# STATEMENT OF EFFECT

# **ON THREATENED FLORA AND FAUNA**

for a proposed Rural Residential Rezoning

at

# Lot 7 DP263182 & Lot 28 DP844871 Elrington Road

# ELRINGTON NSW

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#### **EXECUTIVE SUMMARY**

Flora, fauna and habitat studies have been undertaken for a proposed rezoning over Lot 7 DP263182 and Lot 28 DP844871 Elrington Road, Elrington NSW. Investigations in accordance with the requirements of the Environmental Planning and Assessment Act 1979 (EPA Act) and the Threatened Species Conservation Act 1995 (TSC Act) have led to this Statement of Effect upon Threatened Flora and Fauna, which incorporates an assessment of the site under SEPP 44 – Koala Habitat Protection and the Environmental Protection and Biodiversity Conservation Act 1999. These studies have been undertaken to ascertain whether or not the proposal would have a significant effect upon any populations, ecological communities, or habitats of threatened flora and fauna species. The results of two previous studies (EAP 1999 & Andrews Neil 2001) were also incorporated into the findings.

#### **Description of Site**

The 40ha site comprised of Lot 7 DP263182 and Lot 28 DP844871 was located to the south of Elrington Road approximately 2km east of the settlement of Kearsley. The site is currently zoned 1(a) Rural and is surrounded by similar rural properties to east and west, developed rural-residential lots to the north and vegetated slopes and ridges to the south. The vegetation on site has been heavily disturbed due to past intensive practices such as coal mining and grazing. This has resulted in the site consisting mostly of pasture and sporadic trees. There are a number of large remnant buildings located in the centre of the site from coal works that used to be occupy the site from 1925 until 1964. These buildings are heritage listed and are likely to remain on site in some form.

#### **The Proposal**

It is proposed that the site is subdivided into 31 rural-residential lots, with a minimum lot size of 1ha. No trees are proposed to be removed as the trees on site are generally scattered and can be retained within the lots. The existing buildings on site are heritage listed and are expected to be retained. The buildings are to be located on individual lots and are to be adapted for suitable uses such as farm sheds and dwellings. Access to the site will be provided by Elrington Road and an internal road network.

#### Vegetation

The vegetation on site was heavily disturbed with large portions of the site mostly clear of native vegetation with only scattered trees and a modified understorey. A total of three vegetation

assemblages were delineated as a result of the vegetation survey:

- Lower Hunter Spotted Gum Ironbark Forest
- Hunter Lowlands Red Gum Forest
- Sandstone Hills Bloodwood Woodland

The proposal aims to preserve trees with the road network and building envelopes to be located in a manner that will minimise the loss of trees on site.

## **Endangered Ecological Communities**

Two endangered ecological communities, Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion and Hunter Lowland Redgum Forest in the Sydney Basin Bioregion were considered to be present within the site.

The majority of woodland on site consisted of the above two communities. Both assemblages were heavily disturbed with a sparse canopy and understorey dominated by introduced pasture species. The proposal aims to retain the trees on site and it is unlikely that the remnant trees of these communities would be removed as part of any future development. Taking into account the highly disturbed nature of these assemblages and that no trees are expected to be removed as a result of the proposal it is considered that the proposal is unlikely to adversely effect the extent or adversely modify the composition of these assemblages such that their local occurrence is placed at risk of extinction.

#### **Threatened Flora species**

No threatened flora species were found to be present despite targeted and incidental surveys. Suitable habitat was considered to be present for 6 of the 13 species assessed within the site:

Acacia bynoeana
Callistemon linearifolius
Eucalyptus glaucina
Grevillea parviflora ssp. parvifolia
Rutidosis heterogama
Cymbidium canaliculatum
Bynoe's Wattle
Netted Bottlebrush
Slaty Red Gum
Narrow-leaved Grevillea
Wrinklewort
Tiger Orchid (Endangered Population)

Given the disturbed nature of the site, particularly the understorey, the majority of habitat available on site was considered marginal. The proposal aims to preserve trees with the road network and building envelopes to be placed to minimise the loss of trees on site. Considering the open nature of the site and the disturbed nature of the understorey it is highly unlikely that a significant amount of habitat will be removed as a result of the proposal in relation to these threatened flora species.

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#### **Rare Flora Species**

Two rare flora species, *Acacia kulnurensis* and *Grevillea montana* were found to be present within the Sandstone Hills Bloodwood Woodland located in the south of the site. This area has been identified as too steep to develop and this area will not be impacted upon. It is considered unlikely that the proposed rezoning would lead to the local extinction of any of the above rare flora species, particularly given that the habitat on site will remain intact.

#### **Threatened Fauna Species**

*Myotis adversus* (Large-footed Myotis), *Mormopterus norfolkensis* (Eastern Freetail-bat) and *Pomatostomus temporalis* ssp. *temporalis* (Grey-crowned Babbler) were recorded on site during targeted surveys.

*Myotis adversus* was captured on site during harp trapping. The trap was located close to the dam in the north of the site which is likely be used by this species for hunting. Preferred hunting habitat is restricted to the dams and the ephemeral drainage lines on site, although this species is also known to hunt aerially with marginal hunting habitat available across the site. The large remnant buildings on site provide ideal roosting habitat for this species. *M. adversus* has also been known to utilise tree hollows on occasions and this resource is also available on site in small numbers. *Mormopterus norfolkensis* was also recorded on site during echolocation call recording. The site provided hunting habitat for this species however roosting habitat was restricted to the hollow-bearing trees onsite.

The dams and ephemeral drainage lines are likely to be retained on site and will still provide hunting habitat for *M. adversus* within the proposal. Future development is unlikely to result in a significant reduction of hunting habitat for these species. If for unforeseen circumstances any habitat trees require removal it is recommended that compensatory bat nest boxes be erected prior to any future work on site to offset the loss of any tree hollow. The proposal may also involve the removal or alteration of the buildings on site in the future. It is recommended that the buildings be inspected prior to removal to determine whether any bat colonies are present. If any colonies are discovered a management plan detailing protection methods may be appropriate. Provided the recommendations are implemented and considering that preferred hunting habitat for *M. adversus* will be retained on site the proposal is unlikely to significantly affect the life cycle of these microchiropteran bat species or place any viable local populations of these species at risk of extinction.

A group of approximately 12 Grey-crowned Babblers were recorded in the neighbouring property near the entrance in the north of the site and were observed in the trees on site near this area over a number of days. A small number of dome shaped nests were also observed in this area. Considering that minimal vegetation will be removed as a result of the proposal it is unlikely that a significant

amount of habitat if any will be removed. The proposal has the potential to introduce more domestic cats to the area which have the potential to predate on the local Babbler population. It is recommended that cats be excluded from the site by means of a restriction of title on the proposed lots. Provided this recommendation is implemented the proposal is unlikely to have an adverse effect on the lifecycle of this species such that the local population is placed at risk of extinction.

It was considered that mostly marginal foraging/hunting/nesting resources were available for 31 of the 42 remaining fauna species assessed. The site was found to contain at least marginal habitat for the following addressed species:

- Litoria aurea
- Ixobrychus flavicollis
- Ephippiorhynchus asiaticus
- Rostratula benghalensis australis
- Callocephalon fimbriatum
- Calyptorhynchus lathami
- Glossopsitta pusilla
- Lathamus discolor
- Neophema pulchella
- *Climacteris picumnus* ssp. *victoriae*
- *Melithreptus gularis* ssp. gularis
- Pyrrholaemus sagittatus
- Stagonopleura guttata
- Xanthomyza phrygia
- Erythrotriorchis radiatus
- Hamirostra melanosternon
- Lophoictinia isura
- Ninox connivens
- Ninox strenua
- *Tyto novaehollandiae*
- *Tyto tenebricosa*
- Dasyurus maculatus ssp. maculatus
- *Phascolarctos cinereus*
- Petaurus norfolcensis
- *Pteropus poliocephalus*
- Chalinolobus dwyeri
- Falsistrellus tasmaniensis
- Miniopterus australis
- Miniopterus schreibersii ssp. oceanensis
- Scoteanax rueppellii
- Vespadelus troughtoni

Green and Golden Bell Frog Black Bittern Black-necked Stork Australian Painted Snipe; Gang Gang Cockatoo Glossy Black-Cockatoo Little Lorikeet Swift Parrot **Turquoise** Parrot Brown Treecreeper Black-chinned Honeyeater Speckled Warbler **Diamond Firetail** Regent Honeyeater Red Goshawk Black-breasted Buzzard Square-tailed Kite Barking Owl Powerful Owl Masked Owl Sooty Owl Tiger Quoll Koala Squirrel Glider Grey-headed Flying-fox Large-eared Pied Bat Eastern False Pipistrelle Little Bentwing Bat Large Bentwing-bat Greater Broad-nosed Bat

Eastern Cave Bat

The proposal aims to preserve trees with the road network and building envelopes to be placed to minimise the loss of trees on site. Considering the open nature of the site and lack of native understorey it is unlikely that a significant amount of habitat will be removed as a result of the proposal. Provided the recommendations in this report are implemented and considering the generally low quality of habitat on site and the availability of superior habitat in the surrounding area, the

proposal is unlikely to affect the life cycle of the species considered such that a viable local population is likely to be placed at risk of extinction.

#### State Environmental Planning Policy 44 – Koala Habitat Protection

Consideration of State Environmental Planning Policy 44 – Koala Habitat Protection identified two species of 'Koala Feed Tree' on site, *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus punctata* (Grey Gum). The results of the SEPP 44 assessment revealed that *E. tereticornis* and *E. punctata* comprised over 15% of the total trees present in some locations. Therefore the site would be considered to constitute 'Potential Koala Habitat'. Neither direct observations of Koalas nor evidence of Koala activity such as scats and scratches on the boles of trees were recorded during targeted and incidental searches. Few recent local Koala records were present on the DECCW database. Given the connectivity of the site to large tracts of suitable habitat there is potential for Koalas to utilise the site. However given the disturbed and open nature of the site the site would not be considered to constitute Core Koala Habitat and accordingly no further provisions of this policy apply to the site.

#### Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act (1999)

Considerations have been made to the Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act (1999). It was determined that the proposal is unlikely to have a significant impact on a matter of National Environmental Significance.

#### Recommendations

A number of recommendations have been given for the proposal and including:

- The hollow-bearing trees identified on site are likely to remain in-situ as a result of the proposal. If for some unforeseen purpose any habitat tree requires removal it is recommended that nest boxes of similar habitat value be installed at a ratio of 2:1 (nest boxes installed: hollows removed) prior to any clearing taking place. It is also recommended that a suitably qualified and immunised ecologist be on hand to inspect trees prior to removal and supervise the removal of any habitat trees to reduce the impact on any fauna species, which may be present. Any habitat trees should also be clearly marked prior to felling.
- The proposal may involve the removal or alteration of the buildings on site in the future. It is recommended that the buildings be inspected by a vaccinated ecologist prior to removal modification to determine whether any bat colonies are present.
- The proposal has the potential to introduce more domestic cats to the area which may predate on the local Babbler population. It is recommended that cats be excluded from the site by means of a restriction of title on the proposed lots.

- It is recommended that ongoing weed control targeting Blackberry be conducted throughout the site. Other noxious weeds including *Asparagus asparagoides, Lantana camara* and *Hypericum perforatum* were found in low frequency and should be controlled to limit the spread of these weeds on site.
- A small number of standing dead trees together with a small amount of fallen timber was present within the site. It is recommended that dead and fallen timber within the development area be relocated elsewhere on site so that this habitat resource is retained.
- To minimise the impact of the proposal on the dams and drainage lines on site it is recommended that appropriate sediment controls be utilised prior to any construction taking place.

#### Conclusion

In conclusion considering the proposal's aim to retain the vegetation currently on site and provided the recommendations in this report are implemented it is unlikely that the proposal will result in a significant adverse impact upon any viable local communities, populations or individuals of the threatened species considered in this report.

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# 1.0 INTRODUCTION

It is proposed that Lot 7 DP263182 and Lot 28 DP844871 Elrington Road, Elrington NSW, be rezoned from Rural 1(a) to Rural Residential. This report is intended to indicate the likelihood of this proposal having a significant effect on threatened species of flora, fauna and ecological communities and to fulfil other requirements of the Environmental Planning and Assessment Act (EPA Act) 1979 and the Threatened Species Conservation Act (TSC Act) 1995. Considerations have also been given to SEPP 44 – 'Koala Habitat Protection' and the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). This report will incorporate two previous reports undertaken for the proposal (EAP 1999 & Andrews Neil 2001).

## 1.1 GENERAL DESCRIPTION OF SITE

Lot 28 DP844871 is approximately 40ha and was located to the to the south of Elrington Road approximately 2km east of the settlement of Kearsley (Figures 1 & 2). The site is currently zoned 1(a) Rural and is surrounded by similar rural properties to east and west, developed rural-residential lots to the north and vegetated slopes and ridges to the south. There are a number of large remnant buildings located in the centre of the site from coal works that used to be occupy the site from 1925 until 1964. These buildings are heritage listed and are expected to remain on site in some form. Site information is detailed below in Table 1.

LGA	Cessnock Shire Council
Cadastral info.	Lot 7 DP263182 & Lot 28 DP844871
Zoning	Rural 1(a)
Landscape of Surrounding Area	Rolling low hills, ranging in elevation 60-260m. Most low-lying areas mainly cleared for agricultural purposes with some areas maintained for forestry purposes. Slopes and ridges are mostly vegetated with some sandstone rock outcropping present along the ridgelines.
Landscape of Site	Consisted of hills sloping downwards from approximately 110m asl from the eastern and southern boundaries to approximately 70m asl along the flat in the western portion of the site.
Geology	The landscape is associated with the Branxton Formation with two soil landscapes, Aberdare and Neath present on site. Consists of sandstone, conglomerate, siltstone and some tuff on the sloping areas with siltstone, pebbly sandstone and minor coal located on the low-lying areas.
Soils	<u>Aberdare</u> : Characterised by Yellow Podsolic Soils on the upper to mid slopes and Brown Podsolic soils on the steeper slopes. Alluvial soils occur in some of the drainage lines. <u>Neath</u> : Characterised by grey Solodic Soils in poorly drained areas associated with exposed coal seams. There are yellow Solodic Soils on better-drained lower slopes (Kovac & Lawrie, 1991).
General Vegetation on Site	The vegetation on site has been mostly cleared due to the previous uses of the site. The majority of the site consists of paddock with remnant trees throughout. Trees along the slopes included <i>Corymbia gummifera</i> (Red Bloodwood), <i>Corymbia eximia</i> (Yellow Bloodwood), <i>Corymbia maculata</i> (Spotted Gum) and <i>Eucalyptus punctata</i> (Grey Gum). Trees within the low-lying areas included <i>Angophora floribunda</i> (Rough-barked Apple), <i>Eucalyptus tereticornis</i> (Forest Red Gum) and occasionally <i>Eucalyptus fibrosa</i> (Broad-leaf Ironbark) and <i>Corymbia maculata</i> . <i>Melaleuca</i> sp. occurs in slow draining areas and drainage lines.
Condition of Vegetation on site	The vegetation on site has been heavily disturbed due to past intensive practices such as coal mining and grazing. This has resulted in the site consisting mostly of pasture and sporadic trees. The trees on site were mostly in good condition although there was a low density of hollow-bearing trees present. The vegetation on site lacked a native understorey and was dominated by introduced species.

Table 1: General information of	study site
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# **1.2 DESCRIPTION OF THE PROPOSAL**

It is proposed that the site be subdivided into 31 rural-residential lots, with a minimum lot size of 1ha. No trees are proposed to be removed as the trees on site are generally scattered and can be retained within the lots. The existing buildings on site are heritage listed and will be retained. The buildings are to be located on individual lots and are to be adapted for suitable uses such as farm sheds and dwellings. Access to the site will be provided by Elrington Road and an internal road network. A preliminary plan is shown in Figure 3.



# 2.0 SCOPE OF THE STUDY

This study was designed to address any likely flora and fauna issues of significance occurring as a result of the proposal. This was achieved by appraisal of the vegetation assemblage and structural formation, and identification of representative plant species of the various structural layers. Potential habitat offered by the vegetation present was also assessed. The possibility of this site being significant for any Schedule 1 and 2 (endangered and vulnerable) flora, fauna and ecological communities was paramount in the assessment process.

# 2.1 LEGISLATIVE REQUIREMENTS

This Statement of Effect on Threatened Flora and Fauna report has been structured upon the guidelines laid down in Section 5A of the Environmental Planning and Assessment Act (1979), and the Threatened Species Conservation Act (1995), which requires consideration of the impact of the proposed development upon any Schedule 1 and 2 (endangered or vulnerable) species and ecological communities expected or found on the site. Endangered and vulnerable species are collectively referred to as 'threatened' species in this report.

Also considered in this report was the Commonwealth Environment Protection and Biodiversity Conservation Act (1999) and SEPP 44 – 'Koala Habitat Protection'.

Fieldwork undertaken by Wildthing Environmental Consultants was carried out under the following NPWS Scientific Investigation Licence S10475 and under Animal Care and Ethics Approval: Animal Research Authority Issue by the Director General of NSW Agriculture (File No. 08 – 361) for the Fauna Survey for Biodiversity and Impact Assessment.

## 3.0 METHODOLOGY

# 3.1 VEGETATION APPRAISAL METHODOLOGY

The determination of the vegetation on site was undertaken through a detailed ground survey conducted on throughout the survey period. Flora investigations were undertaken in the manner described by Cropper (1993) as the 'Random Meander Technique'. This involved walking in a random manner throughout the entire study site, visiting the full range of habitats and checking every plant species seen.

During fieldwork, targeted searches were undertaken for any threatened flora species identified by literature and database searches as occurring within 10km of the site. A full list of vegetation species recorded during fieldwork is listed in Appendix B.

## **Targeted Flora Surveys**

Targeted surveys were undertaken to detect the threatened flora species considered in this report. The searches were undertaken by walking parallel transects (Cropper 1993) which were spaced at approximately 15-30m intervals across potential habitat within the site. The locations of any individuals are recorded by the use of a hand held Global Positioning System (GPS).

## **3.2 HABITAT SURVEY METHODOLOGY**

Habitat may be defined as the physical and biological environment required for the survival of a specific population of a species. In modern usage habitat has also come to be regarded as an association of landform and plant life, which provides sustenance and shelter for a particular fauna assemblage.

The methodology of the habitat appraisal used the vegetation community data combined, where relevant, with geomorphological features and the occurrence of particular plant species or forms (i.e. tree hollows) to provide a basis for a subjective habitat assessment aimed at placing the ecological status of the site within a local perspective.

## 3.2.1 GENERAL HABITAT FOR NATIVE SPECIES

From the vegetation appraisal and a general inspection of the site and surrounding areas, a subjective assessment of the general habitat value of this site was made. Considered in this assessment were:

- occurrence of that habitat type in the general vicinity;
- degree of disturbance and degradation;
- area occupied by that habitat on site;
- continuity with similar habitat adjacent to the site, or connection with similar habitat off site by way of corridors; and
- structural and floral diversity.

# 3.2.1.1 HOLLOW-BEARING TREE SURVEY

Hollow-bearing trees are a habitat resource type that is utilised by a variety of native avifaunal and mammalian species. This resource is usually a limiting factor in the occurrence of hollow-dependent species on a site, due to the time taken for hollows to form in trees. During the recent fieldwork a survey was undertaken to identify the number of hollow-bearing trees within the study area and to classify the size of the hollow openings.

## **3.2.2 HABITAT FOR SIGNIFICANT SPECIES**

This site was evaluated as potential habitat for each of the threatened species reported on the Department of Environment, Climate Change and Water (DECCW) Database and the Department of Environment, Water, Heritage and the Arts (DEWHA) on-line database from within 10km of the site. This evaluation was based on home-range, feeding, roosting, breeding, movement patterns and corridor requirements for fauna and hydrology, soil types, aspect and structural formation for flora species.

## 3.3 FAUNA SURVEY METHODOLOGY

The methodology adopted consisted of an assessment of the potential use of the site by any Schedule 1 and 2 fauna identified on the DECC and the DEWHA Databases. This was undertaken by both appraising the extent of likely habitat upon the site, searches for secondary indications of threatened species utilising the site, and incidental observations of native fauna in general. The survey was carried out using the Lower Hunter and Central Coast Region – Flora and Fauna Guidelines (Murray. et. al, 2002).

#### 3.3.1 SMALL TERRESTRIAL MAMMAL TRAPPING

Terrestrial mammal trapping was undertaken using 20 Elliott Type A traps (8x10x33cm) within the site. The traps were left in place for four consecutive nights giving a total of 80 small terrestrial trap nights. The traps were hidden in thick grass, under shrubs or around trees and were camouflaged with vegetation where the ground cover was sparse. The bait used for the traps were a mixture of rolled oats and honey, Good-O's (dry dog food) and peanut butter. The traps were checked early each morning and, where necessary, reset and rebaited. The location of the small terrestrial traps is shown in Figure 4.

## 3.3.2 MEDIUM TERRESTRIAL MAMMAL TRAPING

Medium terrestrial mammal trapping was undertaken using 5 cage traps ( $60 \times 35 \times 40$ cm) within the site. A lower number of traps were used due to the lack of appropriate cover available and exposure to livestock. The traps were left in place for four consecutive nights giving a total of 20 terrestrial



trap nights. The traps were hidden in thick grass, under shrubs or near fallen logs and were camouflaged with vegetation where the ground cover was sparse. The bait used for the traps was sardines and a mixture of rolled oats and honey. The traps were checked early each morning and, where necessary, reset and rebaited. The location of the medium terrestrial traps is shown in Figure 4.

# 3.3.3 ARBOREAL TERRESTRIAL MAMMAL TRAPING

Arboreal mammal trapping was undertaken using 20 Elliott Type B traps  $(15 \times 15 \times 46 \text{cm})$  within the site area to determine the presence of arboreal mammals. The traps were left in place for four consecutive nights giving a total of 80 arboreal trap nights. The traps were placed around 3 - 4 metres above the ground on platforms mounted on tree trunks. Trees which were targeted contained hollows, were flowering or had scratches present on the boles. The baits used consisted of a rolled oats and honey mixture, peanut butter and an aniseed ring (sugar coated sweet). The traps were sprayed with honey mixed in water before being placed in the trees to attract fauna and mask the smell of humans. The tree trunks were also sprayed with this mixture each day. In all cases the traps were checked early each morning and, where necessary, reset and rebaited. The position of the arboreal traps within the study area can be seen in Figure 4.

# 3.3.4 HARP TRAPPING

One monofilament harp trap was set for four consecutive nights within the site. The harp trapping was undertaken in order to sample the use of the site by sub-canopy microchiropteran bat species. The trap was positioned in a potential flyway and was checked early each morning, with any captures being identified directly via the use of dichotomous keys and subsequent comparison with commercially available field guides, where degrees of uncertainty prevailed. The location of the harp trap is shown in Figure 4.

# 3.3.5 MICROCHIROPTERAN BAT CALL SURVEY

Bat echo-location calls were recorded using an Anabat detector in areas which were considered likely to be used by bats. These positions were selected to sample potential hunting sites for bats, including flyways, clearings and ecotones. Echolocation surveys used a combination of set point and hand held mobile surveys. Surveys were conducted for approximately 60 minutes over two nights giving a total of 120 minutes of bat call survey. The location of the bat call survey is shown in Figure 5.

# 3.3.6 AMPHIBIAN SURVEY

The amphibian survey included a combination of diurnal and nocturnal census methods. Diurnal searches were undertaken for two half-person hour periods. Systematic searches involved searches within appropriate habitat for basking or sheltering individuals. Any appropriate cover such as logs were turned over for resting individuals. Nocturnal surveys were undertaken for a one person hour period. The surveys were undertaken in suitable habitat and involved listening for the characteristic



call of male frogs. Playback of frog calls was undertaken in an attempt to elicit a response from threatened amphibian species in particular *Litoria aurea* (Green and Golden Bell Frog). The location of the frog surveys conducted are shown in Figure 5.

# 3.3.7 REPTILE SURVEY

Searches for reptiles involved a combination of diurnal and nocturnal searches. Diurnal searches for reptiles involved searching in likely habitat (i.e. leaf litter, dead logs and long grass) during the morning and afternoon survey period. Nocturnal searches were conducted for reptile species active at night such as geckos and some species of snakes and involved searching in likely habitats with the aid of a spotlight.

# 3.3.8 DIURNAL AVIFAUNA SURVEY

The diurnal avifauna census involved point surveys targeting potential habitat in the study area for species such as *Xanthomyza phrygia* (Regent Honeyeater). Surveys were conducted at peak activity periods (i.e. dawn and dusk) for four periods of half an hour. A total of 2 hours of targeted diurnal bird surveys were undertaken. Incidental observations and secondary indications (i.e. distinctive feathers and nests) of avifauna were also recorded. The location of the diurnal avifauna surveys is shown in Figure 5.

# 3.3.9 NOCTURNAL AVIFAUNA AND MAMMAL CALLPLAYBACK SURVEY

During the nocturnal avifauna and mammal survey pre-recorded calls of *Ninox connivens* (Barking Owl), *Ninox strenua* (Powerful Owl), *Tyto novaehollandiae* (Masked Owl), *Tyto tenebricosa* (Sooty Owl), *Petaurus norfolcensis* (Squirrel Glider) and *Phascolarctos cinerea* (Koala) were broadcast through an amplification system designed to project the sound for at least 1km under still night conditions. An initial listening period of 10 minutes was undertaken, followed by 5 minutes of calls (repeated in four different directions). A period of two minutes of quiet listening was then employed after each 5-minute bracket of calls. At the conclusion of the call playback survey, spotlighting was carried out in the vicinity of the call playback site. The locations of the call playback are shown in Figure 5.

# 3.3.10 SPOTLIGHTING SURVEY

Spotlighting was undertaken on foot using 100watt hand-held spotlights. The spotlighting was completed by two persons and involved walking at a slow pace and stopping every 2 minutes, allowing the observer to hear movements of animals. A total of 5 person-hours of spotlighting was conducted during the survey. The spotlight routes are shown in Figure 5.

# 3.4 DATE, TIMES, ACTIVITIES & WEATHER CONDITIONS

A summary of the time spent on site during fieldwork and the prevailing weather conditions at the time is contained below in Table 2.

DATE	TIME	ACTIVITY	WEATHER
Monday 16/11/09	1000 - 1530	General Site inspection Vegetation Surveys Trap deployment:	0/8 cloud, calm, 34°C.
Tuesday 17/11/09	0530 - 0730	Checking traps Incidental observations Avifauna Survey	6/8 cloud, calm, 19°C.
Wednesday 18/11/09	0530 - 0730	Checking traps Incidental observations Avifauna survey	2/8 cloud, 16°C, Calm.
	2015 - 2130	Nocturnal Work: • Spotlighting; • Bat call detection; • Owl/Mammal Call Playback. • Stag Watching • Amphibian Survey	4/8 cloud, 23°C, Calm.
Thursday 19/11/09	0530 - 0730	Checking traps Incidental observations Avifauna survey	0/8 cloud, 16°C, Calm.
Friday 20/11/09	0530 - 0900	Checking Traps Trap retrieval Incidental observations.	2/8 cloud, dry, calm, 18°C.
Tuesday 01/12/09	1830 - 1930 1930 - 2015	Hollow-bearing Tree Survey Avifauna survey	8/8 cloud, dry, calm, 24°C.
	2015 – 2130	Nocturnal Work: • Spotlighting; • Bat call detection; • Owl/Mammal Call Playback. • Stag Watching • Amphibian Survey	0/8 cloud, 22°C, slight breeze, 8/8 moon.

## Table 2: Survey Dates, Times and Weather Conditions

# 3.5 SIGNIFICANT SPECIES

The following threatened species listed in Table 3 have been recorded on the DECCW Database and DEWHA (\*) on-line database within 10km of the study area.

## Table 3: Threatened Species Considered.

Scientific Name	Common Name	TSC Act 1995	EPBC Act 1999
*Acacia bynoeana	Bynoe's Wattle	E1	V
*Angophora inopina	Charmhaven Apple	V	V
Callistemon linearifolius	Netted Bottlebrush	V	
*Cryptostylis hunteriana	Leafless Tongue Orchid	V	V
Diuris pedunculata	Small Snake Orchid	E1	
*Eucalyptus glaucina	Slaty Red Gum	V	V
*Eucalyptus parramattensis subsp. decadens	Drooping Red Gum	V	V
*Grevillea parviflora subsp. parviflora	Little Flower Grevillea	V	V
Prostanthera cineolifera	Singleton Mint Bush	V	V
*Rhizanthella slateri	Eastern Underground Orchid	E1	Е
Rutidosis heterogama	Heath Wrinklewort	V	
Zannichellia palustris		E1	
Cymbidium canaliculatum	Tiger Orchid in the Hunter	E2	
*Heleioporus australiacus	Giant Burrowing Frog	V	V
*Litoria aurea	Green and Golden Bell Frog	E1	V
Litoria hrevinalmata	Green-thighed Frog	V	•
*Litoria littlejohni	Littleichn's Tree Frog	V	V
*Mixonhyas halbus	Stuttering Frog	v F	V
*Mixophyes Jalous	Giant Barred Frog	E	v E
*Hoplocophalus hungaroides	Draad haadad Spaka	L V	
Inoprocephatus oungarotaes	Dioad-fieaded Shake	V	v
Explored functions	Diack Ditteril	V E1	
Leadingung callingoog	Comb created Jacona		
Treatpurra gallinacea	Australian Dainted Spine	V E1	V
Callocophalon fimbriatum	Australian Failted Shipe		v
Califocephalon jimoriaium	Classy black Cockatoo	V	
Caliptornynchus lainami	Little Levilseet	V	
Glossopsilla pusilla		V E1	Б
*Lainamus alscolor	Swiit Parrot	EI	E
Neopnema puicnella	Turquoise Parrot	V	
Climacteris picumnus ssp. victoriae	Brown Treecreeper	V	
Melithreptus gularis ssp. gularis	Black-chinned Honeyeater	V	
Pomatostomus temporalis ssp. temporalis	Grey-crowned Babbler	V	
Pyrrholaemus sagittatus	Speckled Warbler	V	
Stagonopleura guttata	Diamond Firetail	V	
*Xanthomyza phrygia	Regent Honeyeater	El	E
Erythrotriorchis radiatus	Red Goshawk	El	
Hamirostra melanosternon	Black-breasted Buzzard	V	
Lophoictinia isura	Square-tailed Kite	V	
Ninox connivens	Barking Owl	V	
Ninox strenua	Powerful Owl	V	
Tyto novaehollandiae	Masked Owl	V	
Tyto tenebricosa	Sooty Owl	V	
*Dasyurus maculatus ssp. maculatus	Spotted-tail Quoll	V	E
Phascogale tapoatafa	Brush-tail Phascogale	V	
Phascolarctos cinereus	Koala	V	
Petaurus australis	Yellow-bellied Glider	V	
Petaurus norfolcensis	Squirrel Glider	V	
*Petrogale penicillata	Brush-tailed Rock-wallaby	E1	V
Potorous tridactylus	Long-nosed Potoroo	V	

Scientific Name	Common Name	TSC Act 1995	EPBC Act 1999
*Pteropus poliocephalus	Grey-headed Flying-fox	V	V
*Chalinolobus dwyeri	Large-eared Pied Bat	V	V
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	
Kerivoula papuensis	Golden-tipped Bat	V	
Miniopterus australis	Little Bentwing-bat	V	
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	
Mormopterus norfolkensis	Eastern Freetail-bat	V	
Myotis adversus	Large-footed Myotis	V	
Scoteanax rueppellii	Greater Broad-nosed Bat	V	
Vespadelus troughtoni	Eastern Cave Bat	V	

**CE = Critically Endangered** 

E1 = Endangered Species

**E2** = Endangered Population

V = Vulnerable Species

# 4.0 **RESULTS**

# 4.1 FLORA ASSEMBLAGES

The site was heavily disturbed with large portions of the site mostly clear of native vegetation with only scattered trees and a modified understorey. A total of three vegetation assemblages were delineated as a result of the vegetation survey:

- Lower Hunter Spotted Gum Ironbark Woodland
- Hunter Lowlands Red Gum Woodland
- Sandstone Hills Bloodwood Woodland

A general description of the flora assemblage identified on site is given below. A full list of the flora species recorded during fieldwork is listed in Appendix B. The distribution of the vegetation communities has been indicated in Figure 6\*.

\*Note on Vegetation Community Distribution Map. A map of vegetation of any area seeks to describe the distribution of the plant species in that area by defining a number of vegetation units (assemblages or communities), which are relatively internally homogenous. Whilst such mapping is a convenient tool, it greatly oversimplifies the real situation. Plants rarely occur in defined communities with distinct boundaries. Accordingly vegetation units used for the accompanying map should be viewed as indicative of their extent rather than being precise edges of communities.

#### Lower Hunter Spotted Gum - Ironbark Woodland

A large portion of the slopes on site contained open woodland dominated by a canopy of *Corymbia maculata* (Spotted Gum), *Eucalyptus punctata* (Grey Gum), *Eucalyptus fibrosa* ssp. *fibrosa* (Broad-leaved Ironbark) and *Eucalyptus siderophloia* (Northern Grey Ironbark). A native understorey was mostly absent but a small amount of *Callistemon rigidus* (Stiff Bottlebrush), *Bursaria spinosa* ssp. *spinosa* (Blackthorn), *Acacia falcata* and *Leptospermum laevigatum* (Coastal Tea Tree) was present in the site's northeast. The understorey was typically pasture composed mostly of introduced grasses and herbs with minimal shrub species. Photos of this assemblage are shown in Figures 7 and 8.

#### Vegetation Structure – Lower Hunter Spotted Gum – Ironbark Woodland

**Canopy**: (20m) - *Corymbia maculata* (Spotted Gum), *Eucalyptus punctata* (Grey Gum), *Eucalyptus fibrosa* ssp. *fibrosa* (Broad-leaved Ironbark), *Eucalyptus siderophloia* (Northern Grey Ironbark)

**Shrub Layer**: (<3m) - \**Pyracantha fortuneana* (Firethorn), *Leptospermum laevigatum* (Coastal Tea Tree), *Bursaria spinosa* ssp. *spinosa* (Blackthorn), \**Lantana camara* (Lantana)

**Ground Layer**: (<1m) - \**Pennisetum clandestinum* (Kikuyu), \**Stenotaphrum secundatum* (Buffalo Grass), *Pteridium esculentum* (Bracken), *Imperata cylindrica* var. *major* (Blady Grass), *Themeda australis* (Kangaroo Grass), *Pomax umbellata* (Pomax), *Andropogon virginicus* (Whisky Grass), \**Cynodon dactylon* (Common Couch).





Figure 7: Photo showing Spotted Gum - Ironbark Woodland in north of site.



Figure 8: Photo showing Spotted Gum – Ironbark Woodland looking west from dam in northeast of site.

## Hunter Lowlands Red Gum Woodland

This assemblage was located along the lower slopes and low-lying areas on site. The canopy almost entirely consisted of *Eucalyptus tereticornis* (Forest Red Gum) with a small number of *E. punctata* and *Angophora floribunda* (Rough-barked Apple) also present. The understorey was heavily disturbed and was primarily comprised of pasture and a small amount of weedy shrubs. This assemblage has been grazed for a long period of time limiting any native regrowth and consequently was dominated by weed species. A photo of this assemblage is shown in Figure 9.

#### Vegetation Structure - Hunter Lowlands Red Gum Woodland

**Canopy**: (20m) - *Eucalyptus tereticornis* (Forest Red Gum), *E. punctata, Angophora floribunda* (Rough-barked Apple).

Shrub Layer: (<3m) - \**Pyracantha fortuneana* (Firethorn), \**Rubus fruticosus* (Blackberry)

**Ground Layer**: (<1m) - \**Pennisetum clandestinum* (Kikuyu), \**Stenotaphrum secundatum* (Buffalo Grass), \**Cynodon dactylon* (Common Couch), \**Bromus cartharticus* (Prairie Grass), \**Briza maxima* (Quaking Grass), *Andropogon virginicus* (Whisky Grass)



Figure 9: Photo showing low-lying area supporting Red Gum Woodland.

## Sandstone Hills Bloodwood Woodland

This assemblage was located on the steep slope in the site's southeast and was continuous with similar vegetation along the ridgeline to the south of the site. This assemblage was dominated by *Corymbia eximia* (Yellow Bloodwood) with *C. gummifera* (Red Bloodwood), *Eucalyptus punctata* and *E. capitellata* (Brown Stringybark) also present. The understorey of this assemblage had been cleared prior to the survey period and little groundcover was present within this community. Due to the recent underscrubbing within this assemblage most shrub species were restricted to the base of trees and the high proportion of native species indicated that this area was in relatively good condition. A photo of this assemblage is shown in Figure 10.

## Vegetation Structure - Hunter Lowlands Red Gum Woodland

**Canopy**: (15m) - *Corymbia eximia* (Yellow Bloodwood), *Corymbia gummifera* (Red Bloodwood), *E. punctata, Eucalyptus capitellata* (Brown Stringybark).

Small Tree Layer: (<6m) - *Xylomelum pyriforme* (Woody Pear)

**Shrub Layer**: (<3m) – Acacia kulnurensis, Acacia myrtifolia (Myrtle Wattle), Xanthorrhoea johnsonii (Johnson's Grass Tree), Persoonia linearis (Narrow-leaved Geebung), Grevillea montana, Podolobium ilicifolium (Native Holly), Phebalium squamulosum ssp. squamulosum (Scaly Phebalium)

**Ground Layer**: (<1m) – Entolasia stricta, Lomandra multiflora, Lomandra obliqua (Fish Bones), Pomax umbellata (Pomax), Joycea pallida (Redanther Wallaby Grass), Andropogon virginicus (Whisky Grass)



Figure 10: Photo showing area of Sandstone Hills Bloodwood Woodland along southern boundary.

# 4.1.1 ENDANGERED ECOLOGICAL COMMUNITIES

Four vegetation communities mapped in the local area are currently listed as Endangered Ecological Communities on the NSW Threatened Species Conservation Act 1995. These include:

- Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin Bioregion.
- Hunter Lowlands Redgum Forest in the Sydney Basin Bioregion
- Freshwater Wetlands on Coastal Floodplains of the NSW North Coast
- Kurri Sand Swamp Woodland in the Sydney Basin Bioregion

Highly disturbed representations of Lower Hunter Spotted Gum – Ironbark Forest and Hunter Lowlands Redgum Forest were found to be present on site. The impact of the proposal on these Endangered Ecological Communities is assessed in Section 5.0 and Appendix A of this report.

## 4.1.2 THREATENED PLANT SPECIES

Eight threatened flora species together with five rare species (Briggs and Leigh, 1996) have been previously recorded within 10km of the site on the DECCW database. Species marked with an asterisk (\*) are considered to have potential habitat within 10km according to the DEWHA on-line database.

Threatened Flora Species:

- Acacia bynoeana
- Angophora inopina
- Callistemon linearifolius
- \**Cryptostylis hunteriana*
- Diuris pedunculata
- Eucalyptus glaucina
- Eucalyptus parramattensis ssp. decadens
- Grevillea parviflora ssp. parviflora
- Prostanthera cineolifera
- \**Rhizanthella slateri*
- Rutidosis heterogama
- Zannichellia palustris
- Cymbidium canaliculatum

## Rare Flora Species:

- Acacia kulnurensis
- Eucalyptus fergusonii ssp. dorsiventralis
- Eucalyptus prominula
- Grevillea montana
- Macrozamia flexuosa

Bynoe's Wattle Charmhaven Apple Netted Bottlebrush Leafless Tongue-orchid Small Snake Orchid Slaty Red Gum Drooping Red Gum Narrow-leaved Grevillea Singleton Mint Bush Eastern Underground Orchid Wrinklewort

Tiger Orchid in the Hunter Catchment

During the flora survey no specimens of the abovementioned threatened species were found. Habitat was found to only be available for the threatened species *Acacia bynoeana*, *Callistemon linearifolius*, *Eucalyptus glaucina*, *Grevillea parviflora*, *Rutidosis heterogama* and *Cymbidium canaliculatum*. The

impact of the proposal on these threatened flora species is discussed in more detail in Section 5.0 and Appendix A of this report.

Two rare flora species, *Acacia kulnurensis* and *Grevillea montana* were found to be present within the Sandstone Hills Bloodwood Woodland located in the south of the site. This area has been identified as too steep to develop and this area will not be impacted upon. It is considered unlikely that the proposed rezoning would lead to the local extinction of any of the above rare flora species, particularly given that the habitat on site will remain intact.

# 4.1.3 NOXIOUS WEEDS

A number of noxious weed species were found to be present within the site and are listed below in Table 4. The site lies within the Cessnock Shire Council Noxious Plants Advisory Committee.

WEED SPECIES	WEED CLASS	ADDITIONAL			
	CESSNOCK CITY COUNCIL	SIGNIFICANCE			
Lantana camara (Lantana)	Class 5	N & T			
Rubus fruticosus aggregate (Blackberry)	Class 4				
Asparagus asparagoides (Bridal Creeper)	Class 5				
Hypericum perforatum (St John's Wort)	Class 4				
N – Weed of National Significance (Listed in the Commonwealth Government's National Weeds					
Strategy 1997)	Strategy 1997)				
T – Listed as a Threatening Process under the NSW TSC Act 1995.					
*Control Classes under the Noxious Weeds Act 1993.					
Class 1 & 2 This plant must be eradicated from the land and the land must be kept free of this plant.					

Table 4:	Noxious	Weed	species	found	on sit	e.

Class 1 & 2	This plant must be eradicated from the land and the land must be kept free of this plant.
Class 3	This plant must be fully and continuously suppressed and destroyed.
Class 4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the LCA. Must also 'not be sold, propagated or knowingly
	distributed'.
Class 5	The requirements of the Noxious Weeds Act 1993 for a notifiable weed must be complied
	with

It is recommended that ongoing weed control targeting Blackberry be conducted throughout the site. The other weeds including *Asparagus asparagoides, Lantana camara* and *Hypericum perforatum* were found in low frequency and should be controlled to limit the spread of these weeds on site.

# 4.2 HABITAT APPRAISAL

# 4.2.1 HABITAT DESCRIPTION AND DISTRIBUTION IN THE VICINITY

Based on the vegetation communities delineated in Section 4.1, three broad habitat categories, Dry Sclerophyll Woodland, Open Grassland and Aquatic were identified within the site.

## Open Woodland Habitat

Open Woodland habitat occupied a large portion of the site and was composed of a number of myrtaceous species, particularly *Eucalyptus* and *Corymbia* spp. The canopy species would provide

blossom for nectivorous species (i.e. Gliders, Possums, Flying-foxes, Honeyeaters and Lorikeets). Tree species also provide a foraging resource for insectivorous species such as Thornbills and Fantails. Nesting/roosting opportunities in the form of a small number of tree hollows were also present for hollow dependent fauna species such as Possums, Gliders, Microchiropteran Bat species and some bird species. Few large tree hollows suitable for forest owls and Black Cockatoos were present. The presence of hollow-bearing trees has been dealt with in more detail later in Section 4.2.1.1.

The shrub layer was mostly absent however small clumps of *Rubus fruticosus* (Blackberry) would provide some refuge and nesting habitat for small bird species. The areas of Blackberry were also observed to be refuge areas for Rabbits and Foxes on site.

The ground layer would provide refuge to a number of reptile and small mammal species. Fallen timber and branches would also provide refuge for these species.

# Grassland/Pasture

The Grassland/Pasture habitat, a result of past clearing and continued grazing by Cattle was primarily composed of introduced grasses. Such habitat provides opportunity for a variety of avifauna, including terrestrial species preferring open spaces, seed eating birds and several birds of prey, which may hunt over this area in search of potential prey species. Macropods may also frequent such areas whilst grazing. Some species of bats may also forage over this cleared area for insects. However, the lack of vegetative cover often limits the value of such areas for many species, particularly some reptiles, small mammals and birds which are vulnerable to predation in open spaces.

# Constructed Dam Habitat

Two constructed dams were located on site. Both dams would provide habitat for species such as some fish, frog, turtle and wetland bird species. The dams would also provide drinking water for macropods, domestic animals and woodland birds. The ephemeral drainage lines on site would also provide wetland habitat suitable for these species.

## 4.2.1.1 HOLLOW-BEARING TREES

Twenty-three hollow-bearing trees were observed across the entire site. The locations of the hollow trees are shown in Figure 11 and the results of the survey are displayed in Table 5.

TREE	AMG	SPECIES	CLASSIFICATION OF TREE HOLLOWS &
NO.	REFERENCE		COMMENTS
1	E – 351915	Eucalyptus tereticornis	2 x class 2
	N - 6361481	(Red Gum)	2 x class 3
2	E – 352028	Eucalyptus punctata	1 x class 2

 Table 5: Results of the Habitat Tree Survey.

TREE	AMG	SPECIES	CLASSIFICATION OF TREE HOLLOWS &
NO.	REFERENCE		COMMENTS
	N - 6361456	(Grey Gum)	
3	E – 352037	E. punctata	1 x class 3
	N - 6361446		
4	E – 352135	Corymbia maculata	2 x class 3
	N = 6361435	(Spotted Gum)	
5	E = 352149	E. punctata	1 x class 3
6	N - 6361466		
6	E = 352302	E. punctata	2 x class 2
7	N = 0.001427	E	11
/	E = 3525/1	E. punctata	$1 \times \text{class}$ 1 2 = 1 = 2
	N - 0301420		2 X Class 2 2 x class 2
0	E 252221	Every hyperturg on (Ironhark)	2 X Class 5
0	E = 332331 N = 6361374	Eucurypius sp. (nonoark)	1 X Class 5
9	F = 352286	C maculata	1 v place 2
,	N = 6361302	C. macanana	1 x class 2 1 x class 3
10	F = 352240	F punctata	Spout – Suitable for Bats
10	N = 6361167	L. punctutu	Spour Sultable for Bats
11	E = 352210	E tereticornis	2 x class 3
**	N – 6361146		
12	E – 352209	E. tereticornis	2 x class 3
	N – 6361128		
13	Е-352205	E. tereticornis	1 x class 2
	N – 6361116		
14	E-352004	C. maculata	1 x class 2
	N - 6360856		
15	E – 351936	Stag	Suitable for Bats
	N - 6360933		
16	E – 351838	E. tereticornis	1 x class 3
	N - 6361024		
17	E – 351796	C. maculata	2 x class 2
	N - 6361036		
18	E – 351789	E. punctata	1 x class 2
	N - 6361082	ļ	2 x class 3
19	E – 351801	E. punctata	2 x class 2
	<u>N - 6361132</u>		
20	E – 351806	E. punctata	1  x class  2 - Nesting Galahs utilising hollow
1	N - 6361150		1 x class 3
21	E = 351810	E. punctata	2 x class 2
	N = 6301130		
22	E = 351833	Angophora floribunda	1 x class 3
22	N = 6301131	(Rougn-barked Apple)	1 1 2
23	E = 3517/0	C. maculata	1 x class 3
	1 N = 0.001201		

The classification system employed involved three classes:

- **Class 1** large sized hollow openings (i.e. >15cm) suitable for species such as Owls
- Class 2 medium sized hollow-openings (i.e. 5-15cm) suitable for species such as Gliders and Possums
- Class 3 small sized hollow openings (i.e. <5cm) suitable for species such as microchiropteran bats.

These hollow-bearing trees are likely to remain in-situ as a result of the proposal. If for any unforeseen reason any habitat tree requires removal it is recommended that compensatory fauna nestboxes be installed within remaining trees on site.



## 4.2.2 HABITAT FOR THREATENED SPECIES

An assessment of habitat attributes on site has been undertaken for the threatened species that have been identified within 10km of the site on the DECCW Database and the DEWHA on-line Database. The results of the assessment are displayed in Table 6. Those species identified in this assessment as having potential habitat available on site have been considered further under Section 5A of the EPA Act in Appendix A of this report.

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELIHOOD OF OCCURRENCE ON SITE	7-PART TEST REQUIRED
<i>Acacia bynoeana</i> Bynoe's Wattle	TSC Act – E1 EPBC Act – V ROTAP 3VC-	Found in heath, woodland and dry sclerophyll forests on sandy soils derived from Hawkesbury Sandstone. Within the Cessnock-Kurri area this species is associated with predominantly Kurri Sand Swamp Woodland.	Low Habitat for this species was restricted to the Sandstone Hills Bloodwood Forest community located in the southeast corner of the site. This was considered marginal due to the recent clearing and a heavily disturbed understorey.	Yes
Angophora inopina Charmhaven Apple	TSC Act – V EPBC Act – V	Found in shallow sandy soils within open woodland/forest assemblages in co-dominant distribution with <i>Eucalyptus haemastoma</i> (Scribbly Gum), <i>Corymbia</i> <i>gummifera</i> (Red Bloodwood) and <i>Eucalyptus capitellata</i> (Brown Stringybark), as well as within wet-dry heath, and swamp forest communities. The main occurrences of this species are in the Wyong and Lake Macquarie LGA. Disjunct populations have also been found south of Karuah in the Port Stephens LGA and north of Karuah in the Great Lakes LGA.	<b>Unlikely</b> No habitat was available for this species due to the lack of preferred soil types and commonly associated species.	No
Callistemon linearifolius Netted Bottle Brush	TSC Act – V ROTAP – 2RCi	Dry sclerophyll forest on the coast and adjacent ranges.	Low Habitat was available for this species across the site however this was considered marginal due to the disturbed nature of the site.	Yes
<i>Cryptostylis hunteriana</i> Leafless Tongue Orchid	TSC Act – E1 EPBC Act – E ROTAP – 3VC-	This species is a saprophyte, which grows in small, localised colonies on flat plains close to the coast. This species has also been recorded in mountainous areas growing in moist depressions as well as in swampy habitats.	<b>Unlikely</b> No habitat was available for this species as the low-lying areas on site have been heavily disturbed from historical clearing, dumping	No

#### Table 6: Habitat Assessment for Threatened Species

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELIHOOD OF OCCURRENCE ON SITE	7-PART TEST REQUIRED
			of waste, weed incursion and grazing.	
<i>Diuris pedunculata</i> Small Snake Orchid	TSC Act – E1 EPBC Act – E ROTAP – 2E	Grassy slopes and flats often of peaty soils in moist areas. Also occurs on shale and trap soils, on fine granite and among boulders.	<b>Unlikely</b> No habitat was available for this species due to the lack of preferred soil types and a lack of recent records (last local record from 1933).	No
<i>Eucalyptus glaucina</i> Slaty Red Gum	TSC Act – V EPBC Act – V ROTAP 3VCa	Occurs in woodland on sandy soils in wet sites. Any occurrences are likely to be restricted to areas along riparian vegetation strips or within close proximity to the water table.	Low Habitat was available for this species, particularly along the drainage lines. This habitat has been marginalised by the disturbed nature of the site.	Yes
<i>Eucalyptus parramattensis</i> spp. <i>decadens</i> Drooping Red Gum	TSC Act - V EPBC Act – V ROTAP – 2V	Occurs in woodland on sandy soils in wet sites. In the Port Stephens area, the Drooping Red Gum occurs in open wet sclerophyll woodland on heavy, often waterlogged, inter-barrier depression soils.	<b>Unlikely</b> No habitat was available for this species due to the lack of preferred soil types and commonly associated species.	No
<i>Grevillea parviflora</i> ssp. <i>parviflora</i> Little Flower Grevillea	TSC Act – V EPBC Act – V	Occurs in light clayey soils in woodlands. Often occurs in areas where the soil has been disturbed.	<b>Low</b> Due to the lack of commonly associated soils only marginal habitat was considered to be present for this species.	Yes
Prostanthera cineolifera Singleton Mintbush	TSC Act - V EPBC Act – V ROTAP – 2K	Restricted to a few localities near Walcha, Scone and St Albans. Grows in open woodlands on exposed sandstone ridges. Usually found in association with shallow or skeletal soils.	<b>Unlikely</b> No habitat was available for this species due to the lack of exposed sandstone ridges.	No
Rhizanthella slateri Eastern Underground Orchid	TSC Act – E1 EPBC Act – E	Grows and flowers almost entirely underground. It grows in sclerophyll forests in shallow to deep loams. Recorded near Bulahdelah on the lower western slopes of Alum Mountain.	<b>Unlikely</b> No habitat was available for this species due to the lack of associated soil types and local records.	No
<i>Rutidosis heterogama</i> Heath Wrinklewort	TSC Act – V ROTAP – 2VCa	Dry sclerophyll forest and woodland, as well as heath, sand dunes and in disturbed areas such as roadsides.	Moderate Habitat was considered to be present for this species in the	Yes
SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELIHOOD OF OCCURRENCE ON SITE	7-PART TEST REQUIRED
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			southeastern corner of the site with marginal habitat available across the remainder of the site.	
Zannichellia palustris		Occurs in fresh to brackish, still to slow moving waters.	<b>Unlikely</b> No suitable habitat was considered to be present due to the lack of appropriate wetland / stream conditions within the site.	No
<i>Cymbidium canaliculatum</i> Tiger Orchid (Endangered Population)	TSC Act – E2	Occurs within dry sclerophyll forests and woodlands of NSW tablelands and western slopes, growing in the hollows of trees. This species is an endangered population within the Hunter River catchment. Specimens in the Hunter catchment are most commonly associated with <i>Eucalyptus albens</i> (White Box).	Low Habitat was available for this species, however this is considered marginal due to the lack of commonly associated species and local records.	Yes
<i>Heleioporus australiacus</i> Giant Burrowing Frog	TSC Act – V EPBC Act – V	Banks of semi-permanent to ephemeral sand or rock based streams and has also been identified in dams, drainage ditches and roadside culverts.	<b>Unlikely</b> No suitable habitat was considered to be present for this frog species due to the lack of preferred substrates.	No
<i>Litoria aurea</i> Green and Golden Bell Frog	TSC Act – E1 EPBC Act – E	Inhabits swamps, lagoons, streams and ponds as well as dams, drains and storm water basins.	Low Limited habitat was available within the dam on site however this is considered marginal due to a lack of recent local records and the prevalence of Mosquito Fish.	Yes
<i>Litoria brevipalmata</i> Green-thighed Frog	TSC Act – V EPBC Act – V	Occur in a range of habitats from rainforest and moist eucalypt forest to dry eucalypt forest and heath, typically in areas where surface water gathers after rain. Is found in isolated localities along the coast and ranges of NSW central coast to southeast Queensland.	<b>Unlikely</b> No suitable habitat was considered to be present for this frog species due to the disturbed nature of the site and lack of suitable breeding areas.	No
<i>Litoria littlejohni</i> Little John's Tree Frog	TSC Act – V EPBC Act – V	Habitats include wet and dry sclerophyll forest, coastal woodland and heath. Associated characteristics include rocky streams and sandstone outcrops, semi-permanent dams and slow flowing streams. The water quality required for breeding is usually tannic (pH 6.2) and	<b>Unlikely</b> No habitat was available for this species due to the lack of suitable waterbodies.	No

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELIHOOD OF OCCURRENCE ON SITE	7-PART TEST REQUIRED
		contains detritus which is used as anchors for egg clusters.		
<i>Mixophyes balbus</i> Stuttering Frog	TSC Act – E1 EPBC Act – V	Prefers riparian vegetation or other moist vegetation communities, generally on rich organic soils. Deep leaf litter and/or thick cover is necessary for this species. Water quality must be of a high standard, and the species occurs in 1 <sup>st</sup> to 3 <sup>rd</sup> order streams (i.e. 'young' streams), and is generally absent from ponds and ephemeral pools.	<b>Unlikely</b> No habitat was available for this species due to the lack of suitable waterbodies.	No
<i>Mixophyes iteratus</i> Giant Barred Frog	TSC Act – E1 EPBC Act – E	Prefers riparian vegetation or other moist vegetation communities, generally on rich organic soils. Deep leaf litter and/or thick cover is necessary for this species. Water quality must be of a high standard, and the species occurs in 1 <sup>st</sup> to 3 <sup>rd</sup> order streams (i.e. 'young' streams), and is generally absent from ponds and ephemeral pools.	<b>Unlikely</b> No habitat was available for this species due to the lack of suitable waterbodies.	No
Hoplocephalus bungaroides Broad-headed Snake	TSC Act – V	Found only in a range of 250km from Sydney in sandstone habitats. It is often found under large slabs of rock or crevices on sandstone outcrops.	<b>Unlikely</b> No habitat was available for this species due to the lack of sandstone outcrops and slabs.	No
<i>Ixobrychus flavicollis</i> Black Bittern	TSC Act – V	Solitary, living near water in mangroves and other trees which need to form only a narrow fringe of cover. Feeds on small fish and invertebrates.	Low Habitat was available for this species however this was considered marginal due to a lack of waterbodies with sufficient cover on site.	Yes
Ephippiorhynchus asiaticus Black-necked Stork	TSC Act – V	Inhabits swamps associated with river systems and large permanent pools but sometimes appears on the coast or in estuaries. It has also been recorded on farm dams and sewage treatment ponds.	Low Habitat was available for this species within the dams and drainage lines on site.	Yes
Irediparra gallinacea Comb-crested Jacana	TSC Act – V	Inhabits mostly deep permanent freshwater wetlands with floating aquatic vegetation that forms dense mats or rafts on the surface of the water (eg. <i>Nymphaeaceae, Myriophyllum lacifolium, Marsilea</i> and <i>Riccia</i> ). Occurs from the north-east Kimberley Region through to the Hunter Region (N.S.W.).	Unlikely No habitat was available for this species due to a lack of waterbodies with suitable vegetation.	No
Rostratula benghalensis australis	TSC Act – V EPBC Act – V	Margins of swamps and streams, chiefly those covered with low and stunted vegetation.	<b>Low</b> Marginal habitat was available for	Yes

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELIHOOD OF OCCURRENCE ON SITE	7-PART TEST REQUIRED
Australian Painted Snipe			this species within the dam and drainage lines on site.	
Callocephalon fimbriatum Gang-gang Cockatoo	TSC Act – V	Tall montane forests and woodlands in mature wet sclerophyll forests. Requires hollows in which to breed between October and January.	Low Foraging habitat was available in the form of flowering myrtaceous trees. Roosting habitat was not available due to the lack of suitably sized hollows.	Yes
Calyptorhynchus lathami Glossy Black-Cockatoo	TSC Act – V	Lowland coastal forests, dense mountain forests, semi-arid woodland and trees bordering watercourses, with (Allo)Casuarina trees for foraging.	Low Foraging habitat was available in the form of a small number of <i>Allocasuarina torulosa</i> (Forest Oak). Roosting habitat was not available due to the lack of suitably sized hollows.	Yes
<i>Glossopsitta pusilla</i> Little Lorikeet	TSC Act-V	Tall Open Forests, woodlands, orchards, parks and street trees.	<b>Moderate</b> Foraging and suitable nesting habitat was available within the trees on site.	Yes
Lathamus discolor Swift Parrot	TSC Act – E1 EPBC Act – E	Open Forest to Woodland, also street trees and in parks and gardens, winter flowering eucalypts for feeding. This species nests in Tasmania during the summer months.	<b>Low</b> Seasonal foraging habitat was available in the form of flowering myrtaceous species.	Yes
Neophema pulchella Turquoise Parrot	TSC Act – V	Lives on the edges of Eucalypt woodland adjoining clearings and on timbered ridges and creeks in farmland. It has also been recorded utilising roadside verges and orchards. Nests in small hollow branches of Eucalypts.	Moderate Foraging and suitable nesting habitat was available within the trees on site.	Yes
<i>Climacteris picumnus victoriae</i> Brown Treecreeper	TSC Act – V	Occupies Eucalypt woodlands, particularly open woodlands lacking a dense understorey, River Red Gums on watercourses and around lakeshores. It is sedentary and nests in tree hollows within permanent territories.	<b>Low</b> Habitat is available for this species on site although this is considered marginal due to cleared and disturbed nature of the site.	Yes
Melithreptus gularis ssp. gularis	TSC Act – V	Usually found on the western side of the Great Dividing Range in dry sclerophyll forests and woodlands containing box-ironbark associations and River Red	Low Suitable foraging and nesting habitat was available on site	Yes

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELIHOOD OF OCCURRENCE ON SITE	7-PART TEST REQUIRED
Black-chinned Honeyeater		Gum. In the Hunter Valley this species is known to utilise drier coastal woodlands. Usually found in open woodlands.	although this was marginalised due to the cleared nature of the site.	
Pomatostomus temporalis ssp. temporalis Grey-crowned Babbler	TSC Act – V	Open forest, woodland, scrubland, farmland and outer suburbs. Prefers woodlands with regenerating trees, tall shrubs, and an intact ground cover of grass and forbs.	<b>High – Recorded on site.</b> Suitable foraging and nesting habitat was available within the site.	Yes
Pyrrholaemus sagittatus Speckled Warbler	TSC Act-V	Specked Warblers live in a wide range of eucalypt- dominated vegetation that has a grassy understorey, often on rocky ridges or in gullies. It builds a domed nest of grass, bark shreds and moss, lined with fur on the ground.	<b>Low</b> Marginal foraging and nesting habitat was available within the site.	Yes
<i>Stagonopleura guttata</i> Diamond Firetail	TSC Act-V	Inhabits areas with a grassy, shrubby understorey including Eucalypt woodlands, forests, <i>Acacia</i> scrubs and mallee.	<b>Low</b> Habitat was available within the site although this was considered marginal due to the open nature of the understorey.	Yes
Xanthomyza phrygia Regent Honeyeater	TSC Act – E1 EPBC Act – E	Temperate woodlands and open forest, including forest edges, preferring to forage on large-flowered Eucalypts.	<b>Low</b> Seasonal foraging habitat was available in the form of flowering myrtaceous species.	Yes
Lophoictinia isura Square-tailed Kite	TSC Act – V	Inhabits open forests and woodlands, particularly those on fertile soils with abundant passerines.	<b>Low – Moderate</b> Habitat was available for this species across the site.	Yes
<i>Erythrotriorchis radiatus</i> Red Goshawk	TSC Act – V	Found in coastal, subcoastal forests, tropical woodlands typically north of the QLD border. Formerly found as far south as Sydney but now rarely seen below QLD border.	<b>Low</b> Habitat was available for this species across the site however this is marginalised, as the site is located outside the typical range of this species.	Yes
<i>Ninox connivens</i> Barking Owl	TSC Act – V	Inhabits forest and woodland, encountered most commonly in savanna and paperbark woodlands. It sometimes roosts in rainforests, but it requires more open country for hunting and hollow eucalypts for breeding.	Low - Moderate Hunting habitat was considered to be present across the site. No nesting habitat was considered to be present due to a lack of suitably sized hollows. Marginal roosting habitat was present within areas of	Yes

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELIHOOD OF OCCURRENCE ON SITE	7-PART TEST REQUIRED
			dense vegetation such as the trees lining the road into the site.	
<i>Ninox strenua</i> Powerful Owl	TSC Act – V	Inhabits a wide range of vegetation types from wet eucalypt forests with a rainforest understorey to dry open forests and woodlands. The species has been recorded utilising disturbed habitats such as exotic pine plantations and large trees in parks and gardens.	Low – Moderate Hunting habitat was considered to be present across the site. No nesting habitat was considered to be present due to a lack of suitably sized hollows. Marginal roosting habitat was present within areas of dense vegetation such as the trees lining the road into the site.	Yes
<i>Tyto novaehollandiae</i> Masked Owl	TSC Act – V	Inhabits a range of wooded habitats that contain mature trees with large hollows for roosting and nesting, and more open areas for hunting.	Low Hunting habitat was considered to be present across the site. No nesting habitat was considered to be present. Roosting habitat was considered to be absent.	Yes
Tyto tenebricosa Sooty Owl	TSC Act – V	Occurs along the coastal margins of eastern Australia Prefers dense dimly lit forests, inhabiting pockets of rainforest and wet sclerophyll forest mainly in mountainous areas, often in southeast facing gullies.	Low Hunting habitat was considered to be present across the site. No nesting habitat was considered to be present. Roosting habitat was considered to be absent.	Yes
Dasyurus maculatus ssp. maculatus Tiger Quoll	TSC Act – V EPBC Act – V	Inhabits sclerophyll forests, rainforests and coastal woodlands. Nests are made in rock caves and hollow logs or trees, and basking sites are usually found nearby.	<b>Low</b> Marginal hunting habitat was considered to be present across the site. Den habitat such as caves and large hollow hogs was absent.	Yes
<i>Phascogale tapoatafa</i> Brush-tailed Phascogale	TSC Act – V	Sparsely distributed outside the semi-arid zone in dry sclerophyll forest and monsoonal forest and woodland.	Low Hunting and nesting habitat was available within the site although this was considered marginal due to the openness of the canopy and paucity of suitable hollows.	Yes
Phascolarctos cinereus Koala	TSC Act – V	Woodland and open forest containing suitable food trees.	<b>Low</b> Two potential feed tree species,	Yes

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELIHOOD OF OCCURRENCE ON SITE	7-PART TEST REOUIRED
			<i>Eucalyptus punctata</i> (Grey Gum) and <i>Eucalyptus tereticornis</i> (Forest Red Gum) were present onsite.	
Petaurus australis Yellow-Bellied Glider	TSC Act – V	Occupies tall, mature wet eucalypt forest.	<b>Unlikely</b> No habitat is available for this species due to the open nature of the site and lack of tall wet sclerophyll forest.	No
Petaurus norfolcensis Squirrel Glider	TSC Act – V	Dry sclerophyll forests and woodlands with exudates for foraging and hollows for nesting.	<b>Low – Moderate</b> Foraging and nesting habitat was available within the site although this was considered marginal due to the openness of the canopy and paucity of suitable hollows.	Yes
<i>Petrogale penicillata</i> Brush-tailed Rock-wallaby	TSC Act – E1 EPBC Act – E	Found in steep rocky sites in sclerophyll forests with a grassy understorey.	Unlikely Habitat was not available for this species due to the lack of rocky outcrops.	No
Potorous tridactylus ssp. tridactylus Long-nosed Potoroo	TSC Act – V EPBC Act – V	Known from a variety of habitats, including Rainforest, Open Forests and Woodlands with dense groundcover, and dense, wet coastal heathlands. Soft (often sandy) substrates are preferred by this species.	Unlikely Habitat was not available for this species due to the lack of a dense understorey.	No
Pteropus poliocephalus Grey-headed Flying-Fox	TSC Act – V EPBC Act – V	Wet and Dry Sclerophyll Forests, Rainforest, Mangroves and Paperbark swamps and Banksia Woodlands.	High Suitable foraging habitat was present in the form of seasonally flowering myrtaceous species. No suitable camp sites were considered to be present.	Yes
<i>Chalinolobus dwyeri</i> Large-eared Pied Bat	TSC Act – V EPBC Act – V	Occupies dry sclerophyll forest and woodland. Roosts in caves, abandoned mud-nests of Fairy Martins and mine tunnels.	Moderate Hunting habitat was present across the site although this was considered marginal due to the open nature of the canopy. Roosting habitat was available within the buildings on site which contained suitable underground	Yes

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELIHOOD OF OCCURRENCE ON SITE	7-PART TEST REQUIRED
			areas for roosting.	
Falsistrellus tasmaniensis Eastern False Pipistrelle	TSC Act – V	Inhabits sclerophyll forests and has been observed roosting in holes and hollow trunks of eucalypts.	Moderate Hunting habitat was present across the site although this was considered marginal due to the open nature of the canopy. Roosting habitat was available within the hollow-bearing trees on site.	Yes
<i>Kerivoula papuensis</i> Golden-tipped Bat	TSC Act – V	Localised and uncommon in rainforest, sometimes wet and dry sclerophyll forest. Aside from the occasionally recorded cave, roosts are known to include abandoned nests of Gerygones and Scrubwrens.	<b>Unlikely</b> No habitat was available for this species due to the disturbed and cleared nature of the site.	No
<i>Miniopterus australis</i> Little Bentwing-bat	TSC Act – V	Tropical rainforest to warm-temperate wet and dry sclerophyll forest; caves or similar structures for roosting.	Moderate Hunting habitat was present across the site although this was considered marginal due to the open nature of the canopy. Roosting habitat was available within the buildings on site which contained suitable underground areas for roosting.	Yes
Miniopterus schreibersii ssp. oceanensis Large Bentwing-bat	TSC Act – V	Wet and dry tall open forest, rainforest, monsoon forest, open woodland, paperbark forests and open grasslands, caves or similar structures for roosting. It occasionally uses tree hollows.	Moderate Hunting habitat was present across the site although this was considered marginal due to the open nature of the canopy. Roosting habitat was available within the buildings on site which contained suitable underground areas for roosting.	Yes
<i>Mormopterus norfolkensis</i> East Coast Freetail-bat	TSC Act – V	Appears to live in sclerophyll forests and woodland. Roosts in tree hollows or under loose bark.	High – Recorded on site Hunting habitat was present across the site although this was considered marginal due to the open nature of the canopy.	Yes

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY	LIKELIHOOD OF	7-PART TEST
		KNOWN POPULATIONS	Roosting habitat was available within the hollow-bearing trees on site.	KEQUIKED
<i>Myotis adversus</i> Large Footed Myotis	TSC Act – V	Various habitats of the coast and adjacent ranges with suitable waterbodies for hunting; caves or similar structures for roosting. It occasionally uses tree hollows.	High – Recorded on site Hunting habitat in the form of waterbodies was present onsite. Roosting habitat was available within the buildings on site which contained suitable underground areas for roosting.	Yes
Scoteanax rueppellii Greater Broad-nosed Bat	TSC Act – V	Tree-lined creeks, woodland/clearing ecotones and rainforest creeks, roosting mainly in tree hollows.	Moderate Hunting habitat was present across the site although this was considered marginal due to the open nature of the canopy. Roosting habitat was available within the hollow-bearing trees on site.	Yes
<i>Vespadelus troughtoni</i> Eastern Cave Bat	TSC Act – V	A cave dweller, known from wet sclerophyll forest and tropical woodlands. It has been also been found roosting in small groups in sandstone overhangs, in mine tunnels and occasionally in buildings.	Low Hunting habitat was present across the site although this was considered marginal due to the open nature of the canopy. Roosting habitat was available within the buildings on site which contained suitable underground areas for roosting. The site lies to the south of the documented distribution of this species.	Yes

## 4.3 FAUNA SURVEY RESULTS

A full list of fauna species observed during the survey is contained in Appendix C.

#### 4.3.1 SMALL TERRESTRIAL MAMMAL TRAPPING

Three mammal species, *Antechinus flavipes* (Yellow-footed Antechinus), *Rattus lutreolus* (Swamp Rat) and the introduced *Rattus rattus* (Black Rat) and one snake, *Pseudechis porphyriacus* (Red-bellied Black Snake) were captured during the small terrestrial trapping component of the survey. The results of the small terrestrial mammal trapping survey are shown in Table 7.

DATE	TRAP NO	SPECIES	SEX
Wednesday	T8	Rattus lutreolus (Swamp Rat)	Female
18/11/09	T15	Rattus rattus (Black Rat)	Female
	T15	Pseudechis porphyriacus (Red-bellied Black Snake)	
Thursday 19/11/09	Т3	Antechinus flavipes (Yellow-footed Antechinus)	Female

**Table 7: Medium Terrestrial Mammal Trapping Results.** 

#### 4.3.2 MEDIUM TERRESTRIAL MAMMAL TRAPPING

No specimens were captured during the medium terrestrial trapping component of the survey.

#### 4.3.3 ARBOREAL MAMMAL TRAPPING

No specimens were captured during the arboreal trapping component of the survey.

#### 4.3.4 HARP TRAPPING

During the harp-trapping component of the survey one specimen of *Myotis adversus* (Large-footed Myotis) and one specimen of *Vespaledus vulturnus* (Little Cave Bat) were captured. *Myotis adversus* is recognised as a threatened under the under the TSC Act (1995) and has been considered further in Section 5.0 and Appendix A of this report. No other microchiropteran bat species were captured during harp trapping. The results of the harp trapping survey are shown in Table 8.

DATE	SPECIES	SEX
Tuesday 17/11/09	Myotis adversus (Large-footed Myotis)	Female
Wednesday 18/11/09	Vespaledus vulturnus (Little Cave Bat)	Female

Table 8: Microchiropteran bat harp trapping results.

#### 4.3.5 MICROCHIROPTERAN BAT CALL DETECTION

During the Bat Call Survey two species, *Rhinolophus megaphyllus* (Eastern Horseshoe-bat) and *Mormopterus norfolkensis* (Eastern Freetail-bat) were positively identified. *M. norfolkensis* is recognised as a threatened under the under the TSC Act (1995) and has been considered further in Section 5.0 and Appendix A of this report. Other calls could only be identified to genus level, this

being *Vespadelus* sp. Calls attributed to the genus *Vespadelus* were thought to be from either *V*. *pumilus* (Eastern Forest Bat) and *V. vulturnus* (Little Forest Bat), which are common in the local area with *V. vulturnus* also trapped on site. The audible *Nyctinomus australis* (White-striped Freetail Bat) was also commonly heard during nocturnal surveys.

Previous surveys on site have also identified definite calls from *Chalinolobus gouldi* (Gould's Wattledbat), probable calls from *Nyctophilus gouldii* (Gould's Long-eared Bat) and possible calls from *Chalinolobus morio* (Chocolate Wattled-bat) (Andrews Neil, 2001).

Apart from *M. norfolkensis*, none of these microchiropteran bat species are regarded as threatened under state or national legislation.

## 4.3.6 AMPHIBIAN SURVEY

Eight frog species, *Crinia signifera* (Common Eastern Froglet), *Limnodynastes peronii* (Striped Marsh Frog), *Limnodynastes tasmaniensis* (Spotted Grass Frog), *Platyplectrum ornatum* (Ornate Burrowing Frog), *Litoria latopalmata* (Broad-palmed Tree Frog), *Litoria fallax* (Dwarf Tree Frog), *Litoria wilcoxi* (Stony River Frog) and *Uperoleia laevigata* (Smooth Toadlet) were recorded on site during the survey. None of these amphibian species are regarded to be threatened under state or national legislation.

#### 4.3.7 REPTILE SURVEY

Two reptile species, *Oedura robusta* (Robust Velvet Gecko) and *Amphibolurus muricatus* (Jacky Lizard), were identified within the site during the survey. Scratches present on the boles of trees were also consistent with *Varanus varius* (Lace Monitor). A *Pseudechis porphyriacus* (Red-bellied Black Snake) was also captured in a small mammal trap around the dam in the north of the site. None of these reptile species are regarded to be threatened under state or national legislation.

#### 4.3.8 DIURNAL AVIFAUNA SURVEY

A number of avifauna species were found to be present across the various habitats of the site. Common birds recorded within the open woodland habitat at the time of the survey included *Cacatua roseicapilla* (Galah), *Glossopsitta concinna* (Musk Lorikeet), *Gerygone olivacea* (White-throated Gerygone), *Eurystomus orientalis* (Dollarbird), *Eudynamys scolopacea* (Common Koel), *Cormobates leucophaea* (White-throated Treecreeper), *Hirundo neoxena* (Welcome Swallow), *Coracina novaehollandiae* (Black-faced Cuckoo-shrike), *Gymnorhina tibicen* (Australian Magpie) and *Rhipidura leucophrys* (Willie Wagtail). Common birds recorded in and around the constructed dams included *Anas superciliosa* (Pacific Black Duck) and *Porphyrio porphyrio* (Purple Swamphen). A single specimen of *Ardea ibis* (Cattle Egret) was observed in a paddock in the north of the site following cattle.

Regurgitation pellets consistent with *Podargus strigoides* (Tawny Frogmouth) were found along the entrance road. No whitewash, regurgitation pellets or prey remains consistent with other Owl species were noted on site.

Also there were:

 no chewed *Allocasuarina torulosa* (Forest Oak) and cones found on site consistent with those eaten by Glossy Black Cockatoos.

A complete list of bird species recorded during the survey is listed in Appendix D.

## 4.3.9 NOCTURNAL AVIFAUNA SURVEY

One nocturnal avifauna species, *Eurostopodus mystacalis* (White-throated Nightjar) was observed hunting and heard calling across the site over both nights of fieldwork. At least six specimens were observed hunting along the ephemeral drainage line in the centre of the site. A *Ninox boobook* (Southern Boobook) was also heard calling from the neighbouring property to the east. These nocturnal species are not regarded as threatened under state or national legislation. There were no responses heard as a result of the owl and mammal calls played during the survey.

## 4.3.10 SPOTLIGHTING SURVEY

No additional species from those mentioned above were identified during spotlighting.

During a previous survey (HLA, 1999) several extra species not identified during this survey period including *Aegotheles cristatus* (Australian Owlet Nightjar), *Tyto alba* (Barn Owl), *Diplodactylus vittatus* (Wood Gecko), *Isoodon macrourus* (Northern Brown Bandicoot), *Petaurus breviceps* (Sugar Glider), *Pseudocheirus peregrinus* (Common Ringtail Possum) and *Trichosurus vulpecula* (Common Brushtail Possum) were found on site. These nocturnal species are not regarded as threatened under state or national legislation.

## 4.3.11 INCIDENTAL OBSERVATIONS

A number of secondary indications of fauna were observed during the survey and included:

• A small number of *Wallabia bicolor* (Swamp Wallaby) and *Macropus giganteus* (Eastern Grey Kangaroo) were observed near the site's southern boundary.

- A number of scats and tracks consistent with a large macropod were found over the site. A number of sleeping places used by large macropods were also found within shady areas within the site. The majority of these signs are thought to be from *Macropus giganteus* (Eastern Grey Kangaroo).
- Burrows, scats and territorial mounds of the introduced *Oryctolagus cuniculus* (European Rabbit) were common within the site, with Rabbits particularly numerous within the Blackberry patches near the site's entrance in the north. The presence of the Rabbit is listed as a Key Threatening Process under the NSW Threatened Species Conservation Act, 1995.
- Evidence of the presence of cattle in the form of scats and tracks were common within the site.
- *Vulpes vulpes* (Red Fox) was observed on site during the day and night. Individuals were observed from a distance in the day and a mother and pups was observed at the entrance of the site during spotlighting. Scats consistent with this species were also found on site. The occurrence of the Red Fox is listed as a Key Threatening Process under the NSW Threatened Species Conservation Act, 1995.

## 4.3.12 SURVEY LIMITATIONS

As with all reports of this type the main survey limitation is considered to be the short period of time in which the fieldwork was carried out during one season. Limitations to the likelihood of detecting certain subject species were also encountered during this survey. Such limitations were generally related to the seasonal detectability of species, be it as a result of known flowering periods for flora or migratory movements by fauna.

These limitations have been overcome by applying the precautionary principle in all cases where the survey methodology may have given a false negative result. This precautionary principle was achieved by recognising that most threatened species are rare and therefore unlikely to be encountered during a survey even if they may utilise the site at other times. These species have been assessed on the basis of the presence of their habitat and the likely significance of that habitat to a viable local population.

## 5.0 CONSIDERATIONS UNDER SECTION 5A OF THE EPA ACT

Considerations of the effects of the proposal under the guidelines of Section 5A of the Environmental Planning and Assessment Act (1995) are given in Appendix A. The species dealt with were those species identified on site during the fieldwork and those considered to have potential habitat available within the study area as detailed in Section 4.2.2 of this report.

Two Endangered Ecological Communities, Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion and Hunter Lowlands Red Gum Forest in the Sydney Basin Bioregion were found to be present within the site. No threatened flora species were found during the survey. Three threatened fauna species *Myotis adversus* (Large-footed Myotis), *Mormopterus norfolkensis* (Eastern Freetail-bat) and *Pomatostomus temporalis* ssp. *temporalis* (Grey-crowned Babbler) were recorded on site during targeted surveys.

The majority of woodland on site consisted of two separate communities, Lower Hunter Spotted Gum – Ironbark Forest and Hunter Lowlands Red Gum Forest, both of which are listed as Endangered Ecological Communities. Both assemblages were heavily disturbed with a sparse canopy and understorey dominated by introduced pasture species. The proposal aims to retain the trees on site and it is unlikely that the remnant trees of these communities would be removed as part of any future development. Taking into account the highly disturbed nature of these assemblages and that no trees will be removed as a result of the proposal it is unlikely to adversely effect the extent or adversely modify the composition of these assemblages such that their local occurrence is placed at risk of extinction.

No threatened flora species were found to be present despite targeted and incidental surveys. Suitable habitat was considered to be present for 6 of the 13 species assessed within the site:

- Acacia bynoeana
- Callistemon linearifolius
- Eucalyptus glaucina
- Grevillea parviflora ssp. parvifolia
- Rutidosis heterogama
- Cymbidium canaliculatum

Bynoe's Wattle Netted Bottlebrush Slaty Red Gum Narrow-leaved Grevillea Wrinklewort Tiger Orchid (Endangered Population)

Given the disturbed nature of the site, particularly the understorey, the majority of habitat available on site was considered marginal. The proposal aims to preserve trees with the road network and building envelopes to be placed to minimise the loss of trees on site. Considering the open nature of the site and the disturbed nature of the understorey it is highly unlikely that a significant amount of habitat will be removed as a result of the proposal in relation to these threatened flora species.

*Myotis adversus* was captured on site during harp trapping. The trap was located close to the dam in the north of the site which is likely be used by this species for hunting. Preferred hunting habitat is restricted to the dams and the ephemeral drainage lines on site, although this species is also known to hunt aerially with marginal hunting habitat available across the site. The large remnant buildings on site provide ideal roosting habitat for this species. *M. adversus* has also been known to utilise tree hollows on occasions and this is also available on site in small numbers. *Mormopterus norfolkensis* was also recorded on site during echolocation call recording. The site provided hunting habitat for this species however roosting habitat was restricted to the hollow-bearing trees onsite.

The dams and ephemeral drainage lines are likely to be retained on site and will still provide hunting habitat for *M. adversus* within the proposal. Future development is unlikely to result in a significant reduction of hunting habitat for these species. If for unforeseen circumstances any habitat trees require removal it is recommended that compensatory bat nest boxes be erected prior to any future work on site to replace the loss of any tree hollow. The proposal may also involve the removal or alteration of the buildings on site in the future. It is recommended that the buildings be inspected prior to removal to determine whether any bat colonies are present. If any colonies are discovered a management plan detailing protection methods may be appropriate. Provided the recommendations are implemented and considering that preferred hunting habitat for *M. adversus* will be retained on site the proposal is unlikely to significantly affect the life cycle of these microchiropteran bat species or place any viable local populations of these species at risk of extinction.

A group of approximately 12 Grey-crowned Babblers were recorded in the neighbouring property near the entrance in the north of the site and were observed in the trees on site near this area over a number of days. A small number of dome shaped nests were also observed in this area. Considering that minimal vegetation will be removed as a result of the proposal it is unlikely that a significant amount of habitat if any will be removed. The proposal has the potential to introduce more domestic cats to the area which have the potential to predate on the local Babbler population. It is recommended that cats be excluded from the site by means of a restriction of title on the proposed lots. Provided this recommendation is implemented the proposal is unlikely to have an adverse effect on the lifecycle of this species such that the local population is placed at risk of extinction.

No other threatened fauna species were recorded within the site during the survey despite habitat of mostly marginal quality being available for 31 of the remaining 42 species considered. Provided the recommendations in this report are implemented and considering the generally low quality of habitat on site and the availability of superior habitat in the surrounding area, the proposal is unlikely to affect the life cycle of these species such that a viable local population is likely to be placed at risk of extinction.

The proposal aims to preserve trees with the road network and building envelopes to be placed to minimise the loss of trees on site. Considering the open nature of the site it is unlikely that a significant amount of habitat will be removed as a result of the proposal and given the occurrence of large areas of better quality habitat to the south of the site the proposal is unlikely to cause the extinction of any species, population or endangered ecological community in the local area.

## 6.0 CONSIDERATIONS UNDER SEPP 44 – 'KOALA HABITAT PROTECTION'

The principal aim of State Environment Planning Policy 44 - Koala Habitat Protection, is to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and to reverse the current trend of Koala population decline.

This policy applies to areas of more than one hectare or an area which has together with any adjoining land in the same ownership an area of more than 1 hectare, whether or not the development application applies to the whole, or only part of the land. In addressing SEPP44 there are two questions to be considered.

## 6.1 FIRST CONSIDERATION - IS THE LAND 'POTENTIAL KOALA HABITAT'?

'Potential Koala Habitat' is defined in SEPP 44 as, "...an area of native vegetation where trees of the type listed in Schedule 2 (Koala feed tree species) constitute at least 15% of the total number of trees in the upper or lower strata of the tree component".

Two species of 'Koala Feed Tree', *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus punctata* (Grey Gum) were recorded within the site. *Eucalyptus punctata* is likely to be hybridising with the closely related *Eucalyptus canaliculata* (Large-fruited Grey Gum). However the results of the SEPP 44 assessment revealed that *E. tereticornis* and *E. punctata* comprise over 15% of the total trees present in some locations. Therefore the site would be considered to constitute 'Potential Koala Habitat', and accordingly further provisions of this policy apply to the site.

## 6.2 SECOND CONSIDERATION - IS THE LAND 'CORE KOALA HABITAT'?

No direct observations of Koalas nor evidence of Koala activity such as scats and scratches on the boles of trees were recorded during targeted and incidental searches. Few recent local Koala records were present on the DECCW database. Due to the connectivity of the site to large tracts of suitable habitat there is potential for Koalas to utilise the site. However given the disturbed and open nature of the site it would not be considered to constitute 'Core Koala Habitat' and accordingly no further provisions of this policy apply to the site.

## 7.0 CONSIDERATIONS UNDER THE COMMONWEALTH ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

Considerations have been made to the Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act 1999. Assessments have been made to determine whether or not the proposal or activity has, will have, or is likely to have a significant impact on a matter of National Environmental Significance. The matters of National Environmental Significance and the appropriate responses are listed below:

## • World Heritage properties;

The proposed development does not affect any World Heritage properties.

## • wetlands recognised under the Ramsar convention as having international significance;

The site does not have any impact or occur in proximity to a Ramsar listed wetland.

## • listed threatened species and communities;

Twenty-one nationally threatened species were recorded on the DEWHA on-line database as occurring or having potential habitat available within 10km of the site, these being:

Acacia bynoeana	ł
Angophora inopina	(
Cryptostylis hunteriana	Ι
Eucalyptus glaucina	S
Eucalyptus parramattensis ssp. decadens	Ι
Grevillea parviflora ssp. parviflora	S
Rhizanthella slateri	ł
Heleioporus australiacus	(
Litoria aurea	(
Litoria littlejohnii	ł
Mixophyes balbus	S
Mixophyes iteratus	S
Hoplocephalus bungaroides	I
Rostratula benghalensis	I
Lathamus discolor	S
Xanthomyza phrygia	I
Dasyurus maculatus ssp. maculatus	]
Petrogale penicillata	I
Potorous tridactylus ssp. tridactylus	Ι
Pteropus poliocephalus	(
Chalinolobus dwyeri	Ι
-	

Bynoe's Wattle Charmhaven Apple Leafless Tongue Orchid Slaty Red Gum Drooping Red Gum Small-flowered Grevillea Eastern Underground Orchid **Giant Burrowing Frog** Green and Golden Bell Frog Heath Frog Stuttering Frog Southern Barred Frog Broad-headed Snake Painted Snipe Swift Parrot Regent Honeyeater Tiger Quoll Brush-tailed Rock-Wallaby Long-nosed Potoroo Grey-headed Flying-fox Large Pied Bat

No nationally threatened species were recorded within the site during the survey. With the exception of *Angophora inopina*, *Cryptostylis hunteriana*, *Eucalyptus parramattensis* ssp. *decadens*, *Rhizanthella slateri*, *Heleioporus australiacus*, *Litoria littlejohnii*, *Mixophyes balbus*, *Mixophyes iteratus*, *Petrogale penicillata* and *Potorous tridactylus* habitat of mostly marginal quality was considered to be available within the site for the remaining species. All nationally listed species that were considered to have habitat on site have been addressed under the provisions of state legislation

(i.e. Section 5A of the NSW Environmental Planning and Assessment Act 1979). As stated within Section 5.0, the proposal aims to retain trees on site and considering the open nature of the site it is unlikely that a significant amount of habitat for any of the species considered would be removed as a result of the proposal.

## • migratory species protected under international agreements;

A number of migratory species were recorded on the DEWHA's on-line database as occurring or having potential habitat available within 10km of the site. Two of these species, *Xanthomyza phrygia* and *Lathamus discolor* have been assessed as threatened species within Section 5.0 and Appendix A of this report. Each of the remaining species has been assessed below in Table 9.

Scientific Name	Habitat	Possibility of occurrence &
		impact of action
Migratory Terrestrial S	pecies	
Haliaeetus leucogaster White-bellied Sea- Eagle	Considered to be a migratory species, however any movements are likely to be nomadic rather than migratory, in response to food availability	This species was considered unlikely to utilise the site.
<i>Hirundapus</i> <i>caudacutus</i> White-throated Needletail	Inhabits the airspace above forests, woodlands, farmlands, plains, lakes, coasts and towns.	Due to the general habitat requirements of the White-throated Needletail the proposal is unlikely to adversely impact upon this species.
Monarcha melanopsis Black-faced Monarch	Utilises a range of habitats including rainforests, eucalypt woodlands, coastal scrubs (Pizzey & Knight, 2001).	Due to its general habitat requirements the proposal is unlikely to adversely impact upon this species.
<i>Myiagra cyanoleuca</i> Satin Flycatcher	Heavily vegetated gullies in forests and taller woodlands. During migration this species also utilises coastal forests, woodlands, mangroves, remnant trees in paddocks and gardens (Pizzey & Knight, 2001).	Due to its general habitat requirements the proposal is unlikely to adversely impact upon this species.
<i>Rhipidura rufìfrons</i> Rufous Fantail	Utilises a range of habitats including rainforests, wet sclerophyll forests, monsoon forests, scrubs, mangroves, watercourses, parks and gardens. During migration this species also utilises farms, street trees and buildings (Pizzey & Knight, 2001).	Due to its general habitat requirements during migration the proposal is unlikely to adversely impact upon this species.
Merops ornatus Rainbow Bee-eater	Inhabits areas such as open woodlands with sandy soils, sandridges, riverbanks, beaches, dunes, cliffs and rainforests.	Suitable foraging habitat was contained within the site however no suitable nesting habitat was present. The proposal is unlikely to impact upon this species.

Table 9: Assessment of Migratory Species.

Scientific Name	Habitat	Possibility of occurrence &
		impact of action
Migratory Wetland Spe	ecies:	
Ardea alba	Inhabits shallows of rivers, larger	The drainage line contains foraging
Great Egret	dams, freshwater wetlands and	habitat for this species. The
	irrigation areas.	proposal is unlikely to adversely
		impact upon this species.
Ardea ibis	Inhabits stock paddocks, pastures,	This species was observed on site
Cattle Egret	croplands, wetlands and drains.	during the survey period. A large
		portion of the site contains suitable
		habitat for this species. The
		proposal is unlikely to adversely
		impact this species.
Gallinago hardwickii	Utilises a variety of habitat, such as	The site contains limited habitat for
Latham's Snipe	soft wet ground or shallow water	this species within the ephemeral
	with tussock and other green and	drainage line. The proposal is
	dead vegetation, and scrub or open	unlikely to impact upon this
	wetland from sea-level to alpine	species.
	bogs (Pizzey & Knight, 2001).	

## • nuclear activities;

The proposal does not involve any type of nuclear activity.

## • the Commonwealth marine environment;

The proposal does not involve the modification of the Commonwealth marine environment.

## 8.0 **RECOMMENDATIONS**

The recommendations given in the report have been listed here along with a brief discussion of their implementation.

- The hollow-bearing trees identified on site are likely to remain in-situ as a result of the proposal. If for some unforeseen purpose any habitat tree requires removal it is recommended that nest boxes of similar habitat value be installed at a ratio of 2:1 (nest boxes installed: hollows removed) prior to any clearing taking place. It is also recommended that a suitably qualified and immunised ecologist be on hand to inspect trees prior to removal and supervise the removal of any habitat trees to reduce the impact on any fauna species, which may be present. Any habitat trees should also be clearly marked prior to felling.
- The proposal may involve the removal or alteration of the buildings on site in the future. It is recommended that the buildings be inspected by a suitably qualified and vaccinated ecologist prior to removal or modification to determine whether any bat colonies are present.
- The proposal has the potential to introduce more domestic cats to the area which have the potential to predate on the local Babbler population. It is recommended that cats be excluded from the site by means of a restriction of title on the proposed lots.
- It is recommended that ongoing weed control targeting Blackberry be conducted throughout the site. Other noxious weeds including *Asparagus asparagoides, Lantana camara* and *Hypericum perforatum* were found in low frequency and should be controlled to limit the spread of these weeds on site.
- A small number of standing dead trees together with a small amount of fallen timber was present within the site. It is recommended that dead and fallen timber within the development area be relocated elsewhere on site so that this habitat resource is retained.
- To minimise the impact of the proposal on the dams and drainage lines on site it is recommended that appropriate sediment controls be utilised prior to any construction taking place.

## 9.0 CONCLUSION

Flora, habitat and fauna assessments have been undertaken over approximately 40 ha of land at Lot 7 DP263182 and Lot 28 DP844871, Elrington Road, Elrington NSW to identify potential impacts resulting from a proposed rural-residential subdivision.

It is proposed that the site be subdivided into 31 rural-residential lots, with a minimum lot size of 1ha. No trees are proposed to be removed as the trees on site are generally scattered and can be retained within the lots. The existing buildings on site are heritage listed and are expected to be retained. The buildings are to be located on individual lots and are to be adapted for suitable uses such as farm sheds and dwellings. Access to the site will be provided by Elrington Road and an internal road network.

Two Endangered Ecological Communities, Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion and Hunter Lowlands Red Gum Forest in the Sydney Basin Bioregion was found to be present within the site. No threatened flora species were found during the survey. The threatened fauna species *Myotis adversus* (Large-footed Myotis), *Mormopterus norfolkensis* (Eastern Freetail-bat) and *Pomatostomus temporalis* ssp. *temporalis* (Grey-crowned Babbler) were recorded on site during targeted surveys.

The proposal aims to preserve trees by locating the road network and building envelopes to minimise the loss of trees on site. Considering the open nature of the site and lack of native understorey it is unlikely that a significant amount of habitat will be removed as a result of the proposal, however a number of recommendations have been made, listed in Section 8.0, most of which focus primarily on general habitat protection and mitigation to minimise the impact of the proposal.

No other threatened fauna species were recorded within the site during the survey despite habitat of mostly marginal quality being available for 31 of the remaining 42 species considered. Provided the recommendations in this report are implemented and considering the generally low quality of habitat on site and the availability of superior habitat in the surrounding area, the proposal is unlikely to affect the life cycle of the species considered such that a viable local population is likely to be placed at risk of extinction.

Considerations have been made to the Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act (1999). It was determined that the proposal should have no significant impact on a matter of National Environmental Significance.

In conclusion, provided the recommendations in this report are implemented it is unlikely that the proposal will result in a significant adverse impact upon any viable local communities, populations or individuals of the assessed threatened species.

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## APPENDIX A CONSIDERATIONS UNDER SECTION 5A OF THE EPA ACT

## CONSIDERATIONS UNDER SECTION 5A OF THE EPA ACT - SIGNIFICANT EFFECT ON THREATENED SPECIES, POPULATIONS OR ECOLOGICAL COMMUNITIES, OR THEIR HABITATS.

Consideration of this development under the guidelines of Section 5A of the Environmental Planning & Assessment Act (1979) as amended by the Environmental Planning and Assessment Amendment Act (1997) has been made. The heads of consideration of this Section are given in italics followed by the answers applicable to this site. Each species is dealt with separately.

## **Endangered Ecological Communities recorded on site:**

- 1. Hunter Lowland Red Gum Forest
- 2. Lower Hunter Spotted Gum Ironbark Forest

## **Threatened Species Present on site:**

3.	Myotis adversus Mormopterus norfolkensis	Large-footed Myotis Eastern Freetail Bat
4.	Pomatostomus temporalis ssp. temporalis	Grey-crowned Babbler

## Species considered to have potential habitat within the site:

<u>Small Plants</u>
Acacia bynoeana
Grevillea parviflora ssp. parviflora
Rutidosis heterogama

- 6. <u>Orchids</u> Cymbidium canaliculatum
- 7. <u>Myrtaceous Species</u> Callistemon linearifolius Eucalyptus glaucina
- 8. <u>Frogs</u> Litoria aurea

#### 9. <u>Waterbirds</u> Ixobrychus flavicollis Ephippiorhynchus asiaticus Rostratula benghalensis australis

## 10. <u>Cockatoos & Parrots</u>

Callocephalon fimbriatum Calyptorhynchus lathami Glossopsitta pusilla Lathamus discolor Neophema pulchella

## 11. <u>Woodland Birds</u>

Climacteris picumnus ssp. victoriae Melithreptus gularis ssp. gularis Pyrrholaemus sagittatus Stagonopleura guttata Xanthomyza phrygia

## 12. <u>Birds of Prey</u>

Tiger Orchid (Endangered Population)

Netted Bottlebrush Slaty Red Gum

Bynoe's Wattle

Wrinklewort

Small Flower Grevillea

Green and Golden Bell Frog

Black Bittern Black-necked Stork Australian Painted Snipe

Gang-gang Cockatoo Glossy Black-Cockatoo Little Lorikeet Swift Parrot Turquoise Parrot

Brown Treecreeper Black-chinned Honeyeater Speckled Warbler Diamond Firetail Regent Honeyeater

Erythrotriorchis radiatus Red Goshawk Black-breasted Buzzard Hamirostra melanosternon Lophoictinia isura Square-tailed Kite 13. Owls Ninox connivens Barking Owl Powerful Owl Ninox strenua *Tyto novaehollandiae* Masked Owl *Tyto tenebricosa* Sooty Owl 14. **Terrestrial Mammals** Dasyurus maculatus ssp. maculatus Tiger Quoll 15. Large Arboreal Mammals *Phascolarctos cinereus* Koala 16. **Small Arboreal Mammal** Petaurus norfolcensis Squirrel Glider Phascogale tapoatafa Brush-tail Phascogale 17. **Megachiropteran Bats** Pteropus poliocephalus

#### 18. **Microchiropteran Bats**

Chalinolobus dwyeri Falsistrellus tasmaniensis Saccolaimus flaviventris *Miniopterus australis* Miniopterus schreibersii oceanensis Scoteanax rueppellii Vespadelus troughtoni

Grey-headed Flying-fox

Large-eared Pied Bat Eastern False Pipistrelle Yellow-bellied Sheathtail-bat Little Bentwing Bat Large Bentwing Bat Greater Broad-nosed Bat Eastern Cave Bat

## 1. Hunter Lowland Red Gum Forest in the Sydney Basin Bioregion.

Hunter Lowland Red Gum Forest in the Sydney Basin Bioregion is an open forest assemblage found on gentle slopes and drainage flats on the Hunter Valley Floor. The most common canopy species are *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus punctata* (Grey Gum). Other common tree species include *Eucalyptus crebra* (Narrow-leaved Ironbark), Corymbia maculata (Spotted Gum) and *Eucalyptus moluccana* (Grey Box). Common shrub species include *Breynia oblongifolia* (Breynia) and *Leucopogon juniperinus*. The ground cover typically comprises grasses and herbs.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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 to endangered ecological communities.

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 to endangered ecological communities.

- *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*
  - (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.

Low-lying land with remnant *E. tereticornis* occupied approximately 3 hectares and could be considered to be a highly disturbed remnant of Hunter Lowlands Red Gum Forest. The remnant was heavily disturbed lacking a native understorey and was predominantly composed of sparse canopy trees and an understorey of introduced pasture species. The proposal aims to retain the trees on site and it is unlikely that these remnant trees would be removed as part of any future development. Taking into account the highly disturbed nature of this assemblage and that no trees will be removed as a result of the proposal it is unlikely to adversely effect the extent or adversely modify the composition of this assemblage such that its local occurrence is placed 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*
  - (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
  - (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.

The proposal aims to preserve trees with the road network and building envelopes to be placed to minimise the loss of trees on site. Considering the open nature of the site and lack of native understorey

it is unlikely that a significant amount of vegetation will be removed as a result of the proposal.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

No Recovery or Threat Abatement Plan has been developed for this endangered ecological community. However the Department of Environment and Climate Change has prepared Priority Action Statements (PAS) to promote the recovery of these species and the abatement of key threatening processes in NSW. The Priority Action Statement identified a number of broad strategies to help this community recover in NSW. It is considered that the proposal does not significantly conflict with the PAS for this endangered ecological community.

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.

The 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act pertinent to this species are listed below in table form followed by an assessment of the applicability of the threatening process in regards to the proposal.

Key Threatening Process	Applicability in regards to the site
Clearing of Native Vegetation	The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. The proposed roads and future building envelopes will be placed to minimise the loss of vegetation on site. Considering the open nature of the site and mostly exotic understorey it is unlikely that a significant amount of vegetation will be removed.
High frequency fire resulting in the	It is difficult to ascertain the disruption and structural changes,
disruption of life cycle processors in	if any, past fires have caused the site. The proposal is
plants and animals and loss of	unlikely to alter the fire frequency on site.
vegetation structure and composition	
Invasion of native plant communities	This threatening process is already present with introduced
by exotic perennial grasses	grasses such as <i>Pennisetum clandestinum</i> (Kikuyu) present throughout the site. It is unlikely that the proposal will further exacerbate invasion by exotic grasses.
Competition and grazing by the feral	A large number of Rabbits were recorded at the entrance in
European Rabbit Oryctolagus	the north of the site and two rabbit carcasses were observed
cuniculus	within the buildings on site. The proposal is unlikely to increase numbers of this species.
Invasion, establishment and spread	A small amount of Lantana was present within the site
of Lantana camara (Lantana)	particularly around the remnant buildings and woodpiles
	present on site. A site vegetation management plan may assist with the control of this species.
Predation, habitat degradation,	No evidence of feral pigs was recorded on site. The proposal
competition and disease transmission	is unlikely to increase numbers of this species.
by Feral Pigs (Sus scrofa).	
Herbivory and Environmental	No evidence of Feral Deer was recorded on site. The proposal

Key Threatening Process	Applicability in regards to the site	
Degradation caused by Feral Deer.	is unlikely to increase numbers of this species.	
Human-caused Climate Change.	Not applicable to the site.	
Infection of native plants by	Not known to be present on site.	
Phytophthora cinnamomi.		
Exotic vines and scramblers.	Few exotic vines were present on site.	
Competition and habitat degradation	No feral goats were recorded during fieldwork and would be	
by feral goats (Capra hircus).	unlikely to utilise the site.	

Another important threat to the community is the ongoing impact of grazing cattle. Cattle would contribute to the compaction of the soil, increase erosion and contribute to the nitrification of the soil by the addition of waste products.

#### **Bibliography:**

NSW Scientific Committee (2002). Hunter Lowland Red Gum Forest in the Sydney Basin Bioregions. Endangered Ecological Community Determination. Final DEC, Sydney, NSW.

## 2. Lower Hunter Spotted Gum - Ironbark Forest in the Sydney Basin Bioregion.

Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion is the name given to the ecological community that occurs principally on Permian geology in the central to lower Hunter Valley. It is restricted to a range of approximately 65km by 35km centred on the Cessnock – Beresfield area. Lower Hunter Spotted Gum – Ironbark Forest is dominated by *Corymbia maculata* (Spotted Gum) and *Eucalyptus fibrosa* (Broad-leaved Ironbark). *Eucalyptus punctata* (Grey Gum) and *Eucalyptus crebra* (Narrow-leaved Ironbark) also occur occasionally. The understorey is marked by tall shrubs such as *Bursaria spinosa* (Blackthorn), *Melaleuca nodosa* (Ball Honeymyrtle) and *Acacia parvipinnula*. The ground layer is diverse and contains species such as *Cymbopogon refractus* (Barbed Wire Grass), *Entolasia stricta*, *Dianella revoluta* (Blue Flax Lily) and *Cheilanthes sieberi* (Mulga Fern).

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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 to endangered ecological communities.

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 to endangered ecological communities.

- *c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:* 
  - (ii) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
  - (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Spotted Gum – Ironbark Forest was located predominately along the sloping areas on site and occupied approximately 18.5 hectares. The canopy of this assemblage was relatively sparse and was dominated by *Corymbia maculata* (Spotted Gum), *Eucalyptus fibrosa* (Broad-leaved Ironbark) and *Eucalyptus siderophloia* (Ironbark) and could be considered to be a highly disturbed remnant of Lower Hunter Spotted Gum – Ironbark Forest. The remnant was heavily disturbed lacking a native understorey and was predominantly composed of sparse canopy trees and an understorey of introduced pasture species. The proposal aims to retain the trees on site and it is unlikely that these remnant trees would be removed as part of any future development. Taking into account the highly disturbed nature of this assemblage and that no trees will be removed as a result of the proposal it is considered that the proposal is unlikely to adversely effect the extent or adversely modify the composition of this assemblage such that its local occurrence is placed at risk of extinction.

- *d) in relation to the habitat of a threatened species, population or ecological community:* 
  - (ii) the extent to which habitat is likely to be removed or modified as a result of the action

proposed, and

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

The proposal aims to preserve trees with the road network and building envelopes to be placed to minimise the loss of trees on site. Considering the open nature of the site and lack of native understorey it is unlikely that a significant amount of vegetation will be removed as a result of the proposal.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

No Recovery or Threat Abatement Plan has been developed for this endangered ecological community. However the Department of Environment and Climate Change has prepared Priority Action Statements (PAS) to promote the recovery of these species and the abatement of key threatening processes in NSW. The Priority Action Statement identified a number of broad strategies to help this community recover in NSW. It is considered that the proposal does not significantly conflict with the PAS for this endangered ecological community.

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.

The 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act pertinent to this species are listed below in table form followed by an assessment of the applicability of the threatening process in regards to the proposal.

Key Threatening Process	Applicability in regards to the site
Clearing of Native Vegetation	The clearing of vegetation is listed as a major factor
	contributing to the loss of biological diversity. The proposed
	roads and future building envelopes will be placed to minimise
	the loss of vegetation on site. Considering the open nature of
	the site and mostly exotic understorey it is unlikely that a
	significant amount of vegetation will be removed.
High frequency fire resulting in the	It is difficult to ascertain the disruption and structural changes,
disruption of life cycle processors in	if any, past fires have caused the site. The proposal is
plants and animals and loss of	unlikely to alter the fire frequency on site.
vegetation structure and composition	
Invasion of native plant communities	This threatening process is already present with introduced
by exotic perennial grasses	grasses such as Pennisetum clandestinum (Kikuyu) present
	throughout the site. It is unlikely that the proposal will further
	exacerbate invasion by exotic grasses.
Competition and grazing by the feral	A large number of Rabbits were recorded at the entrance in
European Rabbit Oryctolagus	the north of the site and two rabbit carcasses were observed
cuniculus	within the buildings on site. The proposal is unlikely to
	increase numbers of this species.

Key Threatening Process	Applicability in regards to the site	
Invasion, establishment and spread	A small amount of Lantana was present within the site	
of Lantana camara (Lantana)	particularly around the remnant buildings and woodpiles	
	present on site. A site vegetation management plan may assist	
	with the control of this species.	
Predation, habitat degradation,	No evidence of feral pigs was recorded on site. The proposal	
competition and disease transmission	is unlikely to increase numbers of this species.	
by Feral Pigs (Sus scrofa).		
Herbivory and Environmental	No evidence of Feral Deer was recorded on site. The proposal	
Degradation caused by Feral Deer.	is unlikely to increase numbers of this species.	
Human-caused Climate Change.	Not applicable to the site.	
Infection of native plants by	Not known to be present on site.	
Phytophthora cinnamomi.		
Exotic vines and scramblers.	Few exotic vines were present on site.	
Competition and habitat degradation	No feral goats were recorded during fieldwork and would be	
by feral goats (Capra hircus).	unlikely to utilise the site.	

Another important threat to the community is the ongoing impact of grazing cattle. Cattle would contribute to the compaction of the soil, increase erosion and contribute to the nitrification of the soil by the addition of waste products.

## **Bibliography:**

National Parks and Wildlife Service (2005). NSW Scientific Committee's Final Determination to list the Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin Bioregion as an Endangered Ecological Community.

## 3. Microchiropteran Bats identified on site:

#### Mormopterus norfolkensis Eastern Freetail-bat

This species is distributed along the east coast of New South Wales from south of Sydney extending north into south-eastern Queensland, near Brisbane. There are no records west of the Great Dividing Range. This species appears to live in Sclerophyll Forests and Woodland. Usually only solitary bats are captured, but one group was caught flying low over a rocky river in Rainforest and Wet Sclerophyll Forest. When hunting insects it flies swiftly above the forest canopy or in clearings at the edge of the forest. Their diet is largely unknown. Small colonies have been found in tree hollows or under loose bark and specimens have been collected from under house roofs and the metal caps on telegraph poles. It commonly roosts with other species of bats, including *Scotorepens orion* (Eastern Broad-nosed Bat) and *Chalinolobus gouldii* (Gould's Wattled Bat).

#### Myotis adversus

#### Large-footed Myotis

The Large-footed Myotis has been recorded along much of the coastal strip of Australia occurring from the east of South Australia, around the Victorian, New South Wales, Queensland and Northern Territory coasts and into Western Australia as far as the Kimberleys (the northern population is likely to be a different subspecies - currently undergoing taxonomic revision).

In N.S.W., the Large-footed Myotis is found in various habitats of the coast and adjacent ranges. Recently, it has also been found along the Murray River valley well into South Australia. It is a small bat that hunts by raking the surface of the water for aquatic insects and small fish, it seldom occurs far from suitable water bodies which range from rainforest streams to large reservoirs and even brackish water. Some aerial hunting also occurs. Prey items include moths, beetles, crickets, cockroaches, flies and many water insects.

It roosts in small colonies of between 15 and several hundred individuals with recorded roosts including caves, mines and disused railway tunnels as well as dense rainforest foliage in the tropical parts of its range. Some occurrences of roosting in tree hollows are also noted. Males establish territories within the colony and monopolise a cluster of females during the breeding season. Outside the breeding season, males roost separately. The number of pregnancies per year varies with latitude. In N.S.W. and Victoria there is one pregnancy per year, the single young being born in November to December. In southern Queensland they produce two litters of single young in October and January. Males show two peaks of testicular development: in April to June and in September to November. Lactation lasts for about eight weeks and young born in late September suckle until late December. The bond between mother and young extends a further 3 to 4 weeks after weaning; they hunt together and roost together during this period. In northern Queensland they are reported to have three births per year.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

*Myotis adversus* was captured on site during harp trapping. The trap was located close to the dam in the north of the site which is likely be used by this species for hunting. Preferred hunting habitat is restricted to the dams and the ephemeral drainage lines on site, although this species is also known to hunt aerially with marginal hunting habitat available across the site. The large remnant buildings on site provide ideal roosting habitat for this species. *M. adversus* has also been known to utilise tree hollows on occasions and this resource is also available on site in small numbers.

*Mormopterus norfolkensis* was also recorded on site during echolocation call recording. The site provided hunting habitat for this species however roosting habitat was restricted to the hollow-bearing trees onsite.

The dams and ephemeral drainage lines are likely to be retained on site and will still provide hunting habitat for *M. adversus* within the proposal. Future development is unlikely to result in a significant reduction of hunting habitat for these species. If in unforeseen circumstances any habitat trees require removal it is recommended that compensatory bat nest boxes be erected prior to any future work on site to replace the loss of any tree hollow. The proposal may also involve the removal or alteration of the buildings on site in the future. It is recommended that the buildings be inspected prior to removal to determine whether any bat colonies are present. If any colonies are discovered a management plan detailing protection methods may be appropriate.

Provided the recommendations are implemented and considering that preferred hunting habitat for *M. adversus* will be retained on site the proposal is unlikely to significantly affect the life cycle of these microchiropteran bat species or place any viable local populations of these 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 to 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*
  - (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 to 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*
  - (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
  - (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.

The proposal aims to preserve trees with the road network and building envelopes to be placed to minimise the loss of trees on site. Considering the open nature of the site it is unlikely that a significant amount of habitat will be removed as a result of the proposal. The dams will remain on site and will continue to provide hunting habitat for *M. adversus*. Hollow-bearing trees will also be retained providing roosting habitat for *M. norfolkensis*. The large buildings on site are heritage listed and are likely to be modified in the future which may result in a loss of potential roost sites. The buildings on site will need to be inspected for roost sites prior to any works taking place and provided no roost sites are found for *M. adversus* the proposal is unlikely to impact the long-term survival of these species in the locality.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

No Recovery or Threat Abatement Plan has been developed for these species. However the Department of Environment and Climate Change has prepared a Priority Action Statement (PAS) to promote the recovery of these species and the abatement of key threatening processes in NSW. Priority Action Statements for these species pertinent to the site include:

Priority	Action	Response
Medium	Promote roosting habitat in new artificial	Artificial structures may be appropriate
	structures within the species range.	particularly if any roost sites are found
		within the remnant buildings on site.
Low	Identify, protect and enhance roost habitat	If a roost site is uncovered during
	beneath artificial structures (eg bridges),	dedicated searches appropriate
	especially when due for replacement, and	management actions will need to be
	assess effectiveness of the actions.	considered including roost protection,
		enhancement or replacement.
Low	Ensure the largest hollow bearing trees in	The number of hollow-bearing trees
	riparian zones are given highest priority for	along the riparian zones on site is
	retention in PVP assessments or other land	minimal however it is not expected that
	clearing assessment tools.	any habitat trees will be removed along
		the riparian areas on site.
Low	Prepare EIA guidelines which address the	There are a small number of hollow-
	retention of hollow bearing trees maintaining	bearing trees on site. These will be
	diversity of age groups, species diversity,	retained on site.
	structural diversity. Give priority to largest	
	hollow bearing trees.	

## 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.

The 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act pertinent to this species are listed below in table form followed by an assessment of the applicability of the threatening process in regards to the proposal.

Key Threatening Process	Applicability in regards to the site
Clearing of Native Vegetation	The clearing of vegetation is listed as a major factor
	contributing to the loss of biological diversity. The proposed
	roads and future building envelopes will be placed to minimise
	the loss of vegetation on site. Considering the open nature of
	the site it is unlikely that a significant amount of vegetation will
	be removed.
Removal of dead wood and dead	A small number of standing dead trees together with a small
trees	amount of fallen timber was present within the site. It is
	recommended that dead and fallen timber within the
	development area be relocated elsewhere on site so that this
	habitat resource is retained.
Key Threatening Process	Applicability in regards to the site
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Loss of hollow-bearing trees	A low number of hollow-bearing trees were present within the
	site. Hollow-bearing trees will be retained on site.
High frequency fire resulting in the	It is difficult to ascertain the disruption and structural changes,
disruption of life cycle processors in	if any, past fires have caused the site. The proposal is
plants and animals and loss of	unlikely to alter the fire frequency on site.
vegetation structure and composition	
Predation by the European Red Fox	The Red Fox was observed on site during the survey period.
Vulpes vulpes	The proposal is unlikely to result in an increase in the number
	of this species.
Predation by the Feral Cat Felis	F. catus was not observed within the study site, although it
catus	would be considered to be have some impact on native fauna in
	the local area. Future residential development is unlikely to
	increase feral numbers of this species, however the number of
	domestic cats may increase. It is recommended that cats be
	excluded from the site by means of a restriction of title.
Competition from feral honeybees	A small number of feral honeybee hives were observed on
Apis mellifera	site. The site also contained a large number of domestic
	honeybee hives which may be a source of feral honeybees. It
	is expected that the proposal will result in the eventual
	removal of the beehives. The proposal is unlikely to result in
	an increase in the number of this species.

# **Bibliography:**

Churchill, S. (1998). Australian Bats. Reed New Holland Publishers, Sydney, Australia.

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Parnaby, H. (1992). An Interim Guide to Identification of Insectivorous Bats of South-eastern Australia. Technical Reports of the Australian Museum, Sydney.

Richards, G.C. (1995). Large-footed Myotis (*Myotis adversus*). In: The Mammals of Australia, pp: 521-523. Strahan, R. (Ed). Reed Books, Australia.

# 3. *Pomatostomus temporalis* ssp. *temporalis* Grey-crowned Babbler

The Grey-crowned Babbler occurs in N.S.W. on the western slopes and plains, with isolated populations in coastal woodlands on the North Coast, Hunter Valley and South Coast near Nowra. The Grey-crowned Babbler ranges through open forest, woodland, scrubland, farmland and outer suburbs. Prefers woodlands with regenerating trees, tall shrubs, and an intact ground cover of grass and forbs. Members of this species are rare in settled areas and are threatened by vegetation clearance, habitat fragmentation and degradation, and competition from introduced species. Builds dome-shaped nests with a spout-like entrance, lined with grass, bark-fibre, rootlets, feathers, and wool. The species is insectivorous and forage in leaf litter and on the bark of trees.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

A group of approximately 12 Grey-crowned Babblers were recorded in the neighbouring property near the entrance in the north of the site and were observed in the trees on site near this area over a number of days. A small number of dome shaped nests were also observed in this area. Considering that minimal vegetation will be removed as a result of the proposal it is unlikely that a significant amount of habitat if any will be removed. The proposal has the potential to introduce more domestic cats to the area which may predate on the local Babbler population. It is recommended that cats be excluded from the site by means of a restriction of title on the proposed lots. Provided this recommendation is implemented the proposal is unlikely to have an adverse effect on the lifecycle of this species such that the local population is 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.

- *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*
  - (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.

- *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*
  - (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
  - *(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.

The proposal aims to preserve trees with the road network and building envelopes to be placed to minimise the loss of trees on site. Considering the open nature of the site it is unlikely that a significant amount of habitat will be removed as a result of the proposal.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

No Recovery or Threat Abatement Plan has been developed for the Grey-crowned Babbler. However the Department of Environment and Climate Change has prepared a Priority Action Statement (PAS) to promote the recovery of this species. It is considered that the proposed action will not significantly compromise this Priority Action 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.

The 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act pertinent to this species are listed below in table form followed by an assessment of the applicability of the threatening process in regards to the proposal.

Key Threatening Process	Applicability in regards to the site
Clearing of Native Vegetation	The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. The proposed roads and future building envelopes will be placed to minimise the loss of vegetation on site. Considering the open nature of the site it is unlikely that a significant amount of vegetation will be removed.
Removal of dead wood and dead trees	A small number of standing dead trees together with a small amount of fallen timber was present within the site. It is recommended that dead and fallen timber within the development area be relocated elsewhere on site so that this habitat resource is retained.
High frequency fire resulting in the disruption of life cycle processors in plants and animals and loss of vegetation structure and composition	It is difficult to ascertain the disruption and structural changes, if any, past fires have caused the site. The proposal is unlikely to alter the fire frequency on site.
Predation by the European Red Fox Vulpes vulpes	The Red Fox was observed on site during the survey period. The proposal is unlikely to result in an increase in the number of this species.
Predation by the Feral Cat Felis catus	F. catus was not observed within the study site, although it would be likely to be have some impact on native fauna in the local area. Future residential development is unlikely to increase feral numbers of this species, however the number of domestic cats may increase. It is recommended that cats be excluded from the site by means of a restriction of title.

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NSW National Parks and Wildlife Service. (2001). Threatened Species Conservation Act 1995 NSW Scientific Committee Final Determination, Grey-crowned Babbler (eastern subspecies) *Pomatostomus temporalis temporalis*.

Pizzey, G. & Knight, F. (1997). Field Guide to the Birds of Australia, Angus and Robertson, Sydney

Reader's Digest (1982). The Complete Book of Australian Birds. Reader's Digest Services Pty. Ltd., Sydney.

Slater, P., Slater, P. and Slater, R. (1997). The Slater Field Guide to Australian Birds. Lansdowne Publishing, Sydney.

# 4. <u>Small Flora Species</u>

# Acacia bynoeana

Acacia bynoeana occurs from Morisset (lower Hunter Valley) to Mittagong. This species is an erect or spreading shrub, 0.2-1m high (Harden 1991). It's found in heath, woodland and dry sclerophyll forests on sandy soils derived from Hawkesbury Sandstone. Commonly associated species include *Eucalyptus haemastoma* (Scribbly Gum), *Corymbia gummifera* (Red Bloodwood), *Angophora bakeri*, *Banksia spinulosa* (Hairpin Banksia), *B serrata* (Old Man Banksia), *Acacia oxycedrus* and *Kunzea* spp. It is considered to be uncommon, but scattered populations have been noted throughout the Sydney region. This species can be recognised by the rough coarse hairs covering the branchlets and the phyllodes, and the thick and resinous phyllodes with parallel veins. Flowering occurs during the summer months and is characterised by a bright yellow, globular single flower located within the leaf axil. This species has been ROTAP-coded 3VC- and has recently (March 2000) been upgraded from 'Vulnerable' to 'Endangered' under the TSC Act 1995. Conserved populations occur within the Blue Mountains National Park and the Royal National Park, though the exact size of these populations is unknown.

# Grevillea parviflora ssp. parviflora Small-flowered Grevillea

*Grevillea parviflora* ssp. *parviflora* is distributed from Prospect to Camden and Appin, with disjunct northern populations occurring near Putty, Cessnock and Cooranbong. This species is a low open to erect shrub, 0.3-1m tall. Flowering time is from July to October. It occurs in light clayey soils in woodlands. This sub-species is not ROTAP-listed.

# Rutidosis heterogama

# Wrinklewort

*Rutidosis heterogama* is a perennial herb and a member of the Asteraceae family. It grows to 30cm tall from a woody base. The flower head is yellow and has 6 to 8 rows of shiny and translucent golden-tawny scales, usually flowering in Autumn. It has been recorded on the north coast and northern tablelands, mainly in coastal districts from MacLean to the Central Coast and inland to Torrington. Populations of this species have been recently recorded in the Kurri Kurri and Cooranbong areas (Stevenson, 2004). Found growing in dry sclerophyll forest and woodland, as well as heath, sand dunes and in disturbed areas such as roadsides. This species has been recorded in the Kurri Sand Swamp Woodland, as well as in Lower Hunter Spotted Gum Ironbark Forest.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

Acacia bynoeana, Rutidosis heterogama nor Grevillea parviflora ssp. parviflora were found within the site during fieldwork. Suitable habitat for *A. bynoeana* and *R. heterogama* was restricted to the Bloodwood assemblage in the southeastern corner of the site however marginal habitat was available over the remainder of the site for *R. heterogama*. Only marginal habitat was present for *G. parviflora* ssp. parviflora across the site, however locally this Grevillea species occurs mostly within the community Kurri Sand Swamp Forest, which is not present on site. The proposal may result in the removal of a small amount of habitat for these three flora species however it is unlikely to have an adverse effect on the life cycle of these species such that a viable local population is likely to be placed at risk of extinction. b) in the case of an endangered 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.

No endangered population has been identified utilising the site.

- *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*
  - (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 to 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*
  - (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
  - (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.

The proposal aims to preserve trees with the road network and building envelopes to be placed to minimise the loss of trees on site. Considering the open nature of the site and the disturbed nature of the understorey it is highly unlikely that a significant amount of habitat will be removed as a result of the proposal in relation to these three species.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

No Recovery or Threat Abatement Plan has been developed for these three species. However the Department of Environment and Climate Change has prepared a Priority Action Statement (PAS) to promote the recovery of these species. Considering the mostly marginal nature of habitat on site and the minimal impact on this habitat it is considered that the proposed action will not significantly compromise this PASs for these three 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.

The 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act pertinent to these species are listed below in table form followed by an assessment of the applicability of the threatening

process in regards to the proposal.

Key Threatening Process	Applicability in regards to the site
Clearing of Native Vegetation	The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. The proposed roads and future building envelopes will be placed to minimise the loss of vegetation on site. Considering the open nature of the site and mostly exotic understorey it is unlikely that a significant amount of vegetation will be removed.
High frequency fire resulting in the disruption of life cycle processors in plants and animals and loss of vegetation structure and composition	It is difficult to ascertain the disruption and structural changes, if any, past fires have caused the site. The proposal is unlikely to alter the fire frequency on site.
Invasion of native plant communities by exotic perennial grasses	This threatening process is already present with introduced grasses such as <i>Pennisetum clandestinum</i> (Kikuyu) present throughout the site. It is unlikely that the proposal will further exacerbate invasion by exotic grasses.
Competition and grazing by the feral European Rabbit Oryctolagus cuniculus	A large number of Rabbits were recorded at the entrance in the north of the site and two rabbit carcasses were observed within the buildings on site. The proposal is unlikely to increase numbers of this species.
Invasion, establishment and spread of <i>Lantana camara</i> (Lantana)	A small amount of Lantana was present within the site particularly around the remnant buildings and woodpiles present on site. A site vegetation management plan may assist with the control of this species.
Predation, habitat degradation, competition and disease transmission by Feral Pigs ( <i>Sus scrofa</i> ).	No evidence of feral pigs was recorded on site. The proposal is unlikely to increase numbers of this species.
Herbivory and Environmental Degradation caused by Feral Deer.	No evidence of Feral Deer was recorded on site. The proposal is unlikely to increase numbers of this species.
Human-caused Climate Change.	Not applicable to the site.
Infection of native plants by <i>Phytophthora cinnamomi</i> .	Not known to be present on site.
Exotic vines and scramblers.	Few exotic vines were present on site.
Competition and habitat degradation	No feral goats were recorded during fieldwork and would be
by feral goats (Capra hircus).	unlikely to utilise the site.

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# 5. <u>Myrtaceous Species</u>

# Eucalyptus glaucina

#### Slaty Red Gum

*Eucalyptus glaucina* occurs as a tree, often to 18m, sometimes to 30m. The bark is smooth throughout, white or grey. Juvenile leaves are ovate, pale green or glaucous and slightly discolorous. Adult leaves are lanceolate to broadly lanceolate, acuminate and moderately thick. Fruits are hemispherical or ovoid, 7-10mm long, 7-10mm wide; disc broad, ascending; valves 3-5. The seeds are brown-black.

The Slaty Red Gum principally occurs in the Casino area in northern NSW and from Gloucester to Broke, in mid-northern NSW. It grows mostly on gentle slopes near drainage lines in alluvial and clayey soils, in open forest. It is closely aligned with *E. tereticornis* (Forest Red Gum), but distinguished by the glaucous buds. This species is ROTAP-coded 3VCa.

#### Callistemon linearifolius

#### **Netted Bottlebrush**

*Callistemon linearifolius* is a shrub which grows to 3-4 metres in height. It flowers from spring to summer. *C. linearifolius* grows in dry sclerophyll forest on the coast and adjacent ranges from the Georges River to Hawkesbury River in the Sydney area, and north to Nelson Bay. In the Sydney area records are limited to the Hornsby Plateau area. This species is ROTAP-coded 2RCi.

*Callistemon linearifolius* was more widespread across its distribution in the past. The spread of urbanization is the most likely cause of its decline. There are currently only 5-6 populations in the Sydney area, of the 22 populations recorded in the past. The plant numbers in any one population are largely unknown but there are a number of locations with low population numbers. The species is threatened by continuing loss of habitat due primarily to urban development. There is also a high risk of local extinction due to low population numbers.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

Despite targeted searches neither *Eucalyptus glaucina* nor *Callistemon linearifolius* were recorded on site during the survey. Suitable habitat for *C. linearifolius* was present over large portions of the site with habitat available for *E. glaucina* along the drainage lines and low-lying areas. Habitat for both species is considered marginal due to the disturbed nature of the site.

The proposal may result in a small incremental decline of marginal habitat for these species in the local area however the proposal is unlikely to have an adverse effect on the life cycle of these species such that a viable local population is likely to be placed at risk of extinction.

b) in the case of an endangered 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.

No endangered population has been identified utilising the site.

*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*
- (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 to 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*
  - (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
  - (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.

The proposal aims to preserve trees with the road network and building envelopes to be placed to minimise the loss of trees on site. Considering the open and disturbed nature of the site it is unlikely that a significant amount of habitat will be removed as a result of the proposal.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

No Recovery or Threat Abatement Plan has been developed for these threatened flora species. However the Department of Environment and Climate Change has prepared Priority Action Statements (PAS) to promote the recovery of these species and the abatement of key threatening processes in NSW. The Priority Action Statement identified a number of broad strategies to help these flora species recover in NSW. Given the marginal nature of habitat on site it is considered that the proposal does not significantly conflict with the PAS for these flora 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.

The 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act pertinent to these species are listed below in table form followed by an assessment of the applicability of the threatening process in regards to the proposal.

Key Threatening Process	Applicability in regards to the site
Clearing of Native Vegetation	The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. The proposed roads and future building envelopes will be placed to minimise the loss of vegetation on site. Considering the open nature of the site and mostly exotic understorey it is unlikely that a significant amount of vegetation will be removed.

Key Threatening Process	Applicability in regards to the site
High frequency fire resulting in the	It is difficult to ascertain the disruption and structural changes,
disruption of life cycle processors in	if any, past fires have caused the site. The proposal is
plants and animals and loss of	unlikely to alter the fire frequency on site.
vegetation structure and	
composition:	
Invasion of native plant communities	This threatening process is already present with introduced
by exotic perennial grasses	grasses such as Pennisetum clandestinum (Kikuyu) present
	throughout the site. It is unlikely that the proposal will further
	exacerbate invasion by exotic grasses.
Competition and grazing by the feral	A large number of Rabbits were recorded at the entrance in
European Rabbit Oryctolagus	the north of the site and two rabbit carcasses were observed
cuniculus	within the buildings on site. The proposal is unlikely to
	increase numbers of this species.
Invasion, establishment and spread	A small amount of Lantana was present within the site
of <i>Lantana camara</i> (Lantana)	particularly around the remnant buildings and woodpiles
	present on site. A site vegetation management plan may assist
~	with the control of this species.
Predation, habitat degradation,	No evidence of feral pigs was recorded on site. The proposal
competition and disease transmission	is unlikely to increase numbers of this species.
by Feral Pigs (Sus scrofa).	
Herbivory and Environmental	No evidence of Feral Deer was recorded on site. The proposal
Degradation caused by Feral Deer.	is unlikely to increase numbers of this species.
Human-caused Climate Change.	Not applicable to the site.
Infection of native plants by	Not known to be present on site.
Phytophthora cinnamomi.	
Exotic vines and scramblers.	Few exotic vines were present on site.
Competition and habitat degradation	No feral goats were recorded during fieldwork and would be
by feral goats ( <i>Capra hircus</i> ).	unlikely to utilise the site.

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# 7. <u>Frogs</u>

# Litoria aurea

### Green and Golden Bell Frog

*Litoria aurea* was formerly known to inhabit the eastern seaboard of New South Wales and Victoria from Byron Bay through to the Gippsland Lake Region as well as highland sites (New England District, south-western slopes of N.S.W. and Monaro District). Recent literature indicates that the northern and southern distribution limits have not changed, however, *L. aurea* is no longer found on sites above an altitude of 300m above sea level. This frog species inhabits swamps, lagoons, streams and ponds as well as dams, drains and storm water basins. *L. aurea* is thought to be displaced from more established sites by other frog species thus explaining its existence on disturbed sites.

The Green and Golden Bell Frog is a summer breeder and voraciously cannibalistic. The males call from August through to January using a distinctive four part call: "crawk-awk, crawk, crok, crok". The common name of *L. aurea* is derived from its body colouration described as being dull olive to bright emerald green above with blotches of brown or golden-bronze.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

The Green and Golden Bell Frog was not recorded on site despite targeted nocturnal and diurnal surveys. Areas of marginal habitat were present for this frog species within the constructed dams and within the drainage lines. Dams within the central area of the site contained preferred habitat in the form of taller emergent aquatic flora species such as *Eleocarpus* sp. and *Typha* sp. however this was marginalised by the presence of *Gambusia* sp. and the isolated nature of the dams.

The proposal will not have any direct impact on habitat for the Green and Golden Bell Frog on site as the dams and drainage lines will remain in their current state. To minimise any secondary impacts it is recommended that appropriate sediment controls be utilised prior to any construction taking place. Provided this recommendation is implemented the proposal is unlikely to have an adverse effect on the life cycle of this frog species such that a viable local population is likely to 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 to 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*
  - (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 to 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*
  - (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
  - (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.

The dams and drainage lines will remain on site therefore no habitat identified on site for this species will be removed.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

A Draft Recovery Plan has been developed for the Green and Golden Bell Frog. Objectives include:

- To avoid direct impacts and retain habitat;
- Minimise impacts where ever possible;
- Mitigate or ameliorate impacts; and as a last resort;
- Compensate or offset for any unavoidable impacts.

Considering that the proposal will retain the habitat available on site the proposal is unlikely to compromise the draft 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.

The 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act pertinent to this species are listed below in table form followed by an assessment of the applicability of the threatening process in regards to the proposal.

Key Threatening Process	Applicability in regards to the site
Clearing of Native Vegetation	The clearing of vegetation is listed as a major factor
	contributing to the loss of biological diversity. The proposed
	roads and future building envelopes will be placed to minimise
	the loss of vegetation on site. Considering the open nature of
	the site and mostly exotic understorey it is unlikely that a
	significant amount of vegetation will be removed.
Predation by the European Red Fox	The Red Fox was observed on site during the survey period.
Vulpes vulpes:	The proposal is unlikely to result in an increase in the number
	of this species.
Predation by the Feral Cat Felis	F. catus was not observed within the study site, although it

Key Threatening Process	Applicability in regards to the site
catus:	would be considered to be have some impact on native fauna in
	the local area. Future residential development is unlikely to
	increase feral numbers of this species, however the number of
	domestic cats may increase. It is recommended that cats be
	excluded from the site by means of a restriction of title.
Alteration to the natural flow	No natural rivers or streams will be altered as a result of the
regimes of rivers and streams and	proposal and accordingly this Key Threatening Process does
their floodplains and wetlands	not apply to the site.
Predation by Gambusia holbrooki	The Plague Minnow was recorded within the dams on site. The
(Plague Minnow)	proposal is unlikely to significantly increase the occurrence of
	this species.
Predation, habitat degradation,	No feral pigs were found to utilise the site. The proposal is
competition and disease transmission	unlikely to increase numbers of this species.
by Feral Pigs (Sus scrofa).	
Infection of frogs by amphibian	The proposal is unlikely to be the cause of any further
chytrid causing the disease	infections of this disease.
chytridiomycosis.	

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Tyler, M.J. (1992). Encyclopaedia of Australian Animals: Frogs. Angus & Robertson, NSW.

#### 8. Waterbirds

#### *Ephippiorhynchus asiaticus*

# **Black-necked Stork**

The Black-necked Stork, formerly known as the Jabiru, ranges through India, south-eastern Asia, southern New Guinea and into northern and eastern Australia. It was known in the Sydney district when settlement was established, disappeared by the 1850s and began to recolonise from about 1930. There is nothing to suggest that the Black-necked Stork in Australia makes seasonal movements, though it is capable of moving long distances and turning up far from breeding grounds. The Black-necked Stork is often in pairs and occasionally in parties of up to 18. Sexes are alike, apart from the eye, which is yellow in the female and black in the male.

It usually inhabits swamps associated with river systems and large permanent pools but sometimes appears on the coast or in estuaries. It has also been recorded on farm dams and sewage treatment ponds. There are no studies of banded birds but it may be that an individual, having once settled in a locality, remains for many years. The species fly high and straight with slow, deliberate wingbeats and the birds are generally seen stalking quietly about seeking its prey, every now and again taking great strides and jabbing at fish with its bill. The bird feeds on fish, frogs, crabs, carrion and possibly rats. Nests are usually found in low trees in swamps or in tall forest trees but may be occasionally on the ground.

#### **Ixobrychus** flavicollis

**Black Bittern** The Black Bittern lives in south-eastern Asia, New Guinea and western, northern and eastern Australia (chiefly coastal areas). In N.S.W. they are found coastally and around inland rivers, but rarely south of Sydney (Pizzev and Knight, 1997). It is solitary, and inhabits terrestrial, littoral and estuarine wetlands, preferring areas of permanent water, which are lined by dense vegetation (Marchant and Higgins, 1990). This species has been known to occur in flooded grasslands, forest, woodland, rainforest and mangroves (Marchant and Higgins, 1990). In the south-west region it lives in vegetation such as paperbark woodland surrounding running water or coastal swamps. Pairs may be within hearing distance along a watercourse. The Black Bittern forages at the edge of running or still water, feeding on small fish and invertebrates. The nest consists of a platform of sticks placed in a tree, usually on a branch overhanging water with the breeding season from September to January. The decline of this species in the south-west region has coincided with increases in the rate of clearing for agriculture and in the salinity of streams.

# Rostratula benghalensis australis

#### **Australian Painted Snipe**

The Painted Snipe is usually found in pairs, frequenting the margins of swamps and streams, chiefly those covered with low and stunted vegetation. It probes in mud along the shore to gather snails, water insects and aquatic plants. The Painted Snipe appears to be nomadic, with movements mainly north in winter and south in summer. It requires shallow fresh water for breeding, though the nest is not deserted if the water dries up. Nests are usually in groups, and consist of a shallow depression in the ground, lined with grass or leaves and frequently sheltered by a low bush or tuft of grass.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

Despite targeted and incidental surveys Ixobrychus flavicollis (Black Bittern), Ephippiorhynchus asiaticus (Black-necked Stork) and Rostratula benghalensis australis (Australian Painted Snipe) were not recorded on site during the survey. Suitable habitat was found to be present within the drainage lines and dams on site although this was considered marginal due to the lack of cover as a result of grazing.

The proposal will not have any direct impact on habitat for these three species on site as the dams and drainage lines will remain in their current state. To minimise any secondary impacts it is recommended that appropriate sediment controls be utilised prior to any construction taking place. Provided this recommendation is implemented the proposal is unlikely to have an adverse effect on the life cycle of these species such that a viable local population is likely to be placed at risk of extinction.

b) in the case of an endangered 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.

- *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
  - (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.

- *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*
  - (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
  - *(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.*

The dams and drainage lines will remain on site as is and therefore no habitat identified on site for this species will be removed.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

No Recovery or Threat Abatement Plan has been developed these bird 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.

The 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act pertinent to these

species are listed below in table form followed by an assessment of the applicability of the threatening process in regards to the proposal.

Key Threatening Process	Applicability in regards to the site
Clearing of Native Vegetation	The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. The proposed roads and future building envelopes will be placed to minimise the loss of vegetation on site. Considering the open nature of the site and mostly exotic understorey it is unlikely that a significant amount of vegetation will be removed.
Predation by the European Red Fox <i>Vulpes vulpes</i> :	The Red Fox was observed on site during the survey period. The proposal is unlikely to result in an increase in the number of this species.
Predation by the Feral Cat <i>Felis catus</i> :	<i>F. catus</i> was not observed within the study site, although it would be considered to be have some impact on native fauna in the local area. Future residential development is unlikely to increase feral numbers of this species, however the number of domestic cats may increase. It is recommended that cats be excluded from the site by means of a restriction of title.
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	No natural rivers or streams will be altered as a result of the proposal and accordingly this Key Threatening Process does not apply to the site.
Predation, habitat degradation, competition and disease transmission by Feral Pigs ( <i>Sus scrofa</i> ).	No feral pigs were recorded on site. The proposal is unlikely to increase numbers of this species.

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# 9. <u>Cockatoos And Parrots</u>

### Callocephalon fimbriatum

#### Gang-gang Cockatoo

The Gang-gang Cockatoo is distributed from southern Victoria through south and central-eastern New South Wales. In New South Wales, the Gang-gang Cockatoo is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and southwest slopes. It is rare at its extremities of its range, with isolated records known from as far west as Mudgee.

In summer they are generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter they move to lower altitudes and drier more open eucalypt forests and woodlands, and often found in urban areas. In winter they show a preference for more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. Favours old growth attributes for nesting and roosting. Breeding usually occurs between October and January in tall mature sclerophyll forests that have a dense understorey, and occasionally in coastal forests. Nests are most commonly recorded in eucalypt hollows in live trees close to water.

#### Calyptorhynchus lathami

#### Glossy Black-Cockatoo

The Glossy Black-Cockatoo inhabits wet and dry sclerophyll forests and woodlands of eastern Victoria to central Queensland, extending to the western slopes in New South Wales. A subspecies, *C. l. halmaturinus* exists on Kangaroo Island, South Australia. It prefers highlands towards the north but may be found closer to the coast where conditions are suitable. In the south they are widespread in lowland coastal forests, dense mountain forests, semi-arid woodland and trees bordering water courses.

It forages primarily on the seeds of Casuarinas, but will also take woodborers from large *Acacia* stems. *Allocasuarina torulosa, A. verticillata* and *A. littoralis* are the predominant food trees, however, on Kangaroo Island *Casuarina stricta* is the predominant food source. They have also been observed eating *Angophora, Acacia* and *Eucalyptus* seeds. It now appears to supplement its diet with the seeds of exotic pine trees. A sign that foraging individuals have recently fed at a site is a scattering of leaves, twigs and freshly chewed cones under the Casuarinas. While feeding they are tame and relatively easy to approach. Flocks of Glossy Black-Cockatoos have been seen but are not common. They are usually seen in threes, a pair and their young, or feeding groups consisting of 10-12 birds, which are loosely family aggregations. Glossy Black-Cockatoos largely seem to occupy an area permanently and have a distinctive flight pattern of slow, shallow wing-beats. Nesting takes place from March through August in the hollows of large Eucalypts, 10-20m above the ground, where a single egg is laid.

# Glossopsitta pusilla Little Lorikeet

The Little Lorikeet measures 16–19 cm in length and is the smallest of the Australian Lorikeets. The body is bright green in colour and the head is green with red forehead and throat patches that do not extend behind the eye. These features, in combination with the black beak and green underwing coverts which are visible in flight, allow the species to be distinguished from other small lorikeets.

The Little Lorikeet occurs from just north of Cairns, around the east coast of Australia, to Adelaide. In New South Wales Little Lorikeets are distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri (Barrett *et al.* 2003). Little Lorikeets are gregarious, usually foraging in small flocks, often with other species of lorikeet. They feed primarily on nectar and pollen in the tree canopy, particularly on profusely-flowering eucalypts, but also on a variety of other species including, melaleucas and mistletoes.

# Lathamus discolor

#### **Swift Parrot**

The Swift Parrot is most closely related to rosellas, though its habits are most closely aligned with those of the lorikeets, which it also resembles morphologically. The main distinction of the Swift Parrot is the long red tail that is not found in lorikeets, which generally have dumpier green tails. During winter the Swift Parrot inhabits mainland Australia from Adelaide (S.A.) through Victoria, and up the east coast to south-east Queensland, as well as visiting the south and central western slopes and the Riverina in NSW.

The Swift Parrot returns to eastern Tasmania in spring to breed. The species appears to have declined greatly in the northern and eastern parts of its over wintering range. The most recent records are from the tablelands and western slopes of southern and central NSW. Swift Parrots have also been recorded during the winter months of 2000 utilising areas in the vicinity of Aberdare State Forest (Roderick pers. comm.) and Millers Forest (Newman pers. comm.).

The Swift Parrot prefers dry sclerophyll in Tasmania and open forest to woodland in the north on the mainland. It has also been recorded utilising street trees and in parks and gardens. Swift Parrots forage on the nectar of Eucalypts, often in mixed flocks with lorikeets. The preferred winter food species are Red Ironbark (*Eucalyptus sideroxylon*), White Box (*E. albens*), Swamp Gum (*E. ovata*), Swamp Mahogany (*E. robusta*) and Yellow Gum (*E. melliodora*) and have also been observed eating the seeds and flowers of *Xanthorrhoea* spp. They also feed on insects and their larvae, fruits, berries, seeds and vegetable matter. While feeding, individuals may be approached and watched from under the feed tree. When there is an abundance of food, large congregations of hundreds of birds may gather in noisy and crowded roosts. Nesting occurs from September to January in a hollow branch of a Eucalypt and they return to the mainland during March and April.

#### Neophema pulchella

#### **Turquoise Parrot**

This 'grass parrot' is a striking green with brilliant blue edges to the wings, on which the male of the species also displays a bright red patch. The main distribution of the Turquoise Parrot is in grassy woodlands of the western slopes and tablelands from the Darling Downs in Queensland to northern Victoria, particularly along watercourses. It lives on the edges of Eucalypt woodland adjoining clearings and on timbered ridges and creeks in farmland. It has also been recorded utilising roadside verges and orchards. They are usually seen in pairs or small groups and spend most of the day on the ground. This species forages primarily on the seeds of shrubs, grasses and herbs, both native and introduced, and the spore cases of moss. They are approachable when feeding and have a characteristic flight call, which is described as a weak tinkling. Partly nomadic, flocks move locally and regionally following seasonal abundances of seed. Breeding pairs nest in small hollow branches of Eucalypts, usually 1m above the ground from August through December and from April to May. Two to five eggs are laid and young leave the nest after 30 days though remain with the parents. The species appears to be consolidating after a long history of decline.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

Despite targeted and incidental avifauna surveys no threatened cockatoo or parrot species were recorded on site. Foraging habitat was available for *G. pusilla*, *N. pulchella*, *C. fimbriatum* and *L. discolor* although foraging habitat for *C. lathami* was limited due to the paucity of Casuarina species present within the site. Nesting habitat was only considered to be present for *G. pusilla* and *N. pulchella* as the site lacked suitable sized hollows for the two cockatoo species.

Considering that the proposal aims to retain trees on site minimal foraging and no nesting habitat will be removed. If for any unforeseen reason any habitat tree requires removal it is recommended that nest boxes of similar habitat value be installed at a ratio of 2:1 (nest boxes installed: hollows removed) prior to any clearing taking place. It is also recommended that a suitably qualified and immunised ecologist be on hand to inspect trees prior to removal and supervise the removal of any habitat trees to reduce the impact on any fauna species present. Given that the majority of habitat will remain on site and with the availability of superior habitat in the local area the proposal is unlikely to have an adverse effect on the life cycle of these species such that a viable local population is likely to be

placed at risk of extinction.

b) in the case of an endangered 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.

No endangered population has been identified utilising the site.

- *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*
  - (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 to threatened species.

- *c) 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*
  - (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
  - (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.

The proposal aims to preserve trees with the road network and building envelopes to be positioned to minimise the loss of trees on site. Considering the open nature of the site it is unlikely that a significant amount of habitat will be removed as a result of the proposal.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

No Recovery or Threat Abatement Plan has been developed for the above species although a Priority Action Statement (PAS) has been developed for each species. The objective of the PAS is to promote the recovery of threatened species, populations and ecological communities and manage key threatening processes. It is considered that the proposal does not conflict with the PAS for the above parrot species. Habitat rehabilitation is a PAS considered pertinent to the proposal for the above parrot and cockatoo species. The installation of nest boxes within the remaining habitat on site will provide some compensatory habitat.

*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.

The 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act pertinent to these species are listed below in table form followed by an assessment of the applicability of the threatening process in regards to the proposal.

Key Threatening Process	Applicability in regards to the site
Clearing of Native Vegetation	The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. The proposed roads and future building envelopes will be placed to minimise the loss of vegetation on site. Considering the open nature of the site and mostly exotic understorey it is unlikely that a significant amount of vegetation will be removed.
Invasion of native plant communities by exotic perennial grasses	This threatening process is already present with introduced grasses such as <i>Pennisetum clandestinum</i> (Kikuyu) present throughout the site. It is unlikely that the proposal will further exacerbate invasion by exotic grasses.
Competition and grazing by the feral European Rabbit Oryctolagus cuniculus	A large number of Rabbits were recorded at the entrance in the north of the site and two rabbit carcasses were observed within the buildings on site. The proposal is unlikely to increase numbers of this species.
Removal of dead wood and dead trees:	A small number of standing dead trees together with a small amount of fallen timber was present within the site. It is recommended that dead and fallen timber within the development area be relocated elsewhere on site so that this habitat resource is retained.
Loss of hollow-bearing trees	A low number of hollow-bearing trees were present within the site. Hollow-bearing trees will be retained on site.
High frequency fire resulting in the disruption of life cycle processors in plants and animals and loss of vegetation structure and composition:	It is difficult to ascertain the disruption and structural changes, if any, past fires have caused the site. The proposal is unlikely to alter the fire frequency on site.
Predation by the European Red Fox <i>Vulpes vulpes:</i>	The Red Fox was observed on site during the survey period. The proposal is unlikely to result in an increase in the number of this species.
Predation by the Feral Cat <i>Felis</i> catus:	F. catus was not observed within the study site, although it would be considered to be have some impact on native fauna in the local area. Future residential development is unlikely to increase feral numbers of this species, however the number of domestic cats may increase. It is recommended that cats be excluded from the site by means of a restriction of title.
Competition from feral honeybees <i>Apis mellifera</i>	A small number of feral honeybee hives were observed on site. The site also contained a large number of domestic honeybee hives which may be a source of feral honeybees. It is expected that the proposal will result in the eventual removal of the beehives. The proposal is unlikely to result in an increase in the number of this species.
Invasion, establishment and spread of <i>Lantana camara</i> (Lantana)	A small amount of Lantana was present within the site particularly around the remnant buildings and woodpiles present on site. A site vegetation management plan may assist with the control of this species.
Infection by Psittacine circoviral (beak and feather) disease affecting endangered psittacine species and	Not known to be present on site.

Key Threatening Process	Applicability in regards to the site
populations.	
Exotic vines and scramblers.	Few exotic vines were present on site.

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# 10. <u>Woodland Birds</u>

# Climacteris picumnus victoriae Brown Treecreeper

The Brown Treecreeper, *Climacteris picumnus* is distributed along the east coast of Australia from Spencer Gulf in South Australia, north to Townsville in Queensland and west to Channel Country. The eastern subspecies, *Climacteris picumnus victoriae*, is distributed through central NSW on the western side of the Great Dividing range and sparsely scattered to the east of the divide in drier areas such as the Cumberland Plain of Western Sydney, and in parts of the Hunter, Clarence, Richmond and Snowy River Valleys. This species is a medium sized insectivorous bird that occupies Eucalypt woodlands, particularly open woodlands lacking a dense understorey, River Red Gums on watercourses and around lake shores. It is sedentary and nests in tree hollows within permanent territories. They forage on tree trunks and on the ground amongst leaf litter and on fallen logs for ants, beetles and larvae. Breeding occurs from May to December.

#### Melithreptus gularis ssp. gularis Black-chinned Honeyeater

Within its eastern range, the Black-chinned Honeyeater is found predominantly west of the Great Dividing Range in a narrow belt through from southern Queensland, through N.S.W. and south into Victoria and South Australia. In N.S.W., this species is mainly found in drier sclerophyll forests and woodlands containing box-ironbark associations and River Red Gum. Black-chinned Honeyeaters are also known from the drier coastal woodlands of the Cumberland Plain, Western Sydney and in the Hunter, Richmond and Clarence Valleys.

#### Pyrrholaemus sagittatus

#### Speckled Warbler

The Speckled Warbler occurs in southeastern Australia, from southwestern Victoria through eastern New South Wales to Central Queensland, mostly on the western slopes and tablelands of the Great Dividing Range and on the driest sections of coast. Specked Warblers live in a wide range of eucalypt-dominated vegetation that has a grassy understorey, often on rocky ridges or in gullies.

#### Stagonopleura guttata

# **Diamond Firetail**

The Diamond Firetail is distributed through central and eastern N.S.W., extending north into southern and central Queensland and south to the Eyre Peninsula, South Australia. In N.S.W., this species occurs predominantly west of the Great Dividing Range. The Diamond Firetail is a brightly coloured grass finch that is usually seen foraging for seeds on the ground. This species occupies a variety of habitats with a grassy understorey including Eucalypt woodlands, forests, *Acacia* scrubs and mallee. Firetails build bulky, bottle shaped nests in trees and bushes. Breeding occurs from August to January.

# Xanthomyza phrygia

# **Regent Honeyeater**

The Regent Honeyeater is nomadic, although it does seem to return to nesting areas sporadically. Seasonal movements appear to be dictated by the flowering of various species of Eucalypts that are characteristic of the dry forests and woodlands of south eastern Australia. The Regent Honeyeater prefers to forage on large-flowered Eucalypts (e.g. *Eucalyptus sideroxylon*, *E. melliodora*, *E. albens*, *E. leucoxylon*), particularly where these trees grow in more productive areas and yield plentiful and predictable nectar flows. They also forage on mistletoe and Banksia flowers, and arthropods. In parts of coastal NSW they are also attracted to stands of *Eucalyptus robusta* (Swamp Mahogany). Recent records (winter 2000) exist of this species foraging in flowering *Corymbia maculata* (Spotted Gum) trees at Aberdare State Forest near Ellalong, NSW have been noted (Roderick pers.comm.). Nesting occurs mainly between November and January, but breeding has been recorded in all months between July and February.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

Despite targeted and incidental searches neither the Regent Honeyeater, Speckled Warbler, Brown Treecreeper, Diamond Firetail nor Black-chinned Honeyeater were recorded within the site during the survey period. The site was considered to contain only marginal foraging and nesting habitat for these species due to the open and disturbed nature of the site. Due to the limited resources available on site these birds would be unlikely to utilise the local area on a continuous basis. Considering that minimal vegetation will be removed as a result of the proposal it is unlikely that a significant amount of habitat for these species will be removed. Given that the majority of habitat will remain on site and with the availability of large areas of superior habitat in the local area the proposal is unlikely to have an adverse effect on the lifecycle of these species such that the local population is placed at risk of extinction.

Not applicable.

- *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*
  - (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.

- *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*
  - (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
  - (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.

The proposal aims to preserve trees with the road network and building envelopes to be placed to minimise the loss of trees on site. Considering the open nature of the site it is unlikely that a significant amount of habitat will be removed as a result of the proposal.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

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.

# threat abatement plan.

A Recovery Plan has been completed for the Regent Honeyeater. The plan recommends the retention of preferred foraging species such as *Corymbia maculata* (Spotted Gum) and Mistletoe. Future development may result in the removal of a small number of foraging species, however is unlikely to significantly compromise the Recovery Plan.

For the remaining bird species no Recovery or Threat Abatement Plan has been developed. However the Department of Environment and Climate Change has prepared Priority Action Statements (PAS) to promote the recovery of these species and the abatement of key threatening processes in NSW. The Priority Action Statement identified a number of broad strategies to help these species recover in NSW. It is considered that the proposal does not significantly conflict with the PAS for these 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.

The 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act pertinent to these species are listed below in table form followed by an assessment of the applicability of the threatening process in regards to the proposal.

Key Threatening Process	Applicability in regards to the site
Clearing of Native Vegetation	The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. The proposed roads and future building envelopes will be placed to minimise
	the loss of vegetation on site. Considering the open nature of
	the site and mostly exotic understorey it is unlikely that a significant amount of vegetation will be removed.
Invasion of native plant communities	This threatening process is already present with introduced
by exotic perennial grasses	grasses such as <i>Pennisetum clandestinum</i> (Kikuyu) present throughout the site. It is unlikely that the proposal will further exacerbate invasion by exotic grasses.
Competition and grazing by the feral	A large number of Rabbits were recorded at the entrance in
European Rabbit Oryctolagus	the north of the site and two rabbit carcasses were observed
cuniculus	within the buildings on site. The proposal is unlikely to
Domoval of dood wood and dood	Increase numbers of this species.
trees.	amount of fallen timber was present within the site. It is
	recommended that dead and fallen timber within the
	development area be relocated elsewhere on site so that this
	habitat resource is retained.
Loss of hollow-bearing trees	A low number of hollow-bearing trees were present within the site. Hollow-bearing trees will be retained on site.
High frequency fire resulting in the	It is difficult to ascertain the disruption and structural changes,
disruption of life cycle processors in	if any, past fires have caused the site. The proposal is
plants and animals and loss of vegetation structure and	unlikely to alter the fire frequency on site.
composition.	
Predation by the European Red Fox	The Red Fox was observed on site during the survey period.
Vulpes vulpes:	The proposal is unlikely to result in an increase in the number
	of this species.
Predation by the Feral Cat Felis	F. catus was not observed within the study site, although it
catus:	would be considered to be have some impact on native fauna in
	the local area. Future residential development is unlikely to

Key Threatening Process	Applicability in regards to the site
	increase feral numbers of this species, however the number of
	domestic cats may increase. It is recommended that cats are
	excluded from the site by means of a restriction of title.
Competition from feral honeybees	A small number of feral honeybee hives were observed on
Apis mellifera	site. The site also contained a large number of domestic
	honeybee hives which may be a source of feral honeybees. It
	is expected that the proposal will result in the eventual
	removal of the beehives. The proposal is unlikely to result in
	an increase in the number of this species.
Invasion, establishment and spread	A small amount of Lantana was present within the site
of Lantana camara (Lantana)	particularly around the remnant buildings and woodpiles
	present on site. A site vegetation management plan may assist
	with the control of this species.
Exotic vines and scramblers.	Few exotic vines were present on site.

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# 11 Birds of Prey

# Erythrotriorchis radiatus

The Red Goshawk is thought to occupy Open Forest and Woodland, especially those located near wetlands, rivers and rainforest fringes. Its habits are not well known but are considered to be a solitary, sedentary bird. The Red Goshawk nests in tree forks of *Eucalypts* and *Melaleucas* or those nests of other large birds such as Magpies or Crows. The nests are generally built of sticks that are lined with soft twigs and leaves. Breeding occurs during late winter/early spring and produces around two young. One of the features of the Red Goshawk is the massive, powerful yellow legs and talons. This species primarily feeds on small animals and nestlings of other birds, however it is known to have consumed animals as large as the Pacific Black Duck. It tends to be limited to coastal and sub-coastal north and north-east Australia, ranging from the Kimberleys in W.A. to the N.S.W./QLD border in the south.

**Red Goshawk** 

#### Hamirostra melanosternon

This species is normally distributed over inland areas of eastern Australia, through the centre and north South Australia to western and northwestern Australia. The Black-breasted Buzzard inhabits woodland and pasture. It feeds on lizards, adult birds and nestlings including those of Hawks and Falcons and, in the south on rabbits. It has the singular habit of robbing the nests of Emus and Bustards by breaking the eggs with a stone grasped in its talons and dropped on to the eggs. It lives singly or in pairs, frequenting open country and nesting in belts of timber growing on plains or along watercourses. This Buzzard is usually seen soaring high in the manner of the Wedge-tailed Eagle. Except when visiting its nest, it seldom frequents trees, preferring to rest on the ground. It is suggested that adult Black-breasted Buzzards are sedentary. The same pairs probably nest year after year in the same area, if not in the same nests, and only during prolonged dry conditions do the birds disappear.

# Lophoictinia isura

# Square-tailed Kite

**Black-breasted Buzzard** 

This raptor is endemic to Australia and is widespread throughout the mainland (absent from Tasmania). It is recorded mainly in coastal and subcoastal regions, although it has been observed inland. The species is migratory throughout its range and is a spring-summer breeding migrant to south-eastern, southern and south-western Australia. The Square-tailed Kite inhabits Open Forests and Woodlands, particularly those on fertile soils with abundant passerines. They may also range into nearby open habitats but not into extensive treeless regions. This species is notably absent from alpine regions and small isolated remnant Woodland in large open areas. Within N.S.W. the species has been recorded in ridge and gully forests dominated by *Eucalyptus longifolia* (Woollybutt), *E. elata* (River Peppermint), *E. smithii* (Blackbutt Peppermint) and *Corymbia maculata* (Spotted Gum), as well as in forests of *Angophora* and *Callitris* with a shrubby understorey.

The Square-tailed Kite hunts mostly Passerines and foliage insects, though it also known to prey on mammals and lizards. Prey taken has also included fledging birds, insects and rabbits. Most prey is taken from the canopy and rarely from shrubs or in the air. Breeding occurs from July to February with an average clutch size of 3 eggs. Nests are built as a platform or bowl of sticks lined with green *Eucalyptus* leaves in forks or large horizontal branches of Eucalypts, *Angophora* or *Melaleuca* trees and may be used in successive years.

Except when breeding *Lophoictinia isura* tends to be a solitary bird, usually seen hunting alone high in, or just above the tree canopy in Coastal or Sub-coastal Rainforest, Sclerophyll Forests or Woodland. Nests have been reported in *Eucalyptus* spp., *Angophora* spp. and native pine forests.

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.

Neither the Square-tailed Kite, Red Goshawk nor Black-breasted Buzzard were recorded on or within the vicinity of the site during fieldwork. Potential hunting habitat as part of a much larger hunting home range was present over the site for these three species. Nesting habitat was available within the

larger trees on site although no raptor nests were observed on site. The proposal is likely to result in a loss of a small amount of hunting habitat that may be viewed as an incremental decline of habitat in the local area. However taking into consideration the amount of habitat that will remain on site it is unlikely to adversely affect these highly mobile species such that a viable local population is likely to 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.

No endangered population has been identified utilising the site.

- *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*
  - (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 to 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*
- (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
- (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.

The proposal aims to preserve trees with the road network and building envelopes to be placed to minimise the loss of trees on site. Considering the open nature of the site it is unlikely that a significant amount of habitat will be removed as a result of the proposal.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

No Recovery or Threat Abatement Plan has been developed for the above species although a Priority Action Statement (PAS) has been developed for each species. The objective of the PAS is to promote the recovery of threatened species, populations and ecological communities and manage key threatening processes. It is considered that the proposal does not conflict with the PAS for the above birds of prey.

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.

The 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act pertinent to these species are listed below in table form followed by an assessment of the applicability of the threatening process in regards to the proposal.

Key Threatening Process	Applicability in regards to the site
Clearing of Native Vegetation	The clearing of vegetation is listed as a major factor
	contributing to the loss of biological diversity. The proposed
	roads and future building envelopes will be placed to minimise
	the loss of vegetation on site. Considering the open nature of
	the site and mostly exotic understorey it is unlikely that a
	significant amount of vegetation will be removed.
Removal of dead wood and dead	A small number of standing dead trees together with a small
trees:	amount of fallen timber was present within the site. It is
	recommended that dead and fallen timber within the
	development area be relocated elsewhere on site so that this
	habitat resource is retained.

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# 12. <u>Owls</u>

#### Ninox connivens

### **Barking Owl**

The Barking Owl is found in forest and woodland, encountered most commonly in savanna and paperbark woodlands. It sometimes roosts in rainforests, but it requires the more open country for hunting and hollow Eucalypts for breeding. These owls are usually found in pairs which occupy permanent territories, generally greater than 100 ha. Each pair has a number of sites where they roost by day, usually in a leafy tree close to the trunk, though not always well hidden. They breed from August to October in large open hollows. Mammals and birds are the main prey, though it also feeds on insects and other invertebrates. In Southern Australia it feeds particularly on rabbits. It also kills hares, rats, mice, occasional small bats and some marsupials, including possums. It kills birds up to the size of Magpies and Tawny Frogmouths.

#### Ninox strenua

#### **Powerful Owl**

Within NSW, Powerful Owls are distributed throughout the length of the Great Dividing Range, which is their stronghold, and extend from the coast to the western slopes where they occur in much lower numbers. The Powerful Owl inhabits a wide range of vegetation types from wet Eucalypt forests with a rainforest understorey to dry open forests and woodlands. The species has been recorded utilising disturbed habitats such as exotic pine plantations and large trees in parks and gardens. The Powerful Owl is the largest predator of nocturnal forest-dwelling animals in Australian forests. Major prey species in NSW forests are the Greater Glider, Common Ringtail Possum, Sugar Glider, Grey-headed Fruit Bat, and several species of diurnal birds, including the Pied Currawong, Magpie and Lorikeets. It rests during the day amid thick foliage, often grasping food-remains. Powerful Owls nest in a slight depression in the wood-mould on the base of a cavity in a large old tree, sometimes in excess of 25 metres above the ground. These trees are usually found growing on a hillside in heavy forest and may be utilised intermittently for several years. One or two young are produced, although some pairs do not breed in every year. Pairs appear to mate for life and occupy exclusive territories in the order of 1000 ha in size.

# Tyto novaehollandiae

#### Masked Owl

Masked Owls in N.S.W. are distributed throughout the length of the Great Dividing Range and extend from the coast to the western slopes. Within this range they inhabit a range of wooded habitats that contain both mature trees for roosting and nesting and more open areas for hunting. They are most commonly encountered within Open Forest with a sparse understorey as well as along the ecotones of these areas to more or less densely vegetated habitats. Their diet comprises mainly ground-dwelling prey, including several species of native and introduced Rodents, *Antechinus* spp. and Bandicoots. On occasions, other prey such as Possums, Gliders and other birds are taken. Masked Owls usually roost in large hollows inside large, old living trees, most often Eucalypts. Within dry forests they often choose hollow trees in gullies or drainage lines. These hollows are 1 to 5 metres deep, 40 to 50 cm wide. The trees containing these hollows are likely to be quite old (>150 years). They are also known to roost among the dense foliage of other trees such as *Pandanus, Livistona, Melaleuca* and *Acacia* species. The species also nests in large hollows, although there appears to be a preference for hollow tree trunks and vertical spouts of large trees. The breeding season, like that for other *Tyto* owls, is variable but there is a tendency for breeding to occur in autumn-winter. Pairs appear to mate for life and occupy exclusive territories in order of 1000ha in size.

# Tyto tenebricosa

# Sooty Owl

The Sooty Owl is a robust, dark-plumaged member of the *Tyto* genus. Its eyes are completely black and very large. The Sooty Owl occurs along the coastal margins of eastern Australia ranging from south-east Queensland to Victoria. The species prefers dense dimly-lit forests, inhabiting pockets of rainforest and wet sclerophyll forest mainly in mountainous areas, often in south-east facing gullies. A secretive species, it roosts by day in tree hollows. When disturbed, it may fumble its way out of the hollow and often appears clumsy and drowsy to the intruder. The call of the Sooty Owl ranges from a far-carrying loud whistle, not unlike that of a falling bomb to a rolling, cricket-like trill. The Sooty Owl possesses massive feet and preys upon both terrestrial and arboreal mammals including rodents, Bandicoots, Possums and Gliders. Sooty Owls are territorial and may have a territory ranging form 200-800ha or more. Breeding takes place mainly during the cooler months but also during autumn and spring. The nest is found on decayed debris in tree hollows which are often at a considerable height, up to over 30m from ground level, where 1-2 eggs are laid.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

*N. connivens, N. strenua, T. tenebricosa* and *T. novaehollandiae* were not observed on site during the recent survey. No evidence of their presence was found (i.e. whitewash, regurgitation pellets, prey remains) nor was a response heard during the call playback census. Potential hunting habitat for these species was available across the site however this was considered marginal due to the disturbed nature of the site and low frequency of prey species such as possums and gliders. Due to the lack of dense vegetation only limited roosting habitat would be available for the Powerful and Barking Owl.

The proposal is unlikely to result in the removal of any trees on site and is therefore unlikely to adversely affect these highly mobile owl species such that a viable local population of these species is likely to 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.

- *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*
  - (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.

- *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*
  - (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
  - *(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.*

The proposal aims to preserve trees with the road network and building envelopes to be placed to

minimise the loss of trees on site. Considering the open nature of the site it is unlikely that a significant amount of habitat will be removed as a result of the proposal.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

Draft Recovery Plans have been completed for Large Forest Owls and the Barking Owl (NPWS, 2003a). The recovery plans recommend that developments containing bushland protect nest and roost sites, patches of habitat and prey bases. The proposal is unlikely to result in the removal of a significant amount of habitat and is unlikely to significantly compromise these recovery 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.

The 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act pertinent to these species are listed below in table form followed by an assessment of the applicability of the threatening process in regards to the proposal.

Key Threatening Process	Applicability in regards to the site
Clearing of Native Vegetation	The clearing of vegetation is listed as a major factor
	contributing to the loss of biological diversity. The proposed
	roads and future building envelopes will be placed to minimise
	the loss of vegetation on site. Considering the open nature of
	the site and mostly exotic understorey it is unlikely that a
	significant amount of vegetation will be removed.
Removal of dead wood and dead	A small number of standing dead trees together with a small
trees:	amount of fallen timber was present within the site. It is
	recommended that dead and fallen timber within the
	development area be relocated elsewhere on site so that this
	habitat resource is retained.
Loss of hollow-bearing trees	A low number of hollow-bearing trees were present within the
	site. Hollow-bearing trees will be retained on site.
Competition from feral honeybees	A small number of feral honeybee hives were observed on
Apis mellifera	site. The site also contained a large number of domestic
	honeybee hives which may be a source of feral honeybees. It
	is expected that the proposal will result in the eventual
	removal of the beehives. The proposal is unlikely to result in
	an increase in the number of this species.

# **Bibliography:**

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Young, J. (1998). Assessing the likely impacts, if any, on the sedentary pair of Masked Owl. Report to Sinclair Knight Mertz Pty Ltd, October 1998.

# 13. <u>Terrestrial Mammals</u>

### Dasyurus maculatus ssp. maculatus

The Tiger Quoll is an agile climber but spends most of its time on the floor of sclerophyll forests, rainforests and coastal woodlands. Although largely nocturnal, it may forage and bask in the sun during the day. Nests are made in rock caves and hollow logs or trees, and basking sites are usually found nearby. It is an opportunistic hunter of a variety of prey, including birds and their young, rats and other small terrestrial and arboreal mammals, gliders, small Macropods, reptiles and Arthropods.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

Despite targeted surveys, which involved cage trapping and spotlighting, *Dasyurus maculatus* ssp. *maculatus* (Tiger Quoll) was not recorded on site during the survey.

Marginal hunting habitat was found to be present across the site although den and nesting habitat was absent. Superior habitat is available to the south of the site with the forested ridges providing ideal hunting and den habitat. The proposal aims to preserve trees on site and is unlikely to result in the removal of a significant amount of habitat for this species. The proposal is unlikely to adversely affect the life cycle of the Tiger Quoll such that a viable local population is likely to 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.

- *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*
  - (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.

- *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*
  - (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

#### **Tiger Quoll**

(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.

The proposal aims to preserve trees with the road network and building envelopes to be placed to minimise the loss of trees on site. Considering the open nature of the site it is unlikely that a significant amount of habitat will be removed as a result of the proposal.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

No Recovery or Threat Abatement Plan has been developed for the Tiger Quoll. However the Department of Environment and Climate Change has prepared Priority Action Statements (PAS) to promote the recovery of this species and the abatement of key threatening processes in NSW. The Priority Action Statement identified a number of broad strategies to help this species recover in NSW. It is considered that the proposal does not significantly conflict with the PAS for this species given the marginal nature of the habitat on site.

# *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.

The 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act pertinent to this species are listed below in table form followed by an assessment of the applicability of the threatening process in regards to the proposal.

Key Threatening Process	Applicability in regards to the site
Clearing of Native Vegetation	The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. The proposed roads and future building envelopes will be placed to minimise the loss of vegetation on site. Considering the open nature of the site and mostly exotic understorey it is unlikely that a significant amount of vegetation will be removed.
Removal of dead wood and dead trees:	A small number of standing dead trees together with a small amount of fallen timber was present within the site. It is recommended that dead and fallen timber within the development area be relocated elsewhere on site so that this habitat resource is retained.
Predation by the European Red Fox <i>Vulpes vulpes:</i>	The Red Fox was observed on site during the survey period. The proposal is unlikely to result in an increase in the number of this species.
Predation by the Feral Cat <i>Felis</i> catus:	F. catus was not observed within the study site, although it would be considered to be have some impact on native fauna in the local area. Future residential development is unlikely to increase feral numbers of this species, however the number of domestic cats may increase. It is recommended that cats be excluded from the site by means of a restriction of title.

### **Bibliography:**

Edgar, R. and Belcher, C. (1995). Spotted-tailed Quoll (*Dasyurus maculatus*) in Strahan, R. (ed) *The Mammals of Australia*, pp: 67-68. Strahan, R. (Ed). Reed Books, Australia.

NPWS Database (2000). *Fauna Species List for Protected Areas in NSW* at http://www.npws.gov.au/wildlife/species.htm

# 14. Large Arboreal Mammals

#### Phascolarctos cinereus

#### Koala

The Koala occurs along the east coast of Australia and extends into woodland, mulga and River Red Gum forests west of the Great Dividing Range. Its range covers all such suitable areas of N.S.W. In drier forested areas, Koalas are generally observed as individuals in low densities. They are more abundant in coastal woodland and in open forest, where they have been found in densities as high as ten per hectare. They are rare or absent in wet forests in the south above 600 m which may be due more to distribution of Eucalypt species than climate, as the Koala is limited to areas where there are acceptable food trees. Its diet is generally restricted to that of Eucalypt leaves and much less-often, non-Eucalypt foliage. The foliage of *Eucalyptus camaldulensis* (River Red Gum), *E. tereticornis* (Forest Red Gum), *E. punctata* (Grey Gum), *E. viminalis* (Manna Gum), and *E. robusta* (Swamp Mahogany) are some of the preferred Eucalypt species. Koalas use a wide variety of tree sizes, and do not preferentially use large or tall trees in NSW forests, although this has been listed as a habitat preference in areas where trees are generally small, stunted, or nutrient deprived.

Koalas sleep in the fork of a tree during the day and feed at night with the peak of activity just after sunset. It is generally a solitary animal with a social behaviour pattern that influences its breeding biology. Breeding biology of the Koala is characterised by the occurrence of discrete core breeding groups which are sedentary. A core group may comprise up to several dozen individuals that are usually well separated from other breeding groups. These core groups produce a continual supply of dispersing nomadic sub-adults. Individual Koalas within core breeding groups occupy semi-exclusive territories. There is interaction with and marginal overlap of territories between adjacent individual animals. The territories of breeding males generally occur within a matrix of adjacent territories of breeding females. In the overlap zones of adjacent territories of breeding Koalas, individual trees occur that are habitually used for interaction between the two animals concerned. These breeding core interaction trees (sometimes termed "home range trees") are readily identifiable by scratched "trails" up the bole and copious dung deposits at the base of the tree. Breeding occurs in summer and young females produce one young (rarely twins) each year.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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 sign of the Koala or indications of its presence (i.e. scratches, scats) could be noted during fieldwork despite targeted surveys. Two preferred Koala Feed Trees, *Eucalyptus punctata* (Grey Gum) and *Eucalyptus tereticornis* (Forest Red Gum) were found to be present within the site. The disturbed nature of the site and open canopy greatly reduces the quality of habitat for this species. Considering the marginal nature of habitat on site and that the proposal aims to retain the trees on site the proposal is unlikely to adversely effect the life cycle of this species such that a viable local population of the species is likely to 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.
- *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*
  - (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.

- *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*
  - (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
  - (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.

The proposal aims to preserve trees with the road network and building envelopes to be placed to minimise the loss of trees on site. Considering the open nature of the site it is unlikely that a significant amount of habitat will be removed as a result of the proposal.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

A Draft Recovery Plan has been completed for the Koala. It is important to retain as many feed tree species as possible within the site. Given that the trees on site are expected to be retained it is considered that the proposal will not significantly compromise this draft 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.

The 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act pertinent to this species are listed below in table form followed by an assessment of the applicability of the threatening process in regards to the proposal.

Key Threatening Process	Applicability in regards to the site
Clearing of Native Vegetation	The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. The proposed roads and future building envelopes will be placed to minimise the loss of vegetation on site. Considering the open nature of the site and mostly exotic understorey it is unlikely that a significant amount of vegetation will be removed.
Predation by the European Red Fox	The Red Fox was observed on site during the survey period.

Key Threatening Process	Applicability in regards to the site
Vulpes vulpes:	The proposal is unlikely to result in an increase in the number
	of this species.
Predation by the Feral Cat Felis	F. catus was not observed within the study site, although it
catus:	would be considered to be have some impact on native fauna in
	the local area. Future residential development is unlikely to
	increase feral numbers of this species, however the number of
	domestic cats may increase. It is recommended that cats be
	excluded from the site by means of a restriction of title.

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## 15. <u>Small Arboreal Mammals</u>

#### Petaurus norfolcensis

#### **Squirrel Glider**

The Squirrel Glider is distributed throughout the dry sclerophyll forests and woodlands of eastern Australia from South Australia to Cairns. In NSW, the Squirrel Gliders' range has recently been extended to coastal habitats, including Swamp Mahogany Swamp forests on the Central Coast. The full range of habitats in which it is found in NSW have not been fully reported in any literature. The Squirrel Glider eats a high proportion of invertebrates from the foliage of Eucalypts and *Acacias* supplemented by plant exudates in the form of Eucalypt and *Melaleuca* sap and *Acacia* gum. The plant exudates, honeydew, pollen and nectar were considered to be more important in winter and spring. In coastal NSW forests a significant component may be mature *Acacia irrorata*, *Melaleuca styphelioides* or *M. nodosa*, providing late winter/early spring carbohydrates.

It has been reported that Squirrel Gliders are consistently preyed upon by cats and foxes and it has been believed that an increase in this predation may result from the opening up of bushland through rural-residential or other development.

#### Phascogale tapoatafa

#### **Brush-tailed Phascogale**

A nocturnal species, the Brush-tailed Phascogale is mainly arboreal but also forages on the ground, eating insects and occasionally small vertebrates. The Brush-tailed Phascogale is known from a variety of forest types from Rainforest to Woodland, but is most frequently recorded in the drier Sclerophyll Forests with little ground cover, on ridges up to 600m altitude. There are two subspecies of the Brush-tailed Phascogale, the nominate race, *P. t. tapoatafa*, which occurs in south-east NSW, Victoria and south-east SA and *P. t. pirata*, which occurs in northern Australia.

It requires small tree hollows and suitable foraging sites in the canopy, sub-canopy, and ground layer of vegetation. During the day it sleeps in a nest lined with leaves or shredded bark in a tree hollow, emerging at dusk to feed. Animals may return to the nest occasionally through the night and, when several share a nest, they tend to show a similar pattern of nocturnal activity. In Victoria, home ranges were recorded from between 20-70ha for females, and there is often no overlap in this home range with other unrelated females of the species. Males may occupy an area of greater than 100ha and contrary to females, overlap with the home ranges of other males and females. The NSW experience is that the Brush-tailed Phascogale may have much smaller home ranges where conditions are suitable. Females may only occupy a home range of 4-5ha when carrying young. It is sexually mature at 11 months, with mating in June. The female has 8 teats and young are weaned at around 5 months of age. Males die soon after mating while females may breed over two consecutive years.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

Neither *Petaurus norfolcensis* (Squirrel Glider) nor *Phascogale tapoatafa* (Brush-tailed Phascogale) were recorded on site despite targeted trapping and spotlighting surveys. Suitable hunting and nesting habitat was available within the site although this was considered marginal due to the openness of the canopy and paucity of suitable hollows. Superior habitat is available along the forested slopes and ridgelines to the south of the site and any usage of the site by these two species is likely to be from this area when seasonal food becomes available. Given the availability of superior habitat to the south and that the proposal aims to preserve the trees on site it is considered that the proposal is unlikely to

adversely affect the life cycle of these two small arboreal mammals such that a viable local population is likely to 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 to 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*
  - (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 to 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*
  - (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
  - (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.

The proposal aims to preserve trees with the road network and building envelopes to be placed to minimise the loss of trees on site. Considering the open nature of the site it is unlikely that a significant amount of habitat will be removed as a result of the proposal.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

No Recovery or Threat Abatement Plan has been developed for the Squirrel Glider or Brush-tailed Phascogale. However the Department of Environment and Climate Change has prepared Priority Action Statements (PAS) to promote the recovery of the Squirrel Glider and Brush-tailed Phascogale and the abatement of key threatening processes in NSW. The Priority Action Statements identified a number of broad strategies to help these species recover in NSW. These actions include:

- Ensure the largest hollow-bearing trees (including dead trees) are given highest priority for retention.
- Delineate boundaries of population to identify the extent to which populations are interconnected.

The proposed action is unlikely to result in the clearing of habitat from the site and is therefore unlikely to conflict with the priority actions to assist the recovery of the Squirrel Glider and Brush-tailed Phascogale.

# *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.

The 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act pertinent to these species are listed below in table form followed by an assessment of the applicability of the threatening process in regards to the proposal.

Key Threatening Process	Applicability in regards to the site
Clearing of Native Vegetation	The clearing of vegetation is listed as a major factor
	contributing to the loss of biological diversity. The proposed
	roads and future building envelopes will be placed to minimise
	the loss of vegetation on site. Considering the open nature of
	the site and mostly exotic understorey it is unlikely that a
	significant amount of vegetation will be removed.
Loss of hollow-bearing trees	A low number of hollow-bearing trees were present within the
	site. Hollow-bearing trees will be retained on site.
Removal of dead wood and dead	A small number of standing dead trees together with a small
trees:	amount of fallen timber was present within the site. It is
	recommended that dead and fallen timber within the
	development area be relocated elsewhere on site so that this
	habitat resource is retained.
Predation by the European Red Fox	The Red Fox was observed on site during the survey period.
Vulpes vulpes:	The proposal is unlikely to result in an increase in the number
	of this species.
Predation by the Feral Cat Felis	F. catus was not observed within the study site, although it
catus:	would be considered to be have some impact on native fauna in
	the local area. Future residential development is unlikely to
	increase feral numbers of this species, however the number of
	domestic cats may increase. It is recommended that cats be
	excluded from the site by means of a restriction of title.
Competition from feral honeybees	A small number of feral honeybee hives were observed on
Apis mellifera	site. The site also contained a large number of domestic
	honeybee hives which may be a source of feral honeybees. It
	is expected that the proposal will result in the eventual
	removal of the beehives. The proposal is unlikely to result in
	an increase in the number of this species.

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# 16. Megachiropteran Bats

# Pteropus poliocephalus Grey-headed Flying-fox

The Grey-headed Flying-fox is distributed predominantly along the sub-tropical east coast, from Rockhampton (Qld) through NSW to SE Victoria. It is a fairly large species, weighing up to a kilogram and having a forearm length of up to 180mm. It is the only Australian Flying-fox to possess a mantle of rusty brown fur that full encircles the neck. The fur on the back is dark grey and as the common name suggests, the head is covered with light grey fur. The grey belly fur is often flecked with white and ginger. The fur extends down the legs to the toes. which contrasts with other *Pteropus* species, which are furred only to the knees.

Grey-headed Flying-foxes are known to occupy a variety of habitats, including wet and dry sclerophyll forests, rainforest, mangroves and paperbark swamps and *Banksia* woodlands. Here they forage on a range of fruits and blossoms. Their diet is so varied that they have been recorded eating the fruit or blossom of more than 80 species of plant. The predominant food source is Eucalypt blossom and fruits from trees such as *Ficus* spp. (Figs). It is likely to act as an important pollinator for many of the trees on which they utilise blossoms. They also inhabit cultivated areas where they feed on introduced trees including commercial food crops, and can become a 'pest' animal in these areas. Ironically, this has led to this species being the most intensively researched bat in Australia.

As with most species of Flying-fox, *P. poliocephalus* roost communally where they form large communal colonies called 'camps'. Camps are mostly in rainforest patches, mangroves, paperbark forests and modified vegetation in urban areas. These camps may contain thousands of individuals, and up to 200 000 individuals have been recorded at one camp. They may move up to 70km from the camp each night to forage. Young are raised in maternity camps after birthing in September to October. The young are able to fly at 3 months of age and puberty is reached at 18 months, although males do not achieve effective fertility until 30 months. Vocal communication is highly sophisticated, with over 20 different situation-specific calls being recorded.

The key threats to Grey-headed Flying-fox include the clearing or modification of native vegetation, in particular roost-camp habitat as well as winter food resources in NE NSW. This species is also threatened by persecution in the form of shooting of animals and the destruction of roost camps. This oppression may be a result of Grey-headed Flying-foxes being a perceived pest in agricultural areas or as presenting a noise problem in more urbanised areas. Recently, it has been identified as being a potential carrier of viral pathogens, such as Lyssa-virus. Another threat is from competition and hybridisation with *P. alecto* (Black Flying-fox).

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

The Grey-headed Flying-fox was not recorded on site during the survey, however is expected to utilise the site seasonally when flowering trees are available. Foraging habitat in the form of seasonally flowering myrtaceous species was available over the entire site for the Grey-headed Flying-fox. No preferred roosting habitat was present due to the lack of dense canopy areas within the site. Given that the proposal aims to preserve the trees on site it is considered that the proposal is unlikely to adversely affect the life cycle of this species such that a viable local population is likely to 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 to 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*
  - (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 to 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*
  - (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
  - (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.

The proposal aims to preserve trees with the road network and building envelopes to be placed to minimise the loss of trees on site. Considering the open nature of the site it is unlikely that a significant amount of habitat will be removed as a result of the proposal.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

A Recovery Plan has been completed for the Grey-headed Flying-fox. The plan recommends the retention of roost sites and as many foraging species as possible. The proposal is not considered to significantly compromise this 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.

The 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act pertinent to this species are listed below in table form followed by an assessment of the applicability of the threatening process in regards to the proposal.

Applicability in regards to the site
--------------------------------------

Key Threatening Process	Applicability in regards to the site
Clearing of Native Vegetation	The clearing of vegetation is listed as a major factor
	contributing to the loss of biological diversity. The proposed
	roads and future building envelopes will be placed to minimise
	the loss of vegetation on site. Considering the open nature of
	the site and mostly exotic understorey it is unlikely that a
	significant amount of vegetation will be removed.
Predation by the European Red Fox	The Red Fox was observed on site during the survey period.
Vulpes vulpes:	The proposal is unlikely to result in an increase in the number
	of this species.
Predation by the Feral Cat Felis	F. catus was not observed within the study site, although it
catus:	would be considered to be have some impact on native fauna in
	the local area. Future residential development is unlikely to
	increase feral numbers of this species, however the number of
	domestic cats may increase. It is recommended that cats be
	excluded from the site by means of a restriction of title.

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# 17. Microchiropteran Bats

#### Chalinolobus dwyeri

## Large-eared Pied Bat

This species was only identified in the late 1960's and as such very little is known about it's distribution or habitat tolerances. The Large Pied Bat ranges from Rockhampton in central Queensland to Bungonia in southern NSW. This species has been found occupying dry sclerophyll forest and woodland, both to the east and west of the Great Divide. Recordings of this species have also been made in subalpine woodland and at the ecotone of rainforest and wet Eucalypt forest.

The Large-eared Pied Bat roosts in caves, abandoned mud-nests of Fairy Martins and mine tunnels. Colonies recorded have ranged in size from 3 to 37 individuals, and are usually located in the twilight area not far from the cave entrance. The physiology of the bat suggests that it feeds primarily on small insects below the canopy. They fly relatively slowly with rapid but shallow wing beats. During autumn and early winter the males have enlarged testes. At this time, the facial glands on either side of the muzzle become swollen and show a cream colour beneath the skin. They exude a milky secretion when compressed. It is probable that these glands have a secondary sexual function. It is not known whether mating occurs in the autumn or spring; hence the duration of pregnancy is also unknown. The females give birth in November, commonly to twins, and the young are independent by late February. They leave the cave soon after and the females remain another month before abandoning the roost in late March for the winter. It is thought that during the cooler winter months the colony disperses for individual hibernation.

#### Falsistrellus tasmaniensis

#### **Eastern False Pipistrelle**

The Eastern Falsistrelle occurs along the coastal ranges from southern Queensland to western Victoria, and is endemic to Australia. These bats inhabit sclerophyll forests from the Great Divide to the east coast. In Tasmania they are found in wet sclerophyll and coastal mallee. A preference has been noted for wet habitats where trees are more than 20m high. Based upon the size and shape of its wings the bat it thought to be highly mobile with a relatively large hunting range. A specimen of this species has been radio-tracked and found to move 12km from where it was hunting to where it was roosting in a very large tree.

On the mainland they eat moths, rove beetles, chafers, weevils, plant bugs, flies and ants. Their flight is swift and direct, within or just below the tree canopy. They tend to fly fast in a fixed horizontal plane with sudden darting changes in course. It has been observed roosting in holes and hollow trunks of Eucalypts, with recorded colony sizes ranging from 3 to 36 individuals. Colonies are usually almost entirely male or female groups, although evenly mixed colonies sometimes occur. They have been recorded roosting in a cave at Jenolan, NSW, and they are occasionally found in old wooden buildings.

Males produce sperm in late summer and store it in the epididymis over the winter. Females produce a large 'hibernation follicle' in autumn. Ovulation, fertilisation and pregnancy occur in late spring and early summer. Single young is born in December. Lactation continues through January and February. The Eastern Falsistrelle hibernates generally during winter, particularly in the southern extent of its range.

## Miniopterus australis

#### Little Bentwing-bat

This species inhabits tropical rainforest to warm-temperate wet and dry sclerophyll forest occurring along the coastal plains and adjacent ranges from Cape York to north-eastern N.S.W. around the Hunter River. Its distribution within Australia becomes increasingly coastal towards the southern limit of its range in N.S.W. It is a sub-canopy hunter with a preference for well-timbered areas but it is also known to hunt in clearings adjacent to forests. Prey items include crane flies, ants, moths and wasps. Flight characteristics include rapid movement with considerable maneuverability.

The species is a cave dweller that congregates in the summer months in maternity roost colonies and disperses during winter. In the southern part of their range they hibernate during winter but in the

north they remain active throughout the year. Recorded roosts include caves, mines, stormwater drains, disused railway tunnels and houses. Mating, fertilisation and implantation occur from July to August, followed by a period of retarded embryonic development until mid-September. Pregnant females congregate in specified large nursery caves to rear their young. Births occur in December, when single young are born. It is often found to roost with the Large Bentwing-bat (*Miniopterus schreibersii*), and benefits from this larger species' ability to increase the roost temperature using metabolic heat. There is a huge nursery colony of 100,000 adult bats at Mt. Etna caves, in central Queensland.

#### Miniopterus schreibersii oceanensis Large Bentwing Bat

The Large (or 'Common') Bentwing-bat may occur throughout the world. However, Parnaby (1992) notes that the Australasian populations are unlikely to be the same species that occurs outside this area. Within Australia, it is found across the coastal and near coastal areas of the north of the NT and WA and also down the east coast from Cape York to Adelaide on the coastal plains and adjacent ranges.

It is a cave (and similar man-made structures) roosting species that generally feeds above the forest canopy in wet and dry tall open forest, catching insects on the wing. However, the species has also been recorded utilising rainforest, monsoon forest, open woodland, paperbark forests and open grasslands. Moths are the main prey item. Flight is very fast and typically relatively level with swift shallow dives; the estimated flight speed is 50km per hour.

The species is known to migrate over large distances, apparently utilising different roosts for different seasonal needs. The pattern of movement varies with local climate and the dispersion of suitable roost sites. It hibernates over winter in the southern parts of its range and development of the embryo may be delayed over winter by lowering body temperature using roosts in the cooler areas of a cave. Pregnant females roost in large colonies in nursery caves. Birth generally occurs around December. Females cluster together in a roost that generally possesses a domed roof, which allows for the retention of warm air, which may also promote faster growth. The young can fly by 7 weeks and reach adult size and are weaned by 10 weeks. The mothers then leave the cave to disperse to their winter roosts and a few weeks later, usually in March, there is a mass exodus of juveniles. The maternity colony is deserted by April.

#### Scoteanax rueppellii

#### **Greater Broad-nosed Bat**

The Greater Broad-nosed Bat occurs only along the eastern coastal strip of Queensland and NSW where it is restricted to the coast and adjacent areas of the Great Dividing Range. In NSW it extends as far south as the Bega Plain. They are only found at low altitudes (below 500m).

This species apparently feeds on large moths and beetles, and some small vertebrates, emerging just after sundown, flying slowly and directly at a height of 3-6 metres, deviating only slightly to catch larger insects. It is also predatory on vertebrates including other bats, and is a noted carnivore on other captured bats in bat traps. *S. rueppellii* is known to hunt along tree-lined creeks, the junction of woodland and cleared paddocks, and low along rainforest creeks. It may have a preference for wet gullies in tall timber country.

The species roosts mainly in tree hollows but it has also been found in the roof spaces of old buildings. Little is known of the reproductive cycle, but it is suggested that the species follows the typical Vespertilionid pattern. What is known is that females congregate in maternity colonies and single young are born in January, slightly later than the other Vespertilionid bats that share its range. Males appear to be excluded from the colony during the birthing and rearing of the young.

#### Vespadelus troughtoni

#### Eastern Cave Bat

This species remains one of the least known members of its genus in Eastern Australia. It is a cavedweller, known from wet sclerophyll forest and tropical woodlands from the coast and Dividing Range to the drier forests of the semi-arid zone. It has been found roosting in small groups in sandstone overhangs, in mine tunnels and occasionally in buildings. In all situations, the roost sites are frequently in reasonably well-lit areas. Single-sex colonies varying in size from 6 to 50 individuals are more commonly recorded; however a large colony of 500 individuals of equal sex ratio has been recorded in a mine. These bats were huddled together and only occupied one-third of a square metre of ceiling.

Although it is widely distributed, relatively few records of this species exist, particularly in the southern part of its range where it appears to be localised. The main population stretches from Cape York south to the mid-north coast of NSW. Little is known of its diet and hunting behaviour. Similarly, information on reproductive activities is limited to the noted capture of lactating females in December in the Atherton Tablelands.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

Chalinolobus dwyeri, Scoteanax rueppellii, Saccolaimus flaviventris, Vespadelus troughtoni and Miniopterus australis were not identified on site during fieldwork despite the undertaking of harp trapping and echolocation call recording. The site provided hunting habitat for all of these threatened microchiropteran bat species. Roosting habitat was available in the form of tree hollows and loose bark for Scoteanax rueppellii and Saccolaimus flaviventris. Roosting habitat for C. dwyeri, M. australis, V. troughtoni and M. adversus was also available with the buildings onsite providing potential roosts locations. The proposal may involve the removal or refurbishment of the buildings on site in the future. It is recommended that the buildings be inspected prior to removal to determine whether any bat colonies are present. If any colonies are discovered a management plan detailing protection methods may be appropriate.

Provided the recommendations are implemented and considering that the trees on site will be retained the proposal is unlikely to significantly affect the life cycle of these microchiropteran bat species or place any viable local populations of this 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 to threatened species.

- *c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:* 
  - (ii) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
  - (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable to threatened species.

- *d) in relation to the habitat of a threatened species, population or ecological community:* 
  - *(iv) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*
  - (v) 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
  - (vi) 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.

The proposal aims to preserve trees with the road network and building envelopes to be placed to minimise the loss of trees on site. Considering the open nature of the site it is unlikely that a significant amount of habitat will be removed as a result of the proposal.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

No Recovery or Threat Abatement Plan has been developed for these microchiropteran bat species. However the Department of Environment and Climate Change has prepared Priority Action Statements (PAS) to promote the recovery of these species and the abatement of key threatening processes in NSW. The Priority Action Statement identified a number of broad strategies to help these species recover in NSW. It is considered that the proposal does not significantly conflict with the PAS for these 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.

The 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act pertinent to these species are listed below in table form followed by an assessment of the applicability of the threatening process in regards to the proposal.

Key Threatening Process	Applicability in regards to the site
Clearing of Native Vegetation	The clearing of vegetation is listed as a major factor
	contributing to the loss of biological diversity. The proposed
	roads and future building envelopes will be placed to minimise
	the loss of vegetation on site. Considering the open nature of
	the site it is unlikely that a significant amount of vegetation will
	be removed.
Removal of dead wood and dead	A small number of standing dead trees together with a small
trees:	amount of fallen timber was present within the site. It is
	recommended that dead and fallen timber within the
	development area be relocated elsewhere on site so that this
	habitat resource is retained.
Loss of hollow-bearing trees	A low number of hollow-bearing trees were present within the
	site. Hollow-bearing trees will be retained on site.
High frequency fire resulting in the	It is difficult to ascertain the disruption and structural changes,

Key Threatening Process	Applicability in regards to the site
disruption of life cycle processors in	if any, past fires have caused the site. The proposal is
plants and animals and loss of	unlikely to alter the fire frequency on site.
vegetation structure and	
composition:	
Predation by the European Red Fox	The Red Fox was observed on site during the survey period.
Vulpes vulpes:	The proposal is unlikely to result in an increase in the number
	of this species.
Predation by the Feral Cat Felis	F. catus was not observed within the study site, although it
catus:	would be considered to be have some impact on native fauna in
	the local area. Future residential development is unlikely to
	increase feral numbers of this species, however the number of
	domestic cats may increase. It is recommended that new
	residents be educated about not letting their cats stray.
Competition from feral honeybees	A small number of feral honeybee hives were observed on
Apis mellifera	site. The site also contained a large number of domestic
	honeybee hives which may be a source of feral honeybees. It
	is expected that the proposal will result in the eventual
	removal of the beehives. The proposal is unlikely to result in
	an increase in the number of this species.

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# **APPENDIX B**

# **FLORA SPECIES LIST**

# FLORA SPECIES LIST

The following list includes all species of vascular plants observed on site during fieldwork. It should be noted that such a list cannot be considered comprehensive, but rather indicative of the flora. It can take many years of flora surveys to record all of the plant species occurring within any area, especially plant species that are only apparent in some seasons such as orchids.

A number of species cannot always be accurately identified during a brief survey, generally due to a lack of suitable flowering and/or fruiting material. Any such species are identified as accurately as possible, and are indicated in the list thus:

- \* Specimens which could only be identified to genus level are indicated by the generic name followed by the abbreviation "sp.", indicating an unidentified species of that genus;
- \* Specimens for which identification of the genus was uncertain are indicated by a question mark ("?") placed in front of the generic, which is followed by the abbreviation "sp.";
- \* Specimens which could be accurately identified to genus level, but could be identified to species level with only a degree of certainty are indicated by a ("?") placed in front of the epithet.

Authorities for the scientific names are not provided in the list. These follow Harden (1991, 1992, 1993 and 2000). Names of families and higher taxa follow a modified Cronquist System (1981).

Introduced species are indicated by an asterisk ("\*").

The following standard abbreviations are used to indicate subspecific taxa:

- ssp. subspecies
- var.- variety
- × hybrid between the two indicated species

FAMILY Scientific Name

Common Name

# **CLASS FILICOPSIDA (FERNS)**

ADIANTACEAE Adiantum aethiopicum	Common Maidenhair Fern
AZOLLACEAE Azolla filiculoides var. rubra	Pacific Azolla
DAVALLIACEAE *Nephrolepis cordifolia	Fishbone Fern
DENNSTAEDTIACEAE Pteridium esculentum	Bracken
SCHIZACEAE Cheilanthes sieberi ssp. sieberi	Mulga Fern
THELYPTERIDACEAE Christella dentata	

# **CLASS CYCADOPSIDA (CYCADS)**

ZAMIACEAE Macrozamia reducta

# **CLASS MAGNOLIOPSIDA (FLOWERING PLANTS)**

#### **SUBCLASS MAGNOLIIDAE (Dicotyledons)**

APIACEAE	
Centella asiatica	
*Hydrocotyle bonariensis	Kurnell Curse
APOCYNACEAE	
*Nerium oleander	Oleander
Parsonsia straminea var.straminea	Monkey Rope
ARALIACEAE	
Polyscias sambucifolia	Elderberry Panax
ASCLEPIADACEAE	
*Gomphocarpus fruticosus	Narrow-leaf Cotton Bush
ASTERACEAE	
*Ageratina adenophora	Crofton Weed
*Bidens pilosa	Cobbler's Pegs
Chrysocephalum apiculatum	Yellow Buttons
*Cirsium vulgare	Spear Thistle
*Conyza bonariensis	Flaxleaf Fleabane
Gnaphalium sp.	Cudweed
*Gomphocarpus fruticosus ASTERACEAE *Ageratina adenophora *Bidens pilosa Chrysocephalum apiculatum *Cirsium vulgare *Conyza bonariensis Gnaphalium sp.	Narrow-leaf Cotton Bush Crofton Weed Cobbler's Pegs Yellow Buttons Spear Thistle Flaxleaf Fleabane Cudweed

*Gnaphalium pensylvanicum *Hypochoeris radicata	Cudweed Cat's Far
*Senecio madagascariensis	Fireweed
Sigesbeckia orientalis	Indian-weed
*Soliva pterosperma	Bindii
*Sonchus oleraceus	Common Sowthistle
*Tagetes minuta	Stinking Roger
Ozothamnus diosmifolium	Everlasting
BIGNONIACEAE	
Pandorea pandorana	Wonga Vine
CAESALPINACEAE	
*Senna colutiodes var. glabrata	
CAMPANULACEAE	
Wahlenbergia gracilis	Native Bluebell
CARYOPHYLLACEAE	
*Petrorhagia naneuilii	Proliferous Pink
CASUARINACEAE	
Allocasuarina torulosa	Forest Oak
Casuarina glauca	Swamp She-oak
CELASTRACEAE	
Maytenus silvestris	
CLUSIACEAE	
Hypericum gramineum	Native Wort
*Hypericum perforatum	St John's Wort
CONVOLVULACEAE	
Dichondra repens	Kidney Weed
DILLENIACEAE	
Hibbertia pedunculata	
Hibbertia scandens	Golden Guinea Flower
EUPHORBIACEAE	
Breynia oblongifolia	Breynia
Chamaesyce drummondii	Caustic Weed
*Euphorbia peplus	Petty Spurge
Glochidion ferdinandi	Cheese Tree
Phyllanthus hirtellus	Thyme Spurge
Poranthera ericifolia	
Poraninera micropnylia	
FABACEAE	0 D
Bossiaea obcoraata	Spiny Bossiaea
Daviesia ulicijolia ssp ulicijolia	
Duiwynia retorta ssp. retorta	Heatny Parrot Pea
Glycine clanaestina	Love Creeper
naraenbergia violacea Verme dia multicon da	Faise Sarsaparilla
Kenneala rubicunaa	Dusky Coral Pea

\*Medicago sp. Medic Podolobium ilicifolium Native Holly \*Trifolium repens White Clover \*Vicia sativa Common Vetch **GENTIANACEAE** \*Centaurium erythraea **Common Centaury GERANIACEAE** Native Geranium Geranium solanderi GOODENIACEAE Variable-leaved Goodenia Goodenia heterophylla HALORAGACEAE Gonocarpus tetragynus Poverty Raspwort LAURACEAE \*Cinnamomum camphora Camphor Laurel LINACEAE French Flax *Linum trigynum* LOBELIACEAE Pratia purpurascens White Root LORANTHACEAE Dendropthoe vitellina MALVACEAE \*Modiola caroliniana **Red-flowered Mallow** \*Sida rhombifolia Paddy's Lucerne **MELIACEAE** Melia azedarach var. australasica White Cedar **MENISPERMACEAE** Snake Vine Stephania japonica var. discolor MIMOSACEAE Acacia falcata Acacia kulnurensis Acacia longifolia Sydney Golden Wattle Acacia myrtifolia Myrtle Wattle Acacia parvipinnula Acacia ulicifolia Prickly Moses **MYRTACEAE** Angophora floribunda Rough-barked Apple Stiff Bottlebrush *Callistemon rigidus* Corymbia eximia Yellow Bloodwood Corymbia gummifera Red Bloodwood Corymbia maculata Spotted Gum Blue-leaved Stringybark Eucalyptus agglomerata Eucalyptus capitellata Brown Stringybark

Eucalyptus crebra Eucalyptus fibrosa ssp. fibrosa Eucalyptus moluccana Eucalyptus punctata Eucalyptus siderophloia Eucalyptus tereticornis Eucalyptus umbra Leptospermum trinervium Melaleuca nodosa Melaleuca styphelioides

OLEACEAE Notelaea longifolia \*Ligustrum sinense \*Olea europea

ONAGRACEAE Ludwigia peploides ssp. montevidensis

OXALIDACEAE \*Oxalis corniculata

PASSIFLORACEAE \*Passiflora subpeltata

PHYTOLACCAECAE \*Phytolacca octandra

PITTOSPORACEAE Bursaria spinosa Pittosporum undulatum

PLANTAGINACEAE \*Plantago lanceolata \*Plantago major

POLYGONACEAE \*Rumex crispus Persicaria decipiens

PORTULACACEAE \*Portulaca oleracea

PROTEACEAE Grevillea montana Isopogon anemonifolius Persoonia linearis Xylomelum pyriforme

RANUNCULACEAE Clematis aristata Ranunculus inundatus

ROSACEAE \*Pyracantha fortuneana Narrow-leaved Ironbark Broad-leaved Ironbark Greybox Grey Gum Northern Grey Ironbark Forest Red Gum Broad-leaved White Mahogany Paperbark Tea-tree Ball Honeymyrtle Prickly-leaved Paperbark

Mock Olive Privett European Olive

Water Primrose

Yellow Wood-sorrel

White Passion Fruit

Inkweed

Blackthorn Sweet Pittosporum

Ribwort / Lamb's Tongues Greater Plantain

Curled Dock Spotted Knotweed

Pigweed

Drumsticks Narrow-leaved Geebung Woody Pear

Old Man's Beard River Buttercup

Firethorn

*Rubus fruticosus	Blackberry
RUBIACEAE	
*Richardia brasiliensis	White Eye
Pomax umbellata	Pomax
SANTALACEAE	
Exocarpus cupressiformis	Cherry Ballart
SAPINDACEAE	
Dodonaea triquetra	Common Hop Bush
SCROPHULARIACEAE	
Misopates orontium	Lesser Snapdragon
*Verbascum virgatum	Twiggy Mullein
Veronica plebeia	Speedwell
SOLANACEAE	
*Datura inoxia	Datura
*Petunia axillaris	Wild Petunia
*Solanum mauritinanum	Wild Tobacco
*Solanum nigrum	Blackberry Nightshade
Solanum prinophyllum	Forest Nightshade
THYMELAEACEAE	
Pimelea linifolia ssp. linifolia	Rice Flower
ULMACEAE	
Trema tomentosa	Native Peach
VERBENACEAE	
*Lantana camara	Lantana
*Verbena bonariensis	Purple Top
*Verbena rigida	
VIOLACEAE	
Hybanthus monopetalus	Spade Flower
VITACEAE	
Cayratia clematidea	Slender Grape
SUBCLASS LILIIDAE (Monocotyledons)	
ANTHERICACEAE	
Tricoryne elatior	Yellow Rush-Lily
ASPARAGACEAE	
*Asparagus aethiopicus	Asparagus Fern
COMMELINACEAE	
Commelina cyanea	Scurvy Weed
CYPERACEAE	
Eleocharis sphacelata	Tall Spike-rush

Gahnia aspera

IRIDACEAE	
*Sisyrinchium species A	Scourweed
JUNCACEAE	
*Juncus acutus ssp. acutus	
Juncus usitatus	Common Rush
LILIACEAE	
Dianella caerulea var. producta	Blue Flax Lily
LOMANDRACEAE	
Lomandra longifolia	Spiny Mat Rush
Lomandra multiflora	1 2
Lomandra obliqua	Fish Bones
LUZURIAGACEAE	
Eustrephus latifolius	Wombat Berry
POACEAE	
*Andropogon virginicus	Whisky Grass
Austrodanthonia sp.	Wallaby Grass
*Briza maxima	Quaking Grass
*Briza minor	Shivery Grass
*Bromus cartharticus	Prairie Grass
*Chloris gayana	Rhodes Grass
Cynodon dactylon	Common Couch
Echinopogon caespitosus var. caespitosus	Tufted Hedgehog Grass
Entolasia stricta	5 5
Eragrostis brownii	Brown's Love Grass
Joycea pallida	Red-anther Wallaby Grass
Imperata cylindrica var. major	Blady Grass
*Lolium rigidum	Annual Ryegrass
*Paspalum dilatatum	Paspalum
Paspalum distichum	Water Couch
*Pennisetum clandestinum	Kikuvu
Sporobolus sp.	Parramatta Grass
*Stenotaphrum secundatum	Buffalo Grass
Themeda triandra	Kangaroo Grass
ТҮРНАСЕАЕ	
Typha orientalis	Cumbungi

XANTHORRHOEACEAE Xanthorrhoea johnsonii

Johnson's Grass Tree

# **APPENDIX C**

# FAUNA SPECIES LIST

#### FAUNA SPECIES LIST

Family sequencing and taxonomy follow for each fauna class:

Birds - Pizzey and Knight (1997).

Herpetofauna - Cogger (1996), Ehmann (Ed) (1997) and Barker, Grigg and Tyler (1995).

Mammals - Strahan (Ed) (1995) and Churchill (1998).

(?) - Indicates a species identified without certainty or to a Genus level only.

- \* Indicates an introduced species.
- o Indicates waterbird species observed flying over the site
- $\sim$  Indicates species observed on neighboring properties but not on site
- ^- Indicates species not observed on site during this survey but were identified on site during previous survey periods (EAP 1999 & Andrews Neil 2001).

Threatened species addressed within this assessment appear in **bold** font.

## **BIRDS**

Family	Anatidae - Ducks, Swans and Geese Anas superciliosa Chenonetta jubata	Pacific Black Duck Australian Wood Duck
Family o	Pelecanidae- Pelican Pelecanus conspicillatus	Australian Pelican
Family	Ardeidae - Herons, Egrets and Bitterns <i>Ardea ibis</i>	Cattle Egret
Family (?) (?)	Accipitridae - Osprey, Hawks, Eagles and Accipiter fasciatus Accipiter cirrhocephalus	Harriers Brown Goshawk Collared Sparrowhawk
Family	Falconidae - Falcons Falco cenchroides	Nankeen Kestrel
Family	Rallidae - Crakes, Rails and Gallinules Porphyrio porphyrio	Purple Swamphen
Family	Charadriidae - Plovers, Dotterels and Lapw Vanellus miles	vings Masked Lapwing
Family ~	Columbidae - Pigeons, Doves Leucosarcia melanoleuca Ocyphaps lophotes *Streptopelia chinensis	Wonga Pigeon Crested Pigeon Spotted Turtle-Dove

Family Cacatuidae - Cockatoos and Corellas Cacatua galerita Cacatua roseicapilla	Sulphur-crested Cockatoo Galah
Family Psittacidae - Parrots, Rosellas and Lorika Glossopsitta concinna Platycercus eximius Trichoglossus haematodus	eets Musk Lorikeet Eastern Rosella Rainbow Lorikeet
Family Cuculidae - Cuckoos Cacomantis flabelliformis Eudynamys scolopacea Scythrops novaehollandiae	Fan-tailed Cuckoo Common Koel Channel-billed Cuckoo
Family Strigidae - Hawk-Owls ~ Ninox boobook	Southern Boobook
Family Podargidae - Frogmouths Podargus strigoides	Tawny Frogmouth
Family Caprimulgidae - Nightjars Eurostopodus mystacalis	White-throated Nightjar
Family Aegothelidae - Owlet Nightjars^Aegotheles cristatus	Australian Owlet Nightjar
Family Halcyonidae - Tree Kingfishers Dacelo novaeguineae Todiramphus sancta	Laughing Kookaburra Sacred Kingfisher
Family Coraciidae - Rollers Eurystomus orientalis	Dollarbird
Family Maluridae - Fairy-Wrens and Emu-Wren Malurus cyaneus	ns Superb Fairy-Wren
Family Pardalotidae - Pardalotes, Gerygones, Sc Gerygone olivacea	rubwrens, Heathwrens and Thornbills White-throated Gerygone
Family Meliphagidae - Honeyeaters Acanthorhynchus tenuirostris Lichenostomus chrysops Manorina melanocephala Philemon corniculatus	Eastern Spinebill Yellow-faced Honeyeater Noisy Miner Noisy Friarbird
Family Pomatostomidae - Australian Babblers <i>Pomatostomus temporalis</i>	Grey-crowned Babbler
Family Cinclosomatidae - Whipbird and Quail-t ~ Psophodes olivaceus	hrushes Eastern Whipbird
Family Pachycephalidae - Whistlers, Shrike-tit a ~ Pachycephala pectoralis	and Shrike-thrushes Golden Whistler

Family Dicruridae - Monarchs, Flycatchers, Fantails, Drongo and Magpie-Lark

Rhipidura leucophrys Grallina cyanoleuca	Willie Wagtail Magpie-lark
Family Campephagidae - Cuckoo-shrikes and Tril Coracina novaehollandiae	lers Black-faced Cuckoo-shrike
Family Artamidae - Wood-swallows, Butcherbirds Gymnorhina tibicen Strepera graculina	s, Magpie and Currawongs Australian Magpie Pied Currawong
Family Corvidae - Crows, Raven Corvus coronoides	Australian Raven
Family Corcoracidae - Mudnest-builders Corcorax melanorhamphos	White-winged Chough
Family Passeridae - Sparrows, Grassfinches, Mann Neochmia temporalis	nikins Red-browed Finch
Family Hirundinidae - Swallows and Martins Hirundo neoxena	Welcome Swallow
Family Sturnidae - Starlings and Mynas *Sturnus vulgaris	Common Starling
AMPHIBIANS	
Family Myabatrachidaa 'Southern Frage'	

Family Myobatrachidae - 'Southern Frogs'<br/>Crinia signiferaCommon Eastern Froglet<br/>Striped Marsh FrogLimnodynastes peroniiStriped Marsh FrogLimnodynastes tasmaniensisSpotted Grass FrogPlatyplectrum ornatum<br/>Uperoleia laevigataOrnate Burrowing FrogFamily Hylidae - Tree Frogs<br/>Litoria fallaxDwarf Tree Frogs

Broad-palmed Frog

Stony River Frog

Litoria fallax Litoria latopalmata Litoria wilcoxi

## **REPTILES**

Family Gekkonidae - Geckoes	
^ Diplodactylus vittatus	Wood Gecko
Oedura robusta	Robust Velvet Gecko
Family Agamidae - Dragons	
Amphibolurus muricatus	Jacky Lizard
Family Varanidae - Monitors	
Varanus varius	Lace Monitor
Family Scinidae - Skinks	
Ctenotus robustus	Striped Skink

^	Eulamprus quoyii	Eastern Water Skink	
Family ^	Typhlopidae - Blind Snakes Ramphotyphlops nigrescens		
Family	Boidae - Pythons		
^	Morelia spilota	Carpet (Diamond) Python	
Family ^	Elapidae - Venomous Snakes Demansia psammophis Pseudechis porphyriacus Pseudonaja textilis	Yellow-faced Whip Snake Red-bellied Black Snake Eastern Brown Snake	
MAMN	<u>MALS</u>		
Family	Dasyuridae - Dasyurids Antechinus flavipes	Yellow-footed Antechinus	
Family ^	Peramelidae - Bandicoots Isoodon macrourus	Northern Brown Bandicoot	
Family	Petauridae - Gliders Petaurus breviceps	Sugar Glider	
Family	Pseudocheiridae - Ringtail Possums and G Pseudocheirus peregrinus	reater Glider Common Ringtail Possum	
Family	Phalangeridae - Brushtail Possums Trichosurus vulpecula	Common Brushtail Possum	
Family	Macropodidae - Kangaroos, Wallabies Macropus giganteus Wallabia bicolor	Eastern Grey Kangaroo Swamp Wallaby	
Family	Rhinolophidae - Horseshoe-bats Rhinolophus megaphyllus	Eastern Horseshoe-bat	
Family	Molossidae - Freetail-bats <i>Mormopterus norfolkensis</i> <i>Nyctinomus australis</i>	Eastern Freetail-bat White-striped Freetail-bat	
Family	Vespertilionidae - Plain-nosed Bats		
^	Chalinolobus gouldi Chalinolobus morio	Gould's Wattled bat Chocolate Wattled Bat	
	<i>Myotis adversus</i>	Large-footed Myotis	
^	Nyctophilus gouldii Vespaledus vulturnus	Gould's Long-eared Bat Little Cave Bat	
Family Muridae Podents			
^	Rattus fuscipes	Southern Bush Rat	
	Rattus lutreolus	Swamp Rat	
	*Rattus rattus	Black Rat	
Family Canidae			

*Vulpes vulpes	Red Fox
Family Leporidae *Oryctolagus cuniculus	European Rabbit
Family Bovidae *Bos taurus	Cow