springwood, Abel Ecology.

Abel Ecology (2012). Flora and fauna assessment report for 115 Old Castle Hill Road, Castle Hill, Lots 121 and 122, DP 1159678, Proposed subdivision. Springwood, Abel Ecology.

Abel Ecology (2012). Flora and fauna constraints and opportunities assessment advice for 14 Telfer Road, Castle Hill.

Abel Ecology (2010). Safe Useful Life Expectancy Tree Report for Cnr Salisbury Road and Victoria Avenue, Castle Hill Proposed Bunnings Warehouse. Faulconbridge, Abel Ecology.

Abel Ecology (2010). Vegetation assessment report Amended for 161 Castle Hill Road, Castle Hill Lot 1, DP 525780 for proposed subdivision Faulconbridge, Abel Ecology.

4.2 Field work

Over the one day of fieldwork a total of 3.42 hours were spent undertaking survey work on the site and surrounding habitat areas.

Table 2. Survey dates and weather conditions

Date	Times	Weather	Task	Hours (hrs x no. people)
7 Dec 15	09:05-12:30	Fine, pleasant	Flora and fauna survey	(3.42 x 1) = 3.42
			Total	**3.42 hours**

Survey effort was concentrated within the site boundaries, although adjacent surrounding vegetation was noted (Figure 1.

4.3 Flora survey method

A flora survey was conducted to compile vegetation descriptions and species lists for the site. Not all exotic species were recorded.

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.

4.4 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 6.

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 the threatened species Grey-headed Flying-fox 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 4.2 above.

4.4.1 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) Searching shelter sites, calling sites, egg deposition sites, spotlighting and triangulation on calling males for frogs.

c) Opportunistic observations and identification of calls of species, and search for indirect evidence such as nests, feathers, scratchings and feeding signs for birds.

d) 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.

4.5 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.

4.6 Limitations of the survey

This survey was conducted in the summer season. This was not suitable for winter migrants or species of winter-flowering orchids that lose their aerial stems after fruiting.

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

e) The species was present during the survey but was not detected due to dormancy, inactivity or cryptic habits.

f) The species use the site at other times of the year, but was not present during the survey due to being nomadic or migratory.

5. Survey Results: Habitat

5.1 Site habitat descriptions

The site habitat is described below. Figure 6

5.1.1 Suburban gardens and residential houses

The area consists of garden plantings and a few larger local indigenous trees. In general the tree canopy is very open as houses, roads and swimming pools limit the areas where tall trees grow.

Specific habitat features, rather than types, are listed below in Section 5.2.

5.2 Specific habitat features

Important habitat features that have significance for fauna occupation of the site are discussed below (Table 4). These include both site disturbance and natural features.

This suburban area provides habitat suitable for common species regularly found in urban areas. There are both scattered Eucalypts providing nectar and Wattles providing seeds, present either as local indigenous species or plantings. The historic 1943 aerial photo demonstrates historic clearing over the majority of the site and is consistent with the highly disturbed character of the site.

At least one potential habitat tree was observed on the site. There is generally a very poor supply of fallen logs and dead wood/coarse woody debris.

5.3 Off-site habitat

Off-site habitat consists of generally similar habitat types. Local parks and drainage lines present in the locality often have a greater density of local indigenous trees.

6. Survey Results: Flora

6.1 Species and communities of conservation concern

Two tall Sydney Blue Gums *Eucalyptus saligna* and two Thin-leaved Stringybarks *Eucalyptus eugenoides* are present on the site. A precautionary approach has been taken and small areas of vegetation are considered to be remnants of Sydney Turpentine Ironbark Forest.

6.2 Vegetation description

The vegetation within the site is residental ornamental gardens surounding residental buildings. Vegetation largely consists of exotic or planted native trees, shrubs and groundcovers, typically lawn.

There was little remnant vegetation on the site. Vegetation which is potentially remnant includes the trees Sydney Blue Gum *Eucalyptus saligna* (two trees both ~ 80 – 90 cm d.b.h.), Smooth-barked Apple *Angophora costata* (one tree ~ 35 cm d.b.h.), Thin-leaved Stringybark *Eucalyptus eugenoides* (two trees) and possibly Sweet *Pittosporum Pittosporum undulatum* as well as the following groundcovers: *Glycine clandestina, Microlaena stipoides, Oplismenus aemulus, Pratia purpurescens, Veronica plebeia* and *Wahlenbergia gracilis*. The groundcovers had in general a very limited distribution occuring typically as scattered plants among weeds or lawn. The overall area occupied by the groundcovers is approximately <1 % of the total area of the site.

While Smooth-barked Apple Angophora costata is locally indigenous, the size of the tree is only 35 cm d.b.h and it is growing in area where the surrounding soil level has been altered so perhaps this specimen represents a planted tree rather than remnant vegetation.

The lack of remnant vegetation is not surprising as the site is currently occupied by fourteen residences and at least as far back as 1943 the site was significantly altered by clearing presumably for agriculture (Figure 4).

It is difficult to accurately determine which indigenous vegetation community was originally present on the site and what the exisitng scattered trees represent. Based upon a comparison with Tozer *et al*. (2010) the scattered locally indigenous trees are potentaily remnants from Sydney Turpentine Ironbark Forest. Sydney Turpentine Ironbark Forest is listed as an Endangered Ecological Community in Part 3 of Schedule 1 of the Threatened Species Conservation Act.

Turpentine-Ironbark Forest in the Sydney Basin Bioregion is listed as a Critically Endangered Ecological Community by the Commonwealth Government. However, the condition of the Turpentine-Ironbark Forest on the site is very poor and it does not meet the requirements to be considered part of this community by the Commonwealth Government.

One of the Sydney Blue Gums Eucalyptus saligna contains a putative hollow and a bracket fungus is also present (Figure 5). The hollow is potential roosting or nesting habitat for fauna. The bracket fungus is typically an indication of advanced decay and is also associated with a loss of structural strength. There is an increased likelihood the tree, particularly the portion of the tree associated with the rot caused by the bracket fungus will fail.

The small patches, largely individual trees of potential remnant vegetation meet the Class 2/3 – Class 3 category.

No threatened flora species were observed during the site visit.

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

6.3 Disturbance and weeds

Noxious weeds on the site include:

Lantana	*Lantana camara*	Class 4
Large-leaf Privet	*Ligustrum lucidum*	Class 4
Small-leaf PrivetXxx	*Ligustrum sinense*	Class 4
African Olive	*Olea europaea* subsp. cuspitata	Class 4

Brief overview of their on-site status.
These species are present in small numbers mostly as single individuals.

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.

7. Survey results: Fauna

7.1 Species of conservation concern

No threatened fauna species were recorded during the site survey.

7.2 Fauna results

A total of 11 species were detected, including mammals, birds, and frogs. 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 3. List of fauna detected on the site

Common Name	Scientific Name	Conservation Status	Recorded AE
Birds			
Masked Lapwing	*Vanellus miles*		O
Spotted Turtle-dove*	*Streptopelia chinensis*		W
Crested Pigeon	*Ocyphaps lophotes*		O
Little Corella	*Cacatua pastinator*		W
Rainbow Lorikeet	*Trichoglossus haematodus*		O
Asian Koel	*Eudynamys scolopaceus*		W
Grey Butcherbird	*Cracticus torquatus*		W
Noisy Miner	*Manorina melanocephala*		O
Australian Raven	*Corvus coronoides*		W
Mammals			
Common Brushtail Possum	*Trichosurus vulpecula*		S
Frogs			
Brown-striped Frog	*Limnodynastes peronii*		W

Key

* = Introduced fauna
O = Observed
S = Scats
W = Calls

7.3 Fauna Summary

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

Mammals

Mammal species detected on the site totalled 1. A scat of a Common Brush-tailed Possum was recorded during the site visit. This is expected as this species is reasonably common in the area. Species not recorded during the survey but likely to occur on the site include Gould's Wattled Bat *Chalinolobus gouldii.*

Reptiles

No reptile species were detected on the site. However, it is highly likely that the Grass Skink *Lampropholis delicate* and Garden Skink *Lampropholis guichenoti* are present on the site.

Frogs

Frog species detected on the site totalled 1. One Brown-striped Frog was heard calling from an underground drain. This species is common in urban areas.

Birds

Bird species detected on the site totalled 9. All species observed are common in urban areas. Species not recorded during the survey but likely to occur on the site or flying over the site include Sulphur-crested Cockatoo and Galah.

7.4 Microbats

Foraging Habitat

This site provides potentially suitable but mostly marginal 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.

Roosting Habitat

One potential tree hollow was observed on the site which may provide suitable roosting habitat for *Falsistrellus tasmaniensis, Mormopterus norfolkensis, Scoteanax rueppellii, Myotis macropus, Miniopterus australis* and *Saccolaimus flaviventris*. This site has residential buildings and other suitable (often human-made) structures which provide potentially suitable roosting habitat for *Chalinolobus dwyeri*, *Miniopterus schreibersii oceanensis, Myotis macropus*. *Kerivoula papuensis* normally roosts in hanging bird nests or trees in rainforest gullies so is very unlikely to roost in the surveyed site.

6.5 Feral fauna

The site is in an urban area so it is likely the Black Rat *Rattus rattus* is present on the site.

8. Discussion of results

The site is an existing residential development prior to the buildings it was part of an area used for agriculture, so significant disturbance has been present on the site at least since the 1940s. Exotic plantings, non-local native landscape planting and weed indicator species are common, indicating a high disturbance regime on the site. Native faunal indicator species, such as a dominance of large birds, are consistent with an urban area.

The majority of the site provides suitable for common species capable of living in suburban areas.

9. Impact on flora and fauna

9.1 Long-term prospects with no development and continuing maintenance

The site will continue to provide habitat suitable for common species.

9.2 Proposal and impact

9.2.1 Short-term impact

It is assumed significant earthworks may take place and require the removal of all tall locally indigenous tree species.

9.2.2 Long-term impact

Long term impacts will in general be similar to short-term impacts, however, landscaping with local indigenous species will offset some of the losses caused by clearing activities.

9.3 Measures to enhance habitat

A recommendation of this report, is the landscape plan for the site must include local indigenous species. This will assist in offsetting the loss of the locally indigenous species when anticipated clearing works take place.

9.4 Impact on floral and faunal species, populations and communities

9.4.1 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 4

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.

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

Table 4. 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 flying night fauna				
Powerful Owl *Ninox strenua*	No	-		No significant effect
Grey-headed Flying-fox *Pteroputs poliocephalus*		Vulnerable		
Eastern False Pipistrelle *Falsistrellus tasmaniensis*		-	Sch. 2, Vul.	
Large-eared Pied Bat *Chalinolobus dwyeri*		Vulnerable	Sch. 2, Vul.	
Eastern Freetail-bat *Mormopterus norfolkensis*		-	Sch. 2, Vul.	
Eastern Bentwing-bat *Miniopterus schreibersii oceanensis*		-	Sch. 2, Vul.	
Greater Broad-nosed Bat *Scoteanax rueppellii*		-	Sch. 2, Vul.	
Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*		-	Sch. 2, Vul.	
Little Bentwing-bat *Miniopterus australis*		-	Sch. 2, Vul.	
Southern Myotis *Myotis macropus*		-	Sch. 2, Vul.	
Sydney Turpentine Ironbark Forest	No	Crit. End.	Sch 1. End	No significant effect

A Species Impact Statement is not recommended.

10. Planning Instruments

10.1 Environment Protection and Biodiversity Conservation Act 1999

Sydney Turpentine Ironbark Forest is protected under Commonwealth legislation by the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999) and is listed as Critically Endangered. However, the condition of the remnant vegetation on the site does not meet the requirements of the Commonwealth Government to be considered part of this ecological community. The provisions of the EPBC Act do not apply to this proposal.

11. Recommendations

a) Landscaping

i. A weed control programme is to be undertaken to remove all weed species from Class 1 to Class 5 categories, consistent with the provisions of the Noxious Weeds Act 1993. On this site it is assumed that all weeds will be controlled during clearing works.

ii. As an offset for the loss of potential indigenous vegetation, presumably remnants of the Endangered Ecological Community Sydney Turpentine Ironbark Forest. The landscape plan and landscaping for the site must include at least some of the following local indigenous species found in Sydney Turpentine Ironbark Forest. At least ten shorter trees and shrubs as well as climbers and groundcovers must be used to offset the loss of the existing trees.

a. Tall trees[1]

Angophora costata
Eucalyptus eugenoides
Eucalyptus fibrosa
Eucalyptus globoidea
Eucalyptus paniculata
Eucalyptus pilularis
Eucalyptus punctata
Eucalyptus resinifera
Syncarpia glomulifera

b. Shorter trees and shrubs

Acacia implexa
Allocasuarina torulosa
Dodonaea triquetra
Elaeocarpus reticulatus[2]
Glochidion ferdinandi
Kunzea ambigua
Ozothamnus diosmifolius
Pittosporum undulatum
Rapanea variabilis

c. Climbers and scramblers

Kennedia rubicunda
Pandorea pandorana

d. Groundcovers

Adiantum aethiopicum
Dianella caerulea
Dianella longifolia
Dichondra repens
Imperata cylindrica
Lomandra longifolia
Pratia purpurascens
Themeda australis

[1]A list of local indigenous tall trees has been provided if adequate space allows the planting of one of a small number of individuals of these species. However, it is reasonably likely that the available space for tall trees in the development may be negligible it may not be appropriate to plant any of these species. Some of these species may eventually grow to 20 – 30 m tall.

[2]Elaeocarpus is not commonly found in Sydney Turpentine Ironbark Forest according to Tozer *et al.* 2010. However, it is common in the locality and often found in adjoining areas.

b) Soil management

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.

The Assessment of Significance (Office of Environment and Heritage (OEH)) states that *"Proposed measures that mitigate, improve or compensate for the action, development or activity should not be considered in determining the degree of the effect on threatened species, populations or ecological communities, unless the measure has been used successfully for that species in a similar situation."*

Threatened flying night fauna

Powerful Owl *Ninox strenua*
Grey-headed Flying-fox *Pteroputs poliocephalus*
Eastern False Pipistrelle *Falsistrellus tasmaniensis*
Large-eared Pied Bat *Chalinolobus dwyeri*
Eastern Freetail-bat *Mormopterus norfolkensis*
Eastern Bentwing-bat *Miniopterus schreibersii oceanensis*
Greater Broad-nosed Bat *Scoteanax rueppellii*
Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*
Little Bentwing-bat *Miniopterus australis*
Southern Myotis *Myotis macropus*

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. The type of habitat found on the site is common in the locality. If any species of threatened flying night fauna forage or possibly roost on the site it would represent a small part of their foraging range. The proposal may lead to a reduction in the amount of vegetation, but it is likely a broadly similar vegetation, that is, an urban landscape with a mixture of local and exotic species and groundcovers will be used for the site. The site post-development will provide a broadly similar habitat.

It is unlikely the proposal will have an adverse effect on the life cycle of any local viable population of threatened flying night fauna that will place that species 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

The site is approximately one (1) hectare in size, it is anticipated that the whole site will be cleared or modified for the proposal.

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 site is surrounded by similar habitat.

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 – low (low – moderate). The foraging habitat on the site is common in the locality so its importance is low to negligible. One Sydney Blue Gum *Eucalyptus saligna* may contain a hollow. Hollows are generally uncommon in urban areas, so this hollow has some value, but most likely to common indigenous and exotic species, its habitat value is rated as low to perhaps moderate.

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,

No. The removal of potential foraging habitat comprising of a few indigenous trees, landscape plantings and possibly one hollow is unlikely to be consistent with any recovery plan. However, the modification of habitat or loss of habitat is likely to have a negligible effect on any of these threatened flying night fauna species.

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.

Yes. Although building construction is not listed as a key threatening process, the proposed development will require the "Clearing of native vegetation" and the "Removal of hollow-bearing trees" 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.

On this site the clearing of native vegetation consists of the removal of the Blue Gums *Eucalytus saligna* and Thin-leaved Stringybark *Eucalyptus eugenoides* and possibly the Smooth-barked Apple *Angophora costata* as well as very small areas of locally indigenous groundcovers. However, the impacts are likely to be considered minor.

Conclusion

The proposed activity is unlikely to have a significant effect on Powerful Owl, Grey-headed Flying-fox, Eastern False Pipistrelle, Large-eared Pied Bat, Eastern Freetail-bat, Eastern Bentwing-bat, Greater Broad-nosed Bat, Yellow-bellied Sheathtail-bat, Little Bentwing-bat, Southern Myotis. Therefore a Species Impact Statement is not recommended.

Sydney Turpentine Ironbark Forest

As stated elsewhere in this report, it is not certain all or some of the local indigenous trees are remnant vegetation. However, a precautionary approach has been taken and the Sydney Blue Gums, the Thin-leaved Stringybarks, local indigenous groundcovers, and perhaps the Smooth-barked Apple are considered part of the critically endangered ecological community Sydney Turpentine Ironbark Forest for this Seven-part Test.

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,

Not applicable. This test is for an endangered ecological community.

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 an endangered ecological community.

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

No. While the proposal is likely to remove the locally indigenous trees comprising of the Sydney Blue Gums and Thin-leaved Stringybarks as well as the indigenous groundcovers equal to approximately 375 m2 when determined by approximate canopy extent. Or 425 m2 (375 m2 + 50 m2) if the Smooth-barked Apple is included, the proposal is unlikely to place the local occurrence at risk of extinction. The local occurrence also includes other scattered local indigenous trees in the locality and also the vegetation present in Maurice Hughes Reserve and Bert Parkinson Reserve at its closest point approximately 220 m distant from the site. This patch of remnant vegetation is in slightly better condition as it is more extensive and the ground cover comprises on average a greater amount of indigenous species, however this area of native vegetation has also been converted to a parkland, so is still significantly altered from the pre-European settlement condition.

A more significant long-term threat to the community, particularly its longevity in the areas of parkland is lack of recruitment (germination and establishment of replacement locally indigenous trees). While the parks contain a lot of tall locally indigenous trees, over the long term, deaths of existant trees will occur and if no replacement occurs the ecological community will become extinct.

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

The prosoal will adversely modify the compostion of the ecological community on the site, however, it will not substantially or adversely modify the composition of the ecological community in the locality. The proposal will not place the local occurrence of this ecological community at risk of extinction.

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

The proposal is likely to remove the locally indigenous trees comprising of the Sydney Blue Gums and Thin-leaved Stringybarks as well as the indigenous groundcovers equal to approximately 375 m2 when determined by approximate canopy extent. Or 425 m2 (375 m2 + 50 m2) if the Smooth-barked Apple is included.

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 site is surrounded by similar habitat.

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 - low. Similar habitat, that is scattered remnant or potentially remnant trees are reasonably common in the locality. Probably the most important habitat in the locality is the remnant vegetation found in Maurice Hughes Reserve and Bert Parkinson Reserve.

Possibly the biggest threat to the long-term survival to this ecological community in the locality is the lack of recruitment (germination and establishment of replacement locally indigenous trees). While the parks contain a lot of tall locally indigenous trees, over the long term, deaths of existant trees will occur and if no replacement occurs the ecological community will become extinct.

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 critically endangered ecological community.

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

No. The removal of remnant or potentially remnant trees is unlikely to be consistent with the overall objectives of any recovery plan.

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.

Yes. Although building construction is not listed as a key threatening process, the proposed development will require the "Clearing of native vegetation" and the "Removal of hollow-bearing trees" which are key threatening processes relevant to this critically endangered ecological community. Key threatening processes are listed under the TSC Act, 1995 and the Commonwealth's EPBC Act, 1999.

On this site the clearing of native vegetation consists of the removal of the Blue Gums *Eucalytus saligna* and Thin-leaved Stringybark *Eucalyptus eugenoides* and possibly the Smooth-barked Apple *Angophora costata* as well as very small areas of locally indigenous groundcovers. However, the impacts are likely to be considered minor.

Conclusion

The proposed activity is unlikely to have a significant effect on Sydney Turpentine Ironbark Forest. 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 a 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 314940 East, 6266140 North (GDA 1994)

Filicopsida	Coniferopsida
Asplenium australasicum	* Araucaria heterophylla
Cyathea cooperi	* Cedrus deodara
Davallia pyxidata	* Chamaecyparis sp.
Nephrolepis cordifolia	* Juniperus communis
	* Thujia plicata

Angiospermae Dicotyledones	
* Acalypha amentacea ssp. wilkesiana	* Macfadeyana unguis-cati
* Acanthus mollis	* Magnolia grandiflora
* Acer negundo	* Magnolia x soulangiana
* Acer palmatum	* Mangifera indica
* Agapanthus praecox	* Mentha sachalinensis
* Alnus jorullensis	* Michelia (Magnolia) figo
* Alyssum maritima	* Modiola carolinana
* Anredera cordifolia	* Nandina domestica
* Araujia sericifera	* Nerium oleander
* Argyranthemum frutescens	* Ochna serrulata
* Azalea x hybrid	* Olea europaea subsp. cuspidata **N4**
* Begonia x semperflorens	* Passiflora edulis
* Buxus sempervirens	* Pelargonium peltatum
* Camellia sasanqua	* Pennisetum clandestinum
* Centaurium erythraea	* Persica americana
* Citrus sp.	* Petunia x hybridum
* Coleonema pulchrum	* Photinia rubra
* Convolvulus mauritanicus	* Plumbago ariculata
* Coreopsis lanceolatus	* Plumeria rubra
* Crassula ovata	* Podranea ricasoliana
* Cuphea ignea	* Polycarpon tetraphyllum
* Genista monspessulana	* Polygala myrtifolia
* Dahlia sp.	* Potentilla (Duchesnea)indica
* Dimorphotheca ecklonis	* Prunus armeniaca
* Erigeron karvinskianus	* Prunus domestica “italica”
* Eruca sativa	* Punica granatum
* Euphorbia peplus	* Pyrus calleryana
* Euphorbia pulcherima	* Robinia pseudoacacia
* Ficus lyrata	* Rosa x hybrid
* Fraxinus griffithii	* Rosmarinus officinalis
* Fuchsia x hybrid	* Rubus sp. (Rasberry)

Angiospermae Dicotyledones	
* Gamochaeta americana	* Salvia elegans
* Gardenia floribunda	* Salvia leucantha
* Gazania rigens	* Salvia officinalis
* Geranium x hortorum	* Schefflera arboricola
* Gordonia axillaris	* Schlumbergera x buckleyi
* Harpephyllum caffrum	* Senecio maritima (syn. Jacobaea maritima)
* Hedera helix	* Senna pendula
* Hibiscus rosa-sinensis	* Solanum lycopersicum
* Hoya sp	* Solanum nigram
* Hydrangea macrophyllum	* Solanum tuberosum
* Hypochaeris radicata	* Sonchus oleracea
* Jacaranda mimosifolia	* Spirea cantonensis
* Jasminium polyanthum	* Stenophratum secundum
* Kalanchoe thyrsiflora	* Streptocarpus sp.
* Lagunaria patersonia	* Taraxacum officinale
* Lampranthus sp.	* Tecoma stans
* Lantana camara **N4**	* Tibochina (lepidota?)
* Largerstroemia indica	* Trachyspermum jasminoides
* Lavendula angustifolia	* Triadica sebifera
* Leucanthemum x superbum	* Trifolium repens
* Ligustrum lucidum **N4**	* Vinca minor
* Ligustrum sinense **N4**	* Viola odorata
* Liquidambar styriciflua	* Wisteria floribunda
* Lonicera japonica	
Acacia fimbriata	Eucalyptus saligna
Acacia podalyriifolia	Ficus benjimina
Acacia sp (dwarf cultivar)	Ficus macrophylla
Acmena smithii	Glycine 39landestine
Angophora costata	Grevillea arenaria (cultivated form)
Brachyton acerifolium	Grevillea sp (~ Robyn Gordon type)
Callistemon "Little John"	Lophostemon conferta
Callistemon salignus	Mandevilla sanderii
Callistemon viminalis	Melaleuca bracteata
Cayratia clematida	Oxalis (small yellow-flowered group)
Ceratopetalum gummiferum	Pittosporum undulatum
Corymbia ficifolia	Pratia purpurascens
Dichrondra repens	Schefflera actinophylla
Elaeocarpus reticulatus	Veronica pleibea
Eucalyptus botryoides	Viburnum tinus
Eucalyptus eugenoides	Wahlenbergia gracilis
Eucalyptus scoparia	Westringa fruticosa

Monocotyledones

* Asparagus aethiopicus	Archontophoenix cunninghamiana
* Asparagus officinalis	Cordyline stricta
* Beaucarnea recurvata	Cynodon dactylon
* Bromus catharticus	Cyperus gracilis
* Canna indica	Doryanthes excelsa
* Chlorophytum comosum	Lepironia articulata
* Clivia minata	Microlaena stipoides
* Cordyline sp.	Oplismenus aemulus
* Dietes iridoides	Xanthorrhoea sp.
* Erharta erecta	
* Monstereo deliciosa	
* Musa sp.	
* Nothoscordum inodorum	
* Nymphaea sp.	
* Philodendron bipinnatifidum	
* Phonenix robelenii	
* Strelitzia reginae	
* Tradescantia albiflora	
* Washingtonia filifera	
* Watsonia meriana	
* Yucca aloifolia	

Appendix 4. Expected fauna species in the Sydney Basin

Mammals

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

Frogs

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

Reptiles

Common Name	Scientific Name
Diamond Python	*Morelia spilota spilota*
Common Death Adder	*Acanthophis antarcticus*
Yellow-faced Whip Snake	*Demansia psammophis*
Common Tree Snake	*Dendrelaphis punctulatus*
Golden-crowned Snake	*Cacophis squamulosus*
Eastern Small-eyed Snake	*Cryptophis nigrescens*
Red-naped Snake	*Furina diadema*
Black-bellied Swamp Snake	*Hemiaspis signata*
Tiger Snake	*Notechis scutatus*
Red-bellied Black Snake	*Pseudechis porphyriacus*
Eastern Brown Snake	*Pseudonaja textilis*
Dwyer's Snake	*Parasuta dwyeri*
Bandy Bandy	*Vermicella annulata*
Blackish Blind Snake	*Ramphotyphlops nigrescens*
Wood Gecko	*Diplodactylus vittatus*
Lesueur's Velvet Gecko	*Oedura lesueurii*
Broad-tailed Gecko	*Phyllurus platurus*
Thick-tailed Gecko	*Underwoodisaurus milii*
Burton's Snake-lizard	*Lialis burtonis*
Common Scaly-foot	*Pygopus lepidopodus*
Jacky Lizard	*Amphibolurus muricatus*
Bearded Dragon	*Pogona barbata*
Punctate Worm-skink	*Anomalopus swansoni*
Eastern Blue-tongue	*Tiliqua scincoides*
Southern Rainbow-skink	*Carlia tetradactyla*
Cream-striped Shinning-skink	*Cryptoblepharus virgatus*
Robust Ctenotus	*Ctenotus robustus*
Copper-tailed Skink	*Ctenotus taeniolatus*
Mainland She-oak Skink	*Cyclodomorphus michaeli*
Pink-tongued Skink	*Cyclodomorphus gerrardii*
Cunningham's Skink	*Egernia cunninghami*
Black Rock Skink	*Egernia saxatilis*
White's Skink	*Liopholis whitii*
Eastern Water-skink	*Eulamprus quoyii*
Barred-sided Skink	*Eulamprus tenuis*
Dark-flecked Garden Sunskink	*Lampropholis delicata*
Pale-flecked Garden Sunskink	*Lampropholis guichenoti*
Weasel Skink	*Saproscincus mustelinus*
Red-throated Skink	*Acritoscincus platynota*
Three-toed Skink	*Saiphos equalis*
Lace Monitor	*Varanus varius*
Eastern Snake-necked Turtle	*Chelodina longicollis*

Birds

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

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

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

Common Name	Scientific Name
Australian Magpie	*Cracticus tibicen*
Pied Currawong	*Strepera graculina*
Australian Raven	*Corvus coronoides*
White-winged Chough	*Corcorax melanorhamphos*
Apostlebird	*Struthidea cinerea*
Eurasian Skylark	*Alauda arvensis*
Australasian Pipit	*Anthus novaeseelandiae rogersi*
House Sparrow	*Passer domesticus*
Red-browed Finch	*Neochmia temporalis*
Double-barred Finch	*Taeniopygia bichenovii*
Mistletoebird	*Dicaeum hirundinaceum*
Welcome Swallow	*Hirundo neoxena*
Tree Martin	*Petrochelidon nigricans*
Fairy Martin	*Petrochelidon ariel*
Cicadabird	*Coracina tenuirostris*
Red-whiskered Bulbul	*Pycnonotus jocosus*
Australian Reed-warbler	*Acrocephalus australis*
Little Grassbird	*Megalurus gramineus*
Golden-headed Cisticola	*Cisticola exilis*
Silvereye	*Zosterops lateralis*
Eurasian Blackbird	*Turdus merula*
Common Starling	*Sturnus vulgaris*
Common Myna	*Sturnus tristis*

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

Invertebrates

Common Name ***Scientific Name*** Schedule Listing	**Preferred Habitat**	**Comments**
Cumberland Plain Land Snail *Meridolum corneovirens* 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.
Dural Woodland Snail *Pommerhelix duralensis* EPBC Act, End.	Forested habitats that have good native cover and woody debris. Under rocks or inside curled-up bark. It does not burrow nor climb.	No Suitable natural habitat occurs on the site.

Mammals

Common Name ***Scientific Name*** Schedule Listing	**Preferred Habitat**	**Comments**
Large-eared Pied Bat *Chalinolobus dwyeri* 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.	Suitable natural habitat occurs on the site.
Eastern False Pipistrelle *Falsistrellus tasmaniensis* TSC Act, Sch. 2, Vul.	Little known of habitat. Has been found roosting in stem holes of living Eucalypts	Suitable natural habitat occurs on the site.
Eastern Freetail-bat *Mormopterus norfolkensis* TSC Act, Sch. 2, Vul.	Dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roosts mainly in tree hollows but will also roost under bark or in man-made structures.	Suitable natural habitat occurs on the site.
Eastern Bentwing-bat *Miniopterus schreibersii oceanensis* TSC Act, Sch. 2, Vul.	Well-timbered valleys. Roosts in caves and storm-water channels and similar structures. Does not roost in tree hollows.	Suitable natural habitat occurs on the site.
Little Bentwing-bat *Miniopterus australis* TSC Act, Sch. 2, Vul.	Well-timbered habitats incl. rainforest, Melaleuca swamps and dry sclerophyll forests. Roosts in caves and storm-water channels and similar structures. Does not roost in tree hollows.	Suitable natural habitat occurs on the site.
Southern Myotis *Myotis macropus* 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.	Very marginal possilbility of roosting habitat on the site.
Greater Broad-nosed Bat *Scoteanax rueppellii* TSC Act, Sch. 2, Vul.	Found in woodlands, moist and dry sclerophyll forests and rainforests. Prefers gullies. Roosts in tree hollows only.	Suitable natural habitat occurs on the site.

Common Name ***Scientific Name*** Schedule Listing	Preferred Habitat	Comments
EPBC Act, Lower risk (near threatened)		
Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris* 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 habitat occurs on the site.
Grey-headed Flying-fox *Pteropus poliocephalus* 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 habitat occurs on the site.

Birds

Common Name ***Scientific Name*** **Schedule Listing**	Preferred Habitat	Comments
Powerful Owl *Ninox strenua* TSC Act, Sch. 2, Vul.	Pairs occupy permanent territories in mountain forests, gullies and forest margins, sparser hilly woodlands, coastal forests, woodlands and scrubs.	Marginal habitat occurs on the site.

Appendix 6. 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 2016
NPWS GIS data licence number is CON95034
DG NSW Dept of Primary Industries Animal Care and Ethics Committee Approval expires 8 December 2016
DG NSW Dept of Primary Industries Animal Research Authority expires 8 November 2016

The Consultancy Team

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PhD, researching Cumberland Plain vegetation and fauna habitat, at Centre for Integrated Catchment Management (University of Western Sydney, 2007)
Planning for Bushfire Protection Certificate course (University of Technology, 2006)
Consulting Planners Bushfire Training Course (Planning Institute of Australia, 2003)
MA (Macquarie University, 1991)
Wildlife Photography Certificate (Sydney Technical College, 1987)
Herpetological Techniques Certificate (Sydney Technical College, 1986)
Applied Herpetology Certificate (Sydney Technical College, 1980)
Dip Ed (University of New England, 1978)
BSc (University of New England - Triple Majors in Zoology, incl. Ecological Zoology, 1974)

Dr Daniel McDonald

PhD (The University of Sydney 2006)
M. Agr (The University of Sydney 1996)
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Daniel is an accredited Biobanking Assessor
Quantified Tree Risk Assessment (QTRA) and Visual Tree Assessment (VTA)

Jesse Tree

Bachelor of Natural Sciences and Horticulture (University of Western Sydney, (2013,
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Mark Mackinnon
Qualifications: B Env. Sci. (Hons), Grad. Dip. Ornithology. Professional Membership - active member of the Environmental Institute of Australia and New Zealand. Expertise: Bushfire Management Operations, Fire Ecology, Ornithology, and Zoology.