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Flora and Fauna Assessment
Proposed Subdivision

Mr D. and Mrs J. Brewer,
Lot 2 DP 250984,
Grandfathers Gully Road,
Lilli Pilli.

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Executive Summary

This Flora and Fauna Assessment investigates the impact of a 13-lot subdivision on flora and fauna at Lot 2, Grandfathers Gully Road, Lilli Pilli, particularly with regard to threatened species, populations, their habitats and endangered ecological communities.

Surveys conducted in March and April 2005 revealed the presence of a variety of species of both flora and fauna on the property, with one threatened species of fauna identified, namely the Grey Headed Flying Fox.

The majority of the land has been cleared historically for agricultural purposes, with only scattered trees remaining. No roosting or breeding sites of the Grey Headed Flying Fox were located on the subject land and the species is not expected to be impacted as a result of the development. Other species located on site are considered common in the area.

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1 Introduction

This Flora and Fauna Assessment was prepared by *PMA Consulting* (Engineering & Environmental) and was commissioned by Mr and Mrs Brewer, the owners of Lot 2 DP 250984 Grandfathers Gully Road, Lilli Pilli. It is proposed to subdivide the property into 13 new allotments.

This study aims to identify the type and distribution of ecological communities present on the property. The likely impacts of the proposed development on flora and fauna are considered, particularly in relation to species of conservation significance within the region.

The assessment of the study site is based on the results of field surveys conducted on the 11th of March and 6th-8th April 2005.

This report aims to:

- Describe the type and distribution of vegetation on the site;
- Describe the fauna habitats constituted by the vegetation, rocky outcrops, drainage routes and soils on the site;
- Identify threatened species that have potential to occur on or utilise the site;
- Provide a list of the flora species and communities on the site;
- Provide a list of fauna recorded on the site;
- Assess the potential impact of the proposed development on threatened species, endangered populations and endangered ecological communities, and their habitats, by applying an 'eight part test' of significance, in accordance with the *Threatened Species Conservation Act 1995*;
- Assess the relevance and applicability of Eurobodalla Shire Council's adopted policy on Yellow-bellied Gliders in relation to the proposed development;
- Assess the impact on potential or core koala habitat, under State *Environmental Planning Policy No. 44 - Koala Protection 1995;* and
- Make recommendations to minimise the potential impacts of the proposed development on the local flora and fauna.

The following pieces of legislation and environmental planning instruments are referred and adhered to in this report:

- Section 5A of the *Environmental Planning and Assessment Act (1979)*;
- The *Threatened Species Conservation (TSC) Act (1995)*;
- The *Environment Protection and Biodiversity Conservation Act (1999)*; and
- The *Policy for the Conservation of the Yellow-bellied Glider in the Broulee Area* (Eurobodalla Shire Council (ESC), 2002).

2 Environmental Setting

2.1 Location and Description

The **subject land,** Lot 2 (DP 250984) Grandfathers Gully Road, Lilli Pilli, is a triangular-shaped allotment with an approximate area of 10.15 ha. A dwelling and associated structures including a tennis court are presently situated on the land. The present layout of the subject land, including the position of the existing dwelling, is indicated on the Site Plan (Appendix 1).

The land is located in the suburb of Lilli Pilli approximately 2 km northwest of Malua Bay, and 7.5 km southeast of Bateman's Bay Township on the South Coast of NSW. The land is zoned 1c Rural Small Holdings under the *Eurobodalla Shire Council Local Environmental Plan* (ESC, 1999), as are most of the surrounding properties. Surf Beach Tip is located further to the west of the site.

2.2 Geology and Topography

According to the *1:250 000 Geological Series Sheet* for Ulladulla (Harris, 1974), the study area is underlain by the ancient Wagonga Beds that are thought to be Ordovician in age. They consist of chert, conglomerate, agglomerate, slate, sandstone and phyllite. On broad crests soils are deep yellow podzolics with lithosols and with shallow podzolics occurring on steep slopes. Soil depth ranges from 50-100 cm. Drainage depressions consist of yellow podsols and soloths with deeper soils to greater than 150 cm (SLCC, 2000).

The subject land generally has a westerly aspect, rising from approximately 20 m above sea level (asl) on its western boundary at Grandfather's Gully Road, rising to 70 m at the ridgetop, approximately where the existing dwelling is situated. Slopes vary over the site, with some steeper areas with a slope of greater than 15 degrees along the side of the ridgeline.

2.3 Local Vegetation

The subject land has largely been cleared, with scattered trees remaining. Small patches of open forest vegetation remain on land adjacent the road along the western boundary. Surrounding land has been developed in a similar manner to that on the subject land, with patches of vegetation mainly in the form of open eucalypt forests remaining along with larger vegetated areas located in portions of Mogo State Forest, located within close proximity to the site. A public reserve extends along George Bass Drive adjacent to the northeastern boundary of the land.

2.4 Landuse

A deer farm was previously situated on the subject land, with fencing and evidence of the impacts of clearing and grazing evident over the land. Four dams are located on the property There is an existing dwelling located on the site at the top of the ridge with associated structures such as a tennis court and swimming pool.

3 Description of Proposal

It is proposed to subdivide the subject land into 13 new allotments with sizes ranging from 0.5 to 1.5 ha. The outlines of the proposed allotments are indicated on the Post Development Site Plan (Appendix 2). As indicated, the existing dwelling is to be retained post development within proposed Lot 10.

Clearing of a small area vegetation will be required as part of the proposed development for building envelopes, access roads and Asset Protection Zones (APZ's) in accordance with Rural Fire Service legislation. The Bushfire Protection Assessment for the proposed development, undertaken by Matt Jones of *Bushfire and Environmental Services* (2005), has indicated that

minimum APZs, (consisting of an Inner Protection Area (IPA) and Outer Protection Area (OPA)), required for the proposed dwellings range from a 20 m protection zone in areas of less risk to 70 m in the south eastern corner where the greatest risk is posed. The approximate extent of these APZ's are indicated on the Post-Development Site Plan (Appendix 2). These requirements will have an impact on the vegetation directly surrounding the building envelopes, however it must be noted that the APZ's will not necessarily be entirely cleared. According to *Planning for Bushfire Protection* (NSW Rural Fire Service (RFS), 2001), trees and shrubs can be present within the IPA provided that they:

- Do not touch or overhang the building;
- Are well spread out and do not form a continuous canopy;
- Are not species that retain dead material or deposit excessive quantities of ground fuel in a short period or in a danger period; and
- Are located far enough away from the house so that they will not ignite the house by direct flame contact or radiant heat emission.

Within the OPA, trees and shrubs should be maintained in such a manner that there is not continuous vegetation.

Most of the land has been cleared historically, with a large proportion of it presently satisfying the requirements for an IPA. Building envelopes will generally be able to be situated within presently cleared areas with only a small amount of clearing on the northwestern corner of the land required for APZ's.

4 Threatened Species Literature Review

A literature review was conducted in order to identify threatened plant species or communities that are potentially present on the subject land or in the local area, and threatened fauna species that potentially live on, or at least utilise the land for foraging. Information was sought in regards to the preferred habitat of species of conservation significance including vegetation, topography and home range. A number of reference sources were utilised to gain information about threatened species and the principal references are listed as follows:

- The list of rare or threatened Australian plant species (ROTAP Species) by Briggs and Leigh (1996);
- The *Threatened Species Conservation Act (1995)*;
- The Atlas of NSW Wildlife (Department of Environment and Conservation (DEC) – formerly National Parks and Wildlife Service (NPWS), Data extracted: 21 August 2004); and
- The *Environment Protection and Biodiversity Conservation Act (1999)*.

4.1 Flora

A search of the Atlas of NSW Wildlife was undertaken for threatened plant species recorded within a 10 km radius of the subject land. One species of conservation significance was recorded within a 10 km radius of the subject land. Table 1 summarises the species identified from this database and more detailed information in regards to these species is contained in Table A3-1 in Appendix 3.

Table 1: Threatened plant species recorded within a 10 km radius of the subject land.

Family	*Name*	*Status*
RUTACEAE	*Correa baeuerlenii* **Chefs Cap Correa**	Vulnerable (3VCi)

4.2 Fauna

A search of the NPWS Atlas of NSW Wildlife was undertaken for Threatened fauna species recorded within a 10 km radius of the subject land. Table 2, below, summarises information regarding the legal status, preferred habitat, known threats and information in regards to these species known presence within conservation reserves (where available). The table lists species in the following groups: Amphibians, Reptiles, Birds, Mammals (excluding Microchiropteran Bats) and Microchiropteran Bats.

Table 2: Threatened plant species recorded within a 10 km radius of the subject land.

Faunal Group	*Common Name*	*Scientific Name*	*Status*
AMPHIBIANS	Green and Golden Bell Frog	*Litoria aurea*	Endangered
BIRDS	Barking Owl	*Ninox connivens*	Vulnerable
	Black-browed Albatross	*Diomeda melanophris*	Vulnerable
	Fleshy-footed Shearwater	*Puffinus carneipes*	Vulnerable
	Glossy Black-Cockatoo	*Calyptorhynchus lathami*	Vulnerable
	Hooded Plover	*Thinornis rubricollis*	Endangered
	Little Shearwater	*Puffinus assimilis*	Vulnerable
	Little Tern	*Sterna albifrons*	Endangered
	Masked Owl	*Tyto novaehollandiae*	Vulnerable
	Pied Oystercatcher	*Haematopus longirostris*	Vulnerable
	Powerful Owl	*Ninox strenua*	Vulnerable
	Providence Petrel	*Pterodroma solanderi*	Vulnerable
	Regent Honeyeater	*Xanthomyza Phrygia*	Endangered
	Sanderling	*Canlidris alba*	Vulnerable
	Sooty Owl	*Tyto tenebricosa*	Vulnerable
	Sooty Oystercatcher	*Haematopus fuliginosus*	Vulnerable
	Southern Giant Petrel	*Macronectes giganteus*	Endangered
	Square-tailed Kite	*Lophoictinia isura*	Vulnerable
	Superb Parrot	*Polytelis swainsonii*	Vulnerable
	Superb Fruit-Dove	*Ptilinopus superbus*	Vulnerable
	Swift Parrot	*Lathamus discolor*	Endangered
	Turquoise Parrot	*Neophema pulchella*	Vulnerable
	Wandering Albatross	*Diomedea exulans*	Endangered
MAMMALS (EXCL MICROCHIROPTERANS)	Brush-tailed Phascogale	*Phascogale tapoatafa*	Vulnerable
	Southern Brown Bandicoot	*Isoodon obesulus*	Endangered
	Squirrel Glider	*Petaurus norfolcensis*	Vulnerable
	Yellow-bellied Glider	*Petaurus australis*	Vulnerable
	Grey-headed Flying-fox	*Pteropus poliocephalus*	Vulnerable
MICROCHIROPTERAN BATS	Eastern Bent-wing Bat	*Miniopterus schreibersii oceanensis*	Vulnerable
	Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	Vulnerable
	Eastern Freetail-bat	*Mormopterus norfolkensis*	Vulnerable
	Greater Broad-nosed Bat	*Scoteanax rueppellii*	Vulnerable
	Large-footed Myotis	*Myotis adversus*	Vulnerable

5 Survey Technique

5.1 Flora Survey

5.1.1 Plant Species

The flora survey was undertaken on the 11th March 2005. Vegetation communities were investigated through traversing the subject land Voucher specimens were collected of plants unable to be identified on site, and these were subsequently identified using more detailed texts.

The flora survey sought to identify as many species on the subject land as possible. The list compiled from this audit is considered to be reasonably extensive, however cannot be assumed to be definitive. Problems may be encountered in detecting and identification of certain species as fruits, flowering parts and other defining characteristics of certain species are only present at particular times of the year. These factors must be taken into consideration when referring to the species list. Species of Conservation Significance are best targeted at times when they are most likely to be located and identified. Exotic species detected in the surveys are indicated in the species list and throughout the report with an asterisk.

5.1.2 Habitat Assessment

Assessment of the habitat on the subject land was undertaken with the aim to detect areas of preferred habitat for threatened fauna species. Presence of known 'preferred habitat' can indicate species of fauna that may potentially utilise habitat on, or in the vicinity of the subject land, (even when not detected in surveys). The habitat assessment was used to assist with the consideration and determination of habitat features likely to be significant to the lifecycle requirements of any threatened fauna that may utilise the subject land.

Habitat features sought on the subject land included feed trees, rocky outcrops, habitat trees (i.e. mature trees exhibiting hollows suitable for bird and mammal occupation), waterways, drainage routes, habitat interconnections, caves, and areas of prolific flowering suitable for birds and small mammals.

5.2 Fauna Survey

The diurnal fauna survey was undertaken on the 7th and 8th of April 2005. Nocturnal fauna surveys were undertaken on the 6th and 7th of April 2005. Conditions were overcast and mild with rain during surveys on the 7th Temperature was on average 20 degrees. Table 3 summarises the survey effort undertaken for the fauna surveys. The Site Plan (Appendix 1) indicates the location of nocturnal survey sites.

Table 3: Fauna Survey Effort.

Method	*Species Targeted*	*Date*	*Survey Effort/*
Census and opportunistic	▪ General: Amphibians, Reptiles, Birds, Mammals ▪ Glossy Black-Cockatoo	6/4/05	1 hour x 1 person
		7/4/05	1 hour x 1 person
		8/4/05	3 hours x 1 person
Spotlighting	▪ General ▪ Arboreal/Nocturnal Mammals ▪ Mammals ▪ Yellow Bellied Glider ▪ Brush-tailed Phascogale	6/4/05	2 hours x 2 persons
		7/4/05	0.5 hours x 2 persons
Call Playback	▪ Masked Owl ▪ Powerful Owl ▪ Sooty Owl ▪ Barking Owl ▪ Yellow Bellied Glider ▪ Squirrel Glider	6/4/05	1.5 hours
		7/4/05	0.5 hours
Anabat™ II Ultrasonic Detection	▪ Microchiropteran Bats	6/4/05	Overnight
		7/4/05	0.5 hours
Habitat Searches	▪ General ▪ Southern Brown Bandicoot	6/4/05	1 hour x 1 person
		7/4/05	1 hour x 1 person
		8/4/05	3 hours x 1 person

5.2.1 Amphibians

Amphibians were sought during both the diurnal and nocturnal surveys. With listening for frog calls undertaken, along with spotlighting for frogs nearby potential habitat on the subject land. Frog calls were distinguished using the CD "Australian Frog Calls Subtropical East" produced by David Stewart of Nature Sound (Stewart, 1998).

5.2.2 Reptiles

Searches for reptiles were undertaken during the diurnal survey amongst leaf litter and around dead wood present on the land.

5.2.3 Birds

A diurnal bird census was undertaken at various times throughout the day. Birds were identified by sight or through recognition of their individual distinctive calls. Crushed cones, indicative of the feeding of Glossy Black Cockatoos were sought around *Allocasuarina sp.* trees on the land.

Call playback targeting the threatened owl species was undertaken over two consecutive evenings after dark. The calls of the Powerful Owl, Barking Owl, Sooty Owl and Masked Owl were each played separately with an interval of 5 minutes listening between and then replayed.

5.2.4 Mammals (excluding bats)

Hollow-bearing trees, fallen trees, leaf litter and other potential habitat elements were investigated on the subject land during the diurnal survey for evidence of mammals including scats, tracks, burrows and diggings indicative of presence of species such as the Southern Brown Bandicoot and Brush-tailed Phascogale.

Call playback was undertaken over two consecutive nights. The calls of the Yellow-bellied Glider and the Squirrel Glider were each played separately, with an interval of 5 minutes listening, and then replayed. Call playback for the Yellow-bellied glider was repeated several times during the survey due to their known occurrence in the region.

Spotlighting was undertaken on foot using 800,000-candlepower spotlights. Potential habitat trees, fallen trees, dead wood and other elements of habitat were targeted.

5.2.5 Bats

An AnaBat™ II Bat Detector was placed in potential flyways on the subject land on two consecutive nights to record ultrasonic echolocation signals of microchiropteran bats.

5.3 Nomenclature

5.3.1 Flora

The botanical nomenclature in this report follows that published by the National Herbarium of New South Wales in the Flora of New South Wales (Harden 1990-93). Additionally current nomenclature was obtained online from PlantNET - The Plant Information Network System of Botanic Gardens Trust (BGT, 2005). Where possible the scientific names have been complimented by common names.

5.3.2 Fauna

Fauna cited in this report follow those in the following texts:

- *The Mammals of Australia* (Strahan, 1995);
- *Reptiles and Amphibians of Australia* (Cogger, 1992); and
- *Taxonomy and Species of Birds of Australia* (Christidis and Boles 1994).

6 Results

6.1 Flora

6.1.1 Plant Species Present

The plant species identified on and near to the subject land during the flora survey are listed in Table 4 below.

Table 4: Flora species discovered on and in the vicinity of the subject land.

Family	Scientific Name	*Common Name*
ARALIACEAE	*Hedera helix**	English Ivy
ASTERACEAE	*Hypochaeris radicata**	Flatweed
BIGNONIACEAE	*Pandorea pandorana*	Wonga Wonga Vine
CAMPANULACEAE	*Wahlenbergia gracilis*	-
CASUARINACEAE	*Allocasuarina littoralis*	Black She-oak
CONVOLVULACEAE	*Dichondra repens*	Kidney Weed
CYPERACEAE	*Eleocharis sp*	Spike Rush
	Lepidosperma flexuosum	-
	Lepidosperma laterale	Variable Sword-sedge
	Lepidosperma urophorum	-
DICKSONIACEAE	*Calochlaena dubia*	Rainbow Fern
DILLENIACEAE	*Hibbertia aspera*	Rough Guinea Flower
	Hibbertia dentata	Trailing Guinea Flower
ELAEOCARPACEAE	*Elaeocarpus reticularis*	Blueberry Ash
ERICACEAE	*Leucopogon lanceolatus*	Lance Beard Heath
EUPHORBIACEAE	*Phyllanthus hirtellus*	-
FABACEAE-FABOIDEAE	*Glycine microphylla*	Small-leaf Glycine
FABACEAE-MIMOSOIDEAE	*Acacia stricta*	-
	Acacia suaveolens	Sweet Wattle

Family	Scientific Name	*Common Name*
	Acacia terminalis	Sunshine Wattle
	Acacia implexa	Hickory Wattle
HALORAGACEAE	*Gonocarpus teucrioides*	Germander Raspwort
LAURACEAE	*Cassytha pubescens*	Devil's Twine
LOMANDRACEAE	*Lomandra longifolia*	Spiny-headed Mat Rush
MYRTACEAE	*Corymbia maculata*	Spotted Gum
	Eucalyptus agglomerata	Blue-leaved Stringybark
	Eucalyptus fibrosa subsp. fibrosa	Broad-leaved Ironbark
	Eucalyptus pilularis	Blackbutt
	Eucalyptus sieberi	Silver-top Ash
	Melaleuca quinquenervia	-
OXALIDACEAE	*Oxalis perennans*	Oxalis
POACEAE	*Andropogon virginicus**	Whisky Grass
	Aristida ramosa	Three-awn Speargrass
	Cymbopogon refractus	Barbed Wire Grass
	Echinopogon caespitosus	Bushy Hedgehog Grass
	Eragrostis brownii	Brown's Love Grass
	Microlaena stipoides	Weeping Grass
	Panicum simile	Two Colour Panic
	*Pennisetum clandestinum**	Kikuyu
	*Sporobolus indicus**	Parramatta Grass
	Themeda australis	Kangaroo Grass
SOLANACEAE	*Solanum prinophyllum*	Forest Nightshade
VIOLACEAE	*Viola hederacea*	Ivy-leaved Violet
VITACEAE	*Cissus hypoglauca*	Water Vine

* Exotic Species

6.1.2 Vegetation Description

The subject land has been cleared historically as can be seen on the Site Plan (Appendix 1), most of the subject land consists of grassland dominated by species such as *Themeda australis*, Barbed-wire Grass *Cymbopogon refractus* and Brown's Love Grass *Eragrostis brownii*. Scattered trees are situated over the land, with Spotted Gum *Corymbia maculata,* Blackbutt *Eucalyptus pilularis*, and Broad-leaved Ironbark *Eucalyptus fibrosa subsp. fibrosa* spread widely over the cleared areas. Understorey species are only very occasional. There are portions of the land where young regrowth eucalypts are present. Fragments of an open forest vegetation community present on land are most likely to be a small part of a remnant Northern Foothills Moist Shrub Forest – *Corymbia maculata* and *Eucalyptus pilularis*, as mapped by NPWS (NPWS 2000), however the community has been seriously degraded through farming of the area.

6.1.3 Habitat Description

Size

The subject land has an area of approximately 10.15 ha.

Connectivity

The surrounding areas to the north, west and east are predominantly vegetated with Eucalypt dominated communities whilst development is taking place on land to the south. The land does not act as a corridor and the development of the property is not expected to isolate any fragments of vegetation.

Significant Species

A number of threatened species have been recorded within 10 km of the subject land. Unsuitable habitat is present on the land for Chef's Cap Correa *Correa baeuerlenii*.

Although most of the land has been cleared, habitat is still present on the land suitable for several threatened species of fauna. Part of the subject land adjacent Grandfather's Gully Road houses open eucalypt forest community whilst the remainder of the land is consistent with open woodland. These areas would form suitable foraging habitat for a number of threatened species as there is potential for a variety of different feeding and breeding requirements to be satisfied, the land however provides limited roosting or breeding habitat.

Significant Vegetation Communities/Habitats

The vegetation community on the subject land would have been contiguous with other eucalypt forests within the region, however fragmentation has occurred due to clearing for agriculture, forestry and residential development. The subject land does not house any threatened communities or critical habitat. The small area of the vegetation community present on the land is reasonably common throughout the region.

Ecological Integrity

Logging and clearing for agriculture has occurred on the subject land leaving it mostly cleared. This has significantly degraded the ecological integrity of the land. Vegetation on the subject land appears to have a low resilience with weeds and pasture species present over the majority of the property. Some areas appear to support regrowth of young eucalypts.

Diversity

There is a reasonably low diversity of plant species across the subject land.

Significant Trees

There were no large hollow-bearing trees recorded on the subject land. No feed trees used by Yellow-bellied Gliders were identified on the land

6.2 Fauna

6.2.1 Amphibians

As a result of the fauna survey three species of amphibian were found on the subject land during spotlighting and identified as listed below in Table 5.

Table 5: Amphibians detected on or in the vicinity of the subject land.

Common Name	*Scientific Name*	*Call*	*Sight*
Common Eastern Froglet	*Crinia signifera*	X	X
Smooth Toadlet	*Uperoleia laevigata*	X	X
Striped Marsh Frog	*Limnodynastes peronii*	X	

6.2.2 Reptiles

Two reptiles were detected during the fauna survey these are indicated in Table 6.

Table 6: Reptiles detected during the survey.

Common Name	*Scientific Name*	*Sight*	*Evidence*
Blue Tongue Lizard	*Tiliqua scincoides*	X	
Delicate Skink	*Lampropholis delicata*	X	

6.2.3 Birds

A number of birds were observed or calls identified during the study. These are listed below in Table 7.

Table 7: Birds detected during the survey (species of conservation significance in bold print).

Common Name	*Scientific Name*	*Call*	*Sight*	*Evidence*
Australian Magpie	*Gymnorhina tibicen*	X	X	
Crimson Rosella	*Platycercus elegans*		X	
Eastern Whip Bird	*Psophodes olivaceus*	X		
Laughing Kookaburra	*Dacelo novaeguineae*		X	
Pied Currawong	*Strepera graculina*	X		
Rainbow Lorikeet	*Trichoglossus haematodus*	*X*	*X*	
Red Wattle Bird	*Anthochaera carunculata*	X		
Southern Boobook	*Ninox novaeseelandiae*		X	
Superb Fairy Wren	*Malurus cyaneus*	X	X	
White Throated Gerygone	*Gerygone olivacea*	X		
Yellow Faced Honey Eater	*Lichenostomus chrysops*	X		

6.2.4 Mammals (excluding bats)

Mammals detected on the subject land are listed in Table 8 below.

Table 8: Mammals identified during the survey (species of Conservation Significance in bold print).

Common Name	*Scientific Name*	*Call*	*Sight*	*Evidence*
Eastern Grey Kangaroo	*Macropus giganteus*		X	X
Grey-headed Flying Fox	***Pteropus poliocephalus***	**X**	**X**	**X**

Grey-headed Flying Fox were seen during the nocturnal survey foraging over flowering trees on the subject land.

6.2.5 Bats

Data from the Anabat™ II Ultrasonic Detector was sent to Glenn Hoye of 'Fly by Night Bat Surveys Pty Ltd' for analysis. These results are indicated in Table 9 below. Confidence levels for the identification of calls are indicated in the three levels: C = Confident; P = Probable; Po = Possible.

Table 9: Microchiropteran Bats detected during the survey (species of Conservation Significance in bold print)

Common Name	*Scientific Name*	*Confidence*
Gould's Wattled Bat	*Chalinolobus gouldii*	C
Little Forest Bat	*Vespadelus vuluturns.*	Po

Two microchiropteran bat species were identified from data analysed from the AnaBat™ II recordings.

6.2.6 Summary

The subject land provides foraging area for variety of different species as indicated in these results, with a range of species present on, and in the vicinity of the subject land. One species of conservation significance was detected in the study area as a result of the fauna survey, namely the Grey-headed Flying Fox.

In reviewing the results of this fauna survey it must be taken into consideration that the more time spent in the field and the larger the range of detection techniques used, the greater the probability of finding more species. Other techniques available for fauna survey include the laying of box traps, pitfall traps and hair tubes, the use of harp traps and the analysis of predator scats. In relation to the probability of finding threatened species at a given time it was considered that the techniques utilised produced an appropriate fauna survey for the species targeted. A definitive list of fauna present on a site will only be produced following an extensive survey that covers all seasons and climatic periods.

7 Potential Impacts on Threatened Species

The subject land provides a range of habitat features suitable for a number of threatened species recorded within a 10 km radius of the subject land. This section indicates species for which suitable habitat is thought to be available and that may utilise the subject land at least from time to time, based on number and location of records obtained from the NPWS Atlas of NSW Wildlife, information from the Literature Review (Section 4 and Appendix 3), undertaking a Habitat Assessment on site and the consultant's knowledge of the area. Potential impacts of the proposed development on these species are considered further in this section. Impacts on threatened species detected on the land are considered in the Eight Part Test (Section 10).

7.1 Flora

Only one species of conservation significance, namely the Chef's Cap Correa *Correa baeuerlenii,* has been recorded within a 10 km range of the subject land. The species was not considered likely to be present in the habitat on the subject land and no impacts are expected.

7.2 Fauna

7.2.1 Green and Golden Bell Frog

The presence of four dams on the subject land as well as NPWS Atlas of NSW Wildlife records of the species in the area, give rise to the consideration of this species. No Green and Golden Bell Frogs were located on site during surveys by *PMA Consulting*, however dams housing *Eleocharis sp*. could provide suitable potential habitat for the species. Given the isolation of these dams it is not expected that the species would be present and the local population is not expected to be impacted as a result of the proposed development.

7.2.2 Glossy Black Cockatoo

No evidence was found on subject land of the Glossy Black Cockatoo foraging on or inhabiting the subject land. This species has been considered due to the number of records listed with the NPWS Atlas of NSW wildlife. The species forages over She-oak *Allocasuarina sp.,* which are common understorey species in the region. As most of the subject land has been historically cleared of understorey foraging habitat is not present for the species. Additionally no large hollow trees in which the species could potentially use for breeding are present on the land. Taking these factors into consideration, the proposal is not expected to have a significant impact on this species

7.2.3 Masked Owl

Records of the Masked Owl occurring in the area as well as the discovery of the species in surveys conducted by *PMA Consulting* on a nearby site, has led to the consideration of the species in this section. No large hollow bearing trees were located on the land and only a few common prey species were identified. The species may forage over the land from time to time, however due the lack of suitable roosting and breeding habitat it is not expected that the species will be impacted by the proposal.

7.2.4 Microchiropteran Bats

Two common species of microbats were detected on site during surveys conducted by *PMA Consulting*. NPWS records indicate the presence of the Eastern Bent-wing Bat, Eastern False Pipistrelle, Eastern Free-tail Bat, Greater Broad-nosed Bat and the Large-footed Myotis occurring in the surrounding area. Generally, these species are known to utilise caves and hollow trees as well as man made structures such as old buildings for roosting and breeding. As such the existing structures on site may provide habitat for the named species however the failure of surveys to detect these species suggests that they are not in fact utilising the subject land for these purposes. The species are considered likely to forage in the surrounding area. No caves or hollow trees were detected on the land, and it is thus not expected that the proposed development will impact on the habitat or lifecycle of these microchiropteran species.

8 Eurobodalla Shire Council Policy on Yellow-bellied Gliders

The Eurobodalla Shire Council, in conjunction with the National Parks and Wildlife Service developed the *Policy for the Conservation of the Yellow-bellied Glider in the Broulee Area* (Eurobodalla Shire Council, 2002). This document generally recommends that hollow-bearing and feed trees be maintained on sites of proposed developments, along with sufficient trees to enable transport of gliders to and from adjacent forested areas. Although applying to a specific region of the Eurobodalla Shire, the Policy aims to provide a platform for a similar approach to the entire Coastal Plains of the Eurobodalla Shire. The subject land falls outside the specified Policy area however it has been taken into consideration as an important part of this flora and fauna study.

In accordance with Item 4 of the Code of Practice outlined in this Policy the following minimum standards for developments leading to land clearing of Yellow-bellied Glider habitat will apply:

1. Retention of all sap-trees;
2. Retention of all large hollow-bearing trees (i.e. those trees with a diameter at breast height (dbh) >50 cm in diameter), except where it can be demonstrated that Yellow-bellied Gliders do not utilise the hollow-bearing tree;
3. Clearing of vegetation around these retained habitat elements must not inhibit access of Yellow-bellied Gliders to these resources; and
4. Retained vegetation must be configured to allow movement of individual Yellow-bellied Gliders across the property and onto suitable habitat on adjoining properties.

If a proposed development adheres to these minimum standards, it is forecast that a significant impact on the Yellow-bellied Glider or its habitat will be avoided. This will be subsequently confirmed when applying the Eight Part Test of significance in compliance with Section 5A of the *TSC Act* (1995).

No hollow-bearing trees or glider feed trees have been identified on the subject land, and there was no response by the species to call playback. The subject land is not considered to comprise glider habitat, and the species is not likely to be impacted by the proposed development as the proposal involves the removal of a negligible amount of vegetation

It is expected as the proposed development falls within the requirements of the Eurobodalla Shire Council's Policy on Yellow-bellied Gliders that there will be no significant impacts to this species as a result of the proposed development.

9 SEPP 44: Koala Habitat Protection

State Environmental Planning Policy (SEPP) 44-*Koala Habitat Protection* was introduced in 1995 in an effort to better manage the dwindling numbers of Koalas in NSW. SEPP 44 applies to land in which a development application has been made that has an area of more than one hectare or has together with any adjoining land in the same ownership, an area of more than one hectare (whether or not the DA applies to the whole or part of the land).

SEPP 44 aims to identify areas of '*potential'* and '*core'* Koala Habitat. These are described as follows:

- *Potential Koala Habitat* is defined as areas of native vegetation where the trees listed in Schedule 2 of SEPP 44 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component; and
- *Core Koala Habitat* is defined as an area of land with a resident population of koalas, evidenced by attributes such as breeding females, and recent and historical records of a population.

No Evidence of Koalas utilising the subject land were found and no listed Koala feed trees were located on the subject land. The subject land is thus not considered to be either potential or core Koala Habitat, and as such no impacts are expected to the species as a result of the proposed development.

10 Eight Part Test

The Eight Part Test is the informal title for the process set out in Section 5A of the *Threatened Species Conservation Act* 1995. It details how to determine where there is likely to be a 'significant effect' on threatened species, endangered populations or communities or their habitats. If a 'significant effect' is forecast a more specific Species Impact Statement report will be required.

A. *In the case of threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population is likely to be placed at risk of extinction.*

A number of Grey-headed Flying-fox were observed during the nocturnal survey, with the species foraging over flowering eucalyptus. The species is known to roost during the daytime in large roost sites known as "camps". They travel from approximately 15-50 km from this roost to forage over a variety of trees including native figs and palms, and as on the subject land on the blossoms of eucalypts, angophoras, tea-trees and banksias. Breeding occurs at the camp site, and this is a critical resource for the lifecycle of the species. No camp sites were located on the subject land and the species will continue to forage over the subject land and within vegetation in the surrounding area. The local population of the species will not be placed at risk of extinction as a result of the proposed development.

B. *In the case of an Endangered Population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.*

No endangered populations have been recorded on the subject land.

C. *In relation to the regional distribution of the habitat of threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed.*

The vegetation on the subject land has been cleared historically, with scattered trees remaining, in which the Grey-headed Flying Fox was observed to forage. The surrounding area houses large patches of vegetation outside residential areas, many of which are portions of Mogo State Forest, however extending further west to Deua National Park where large areas of habitat suitable for foraging are present. The area to be modified or removed as a result of the proposed development is not considered significant in relation to these large reserved areas.

D. *Whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for threatened species, population or ecological community*

Most of the subject land has been cleared historically, and cleared areas are situated to the west of the subject land in a quarry area and for the rubbish tip and sewage works. The subject land will not disconnect any proximate areas of habitat nor will any corridors be severed.

E. *Whether critical habitat will be affected*

No listed critical habitat is present within the study area.

F. *Whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or similar protected areas) in the region.*

A number of records exist of the Grey-headed Flying Fox in the surrounding area. Records are from both private landholdings and from within State Forest and reserves including Murramarang National Park. Evidence was observed of a large number of the species emerging from a camp to the north of Batemans Bay near South Brooman State Forest during recent surveys. It is thus expected that the habitat of the Grey-headed Flying-fox is adequately represented within both State Forests and National Parks within the region, with large areas of suitable foraging habitat present on both reserved and privately owned land.

G. *Whether the development or activity is of a class of development or activity that is recognised as a threatening process.*

Schedule 3 of the *Threatened Species Conservation Act* (1995), lists processes considered threatening. Those potentially affected by the proposal are listed below.

'Clearing of Native Vegetation'

Clearing of native vegetation has been identified as a key threatening process. The subject land has been cleared historically and the small amount of vegetation removal required further as a result of the proposed development is not considered to be a significant threat to species found on the subject land or recorded in the vicinity of the study area.

H. *Whether any threatened species, population or ecological community is at the limit of its known distribution.*

The Grey-headed Flying-fox is not at the limit of its distribution on the subject land..

The results from this Eight Part Test indicate that the proposed subdivision of Lot 2 DP 250984 Grandfathers Gully Road, will not have a significant effect on threatened species, populations or communities or their habitats. Threatened species recorded in the local area will be able to maintain their populations in the local area and vegetation retained on the subject land will provide suitable breeding and foraging areas for threatened species in the area.

11 Conclusions

The Eight Part Test carried out as part of this report was based on field surveys undertaken in March and April 2005 on the subject land, Lot 2 DP 250984 Grandfathers Gully Road, and has established that the proposed development will not have a significant impact on any threatened species, populations or communities, or their habitats. It is therefore concluded that a Species Impact Statement will not be required for this proposal.

Most of the subject land has been historically cleared due to the presence of a deer farm, with the majority of the land housing only scattered trees over grassland. Surveys revealed the presence of a number of common species. Grey-headed Flying Fox, listed as a vulnerable species, were observed foraging over the subject land. The species forages over flowering eucalypts, however roosts during the day in large camps, none of which were found on the subject land. No habitat trees suitable for roosting or breeding of other species were identified on the subject land. The common species detected during the surveys are likely to persist in the area.

Recommendations to reduce impacts of the proposed development on threatened and other species on the subject land are detailed in Section 12.

12 Recommendations

A. Where possible within Rural Fire Service regulations well-established trees should be retained on the land to provide habitat and retain bushland amenity post-development;

B. Measures should be put in place to minimise erosion and sedimentation which may occur as a result of construction, particularly in regard to retaining water quality;

C. Topsoils removed should be stockpiled for reuse following the completion of construction;

D. Cleared vegetation should not be pushed onto or dumped on adjacent bushland;

E. Vehicles, machinery and building refuse associated with the development should not impinge on areas of adjacent bushland and should remain within disturbed areas. They should not be parked or stored in the vicinity of natural vegetation to be retained. This will prevent compaction of the soil and mechanical damage to trees;

F. Contaminants and rubbish should be collected and removed from the construction area; and

G. Consideration should be given to planting of local provenance species in planning future gardens or landscaping. These could include *Allocasuarina sp.* which provide foraging for the Glossy-black Cockatoo. Details of these species may be obtained from Local Council, or native plant nurseries in the vicinity of the subject land. Use of fertilisers and pesticides should be kept to an absolute minimum as overuse of these promotes growth of exotic species.

The findings contained within this report are the result of discrete/specific methodologies used in accordance with recognised practices. To the best of our knowledge they represent a reasonable interpretation of the general conditions of the subject land.

13 Bibliography

Australian Museum (2004) Australian Museum Online. Retrieved 21/01/2004 at http://www.amonline.net.au/

Botanic Gardens Trust (23-Aug-05). PlantNET - The Plant Information Network System of Botanic Gardens Trust, Sydney, Australia http://plantnet.rbgsyd.nsw.gov.au

Briggs, J. and Leigh, J. (1996). *Rare or Threatened Australian Plants*. CSIRO, Collingswood.

Cogger, H.G. (2000) *Reptiles and Amphibians of Australia* 6th Ed. Reed New Holland, Sydney.

Daly, G. (2001) *Assessment of Fauna Habitat Linkages and Considerations for Management. Select Rural Residential Areas, Eurobodalla Shire.* Prepared for: Eurobodalla Shire Council for the Eurobodalla Environmental Capacity Planning Project. Gaia Research Pty Ltd.

Department of Environment and Conservation (2003) Threatened Species. Retrieved 21/01/2004 at: http://www.nationalparks.nsw.gov.au/npws.nsf/Content/Threatened+Species

Eurobodalla Shire Council (2002), *Policy for the Conservation of the Yellow-bellied Glider in the Broulee Area.* Environment and Administrative Services, Eurobodalla Shire Council.

Harden, G. (ed.) (1990- 93*). Flora of NSW*. Volumes 1 to 4. Royal Botanic Gardens/ University of NSW Press, Sydney.

Harris, R. (1974) *Ulladulla, Metallogenic Map Sheet* Geological Survey of NSW, Department of Mines

Lewis D.P. (2003) The Owl Pages: Information About Owls Retrieved 21/01/2004 at http://www.owlpages.com/

National Parks Association (2001) *Reptile and Frog Survey Methods*

New South Wales (1999) Eurobodalla Urban Local Environmental Plan. Retrieved 20/04/2005 at http://www.legislation.nsw.gov.au/

New South Wales (1979) *Environmental Planning and Assessment Act 1979*. NSW Government Printer, Sydney.

NSW National Parks and Wildlife Service (2003). *Recovery Plan for the Yellow-bellied Glider* (Petaurus australis). NSW National Parks and Wildlife Service, Hurstville.

NSW Rural Fire Service (2001) *Planning for Bushfire Protection.* planningnsw, Sydney.

Pizzey, G. (1980) *A Field Guide to the Birds of Australia*. Collins: Sydney.

Robinson. L (1994). *A Field Guide to the Native Plants of Sydney*. Kangaroo Press, Sydney, NSW.

Simpson K., Day, N. and Trusler, P. (1999) *Field Guide to the Birds of Australia* 6th Ed. Penguin Books Australia, Ringwood.

SLCC (2000) *Compilation and Interpretation of Soil Survey Data for Eurobodalla Shire.* SLCC Technical Report 00/101, Feb 2000.
Stewart, D. (1998) *Australian Frog Calls – Subtropical East*. Recorded and Produced by David Stewart, Nature Sound, Mullumbimby.

Stewart, D. (1998). *Nocturnal Bird and Mammal Calls of South East New South Wales.* Recorded and Produced by David Stewart, Nature Sound, Mullumbimby.

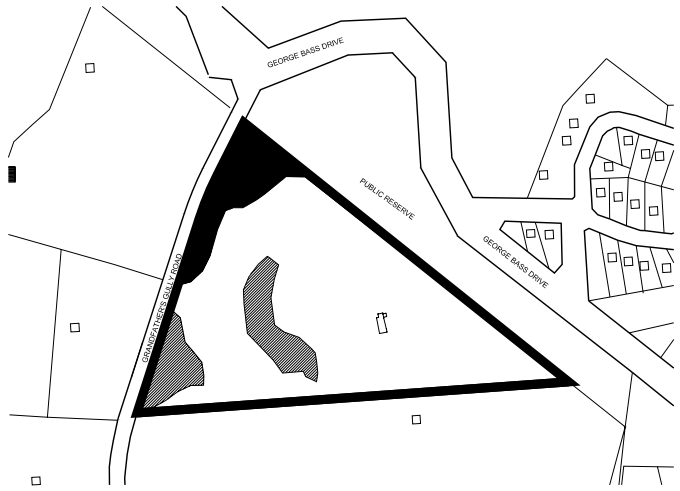
Strahan, R. (Ed) (1995). *The Mammals of Australia*. Reed Books, Sydney.

Triggs, B. (1996) Tracks, Scats and Other Traces. *A Field Guide to Australian Mam*mals. Oxford University Press Australia, Melbourne.

US Geological Survey (USGS), (2004) Non-indigenous Aquatic Species Database. Retrieved online 28/1/2004 at: http://nas.er.usgs.gov/queries/SpFactSheet.asp?speciesID=56

Appendix 1

PMA CONSULTING



REGIONAL SITE PLAN

SCALE 1:10000 (A3)

LEGEND

- CALL PLAYBACK LOCATION
- ANABAT LOCATION
- SPOTLIGHTING TRANSECT
- SITE BOUNDARY
- CLEARED WITH SCATTERED TREES
- OPEN FOREST
- RE-GROWTH VEGETATION

SITE PLAN

SCALE 1:2000 (A3)

FINAL

pma CONSULTING Engineering & Environmental

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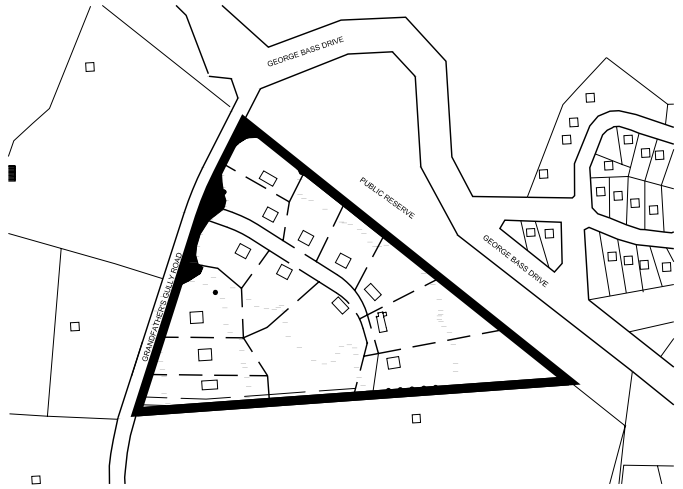
AMENDMENTS

SITE PLAN
PROPOSED SUBDIVISION
MR D. BREWER
LOT 2 DP 250984 GRANDFATHER'S GULLY RD
LILLI PILLI

SCALE	AS SHOWN
SITE CLASS	
REVISION	1
JOB No.	05033-M101
SHEET No.	1 of 2

Appendix 2

PMA CONSULTING



REGIONAL SITE PLAN

SCALE 1:10000 (A3)

LEGEND

ALLOTMENT BOUNDARY

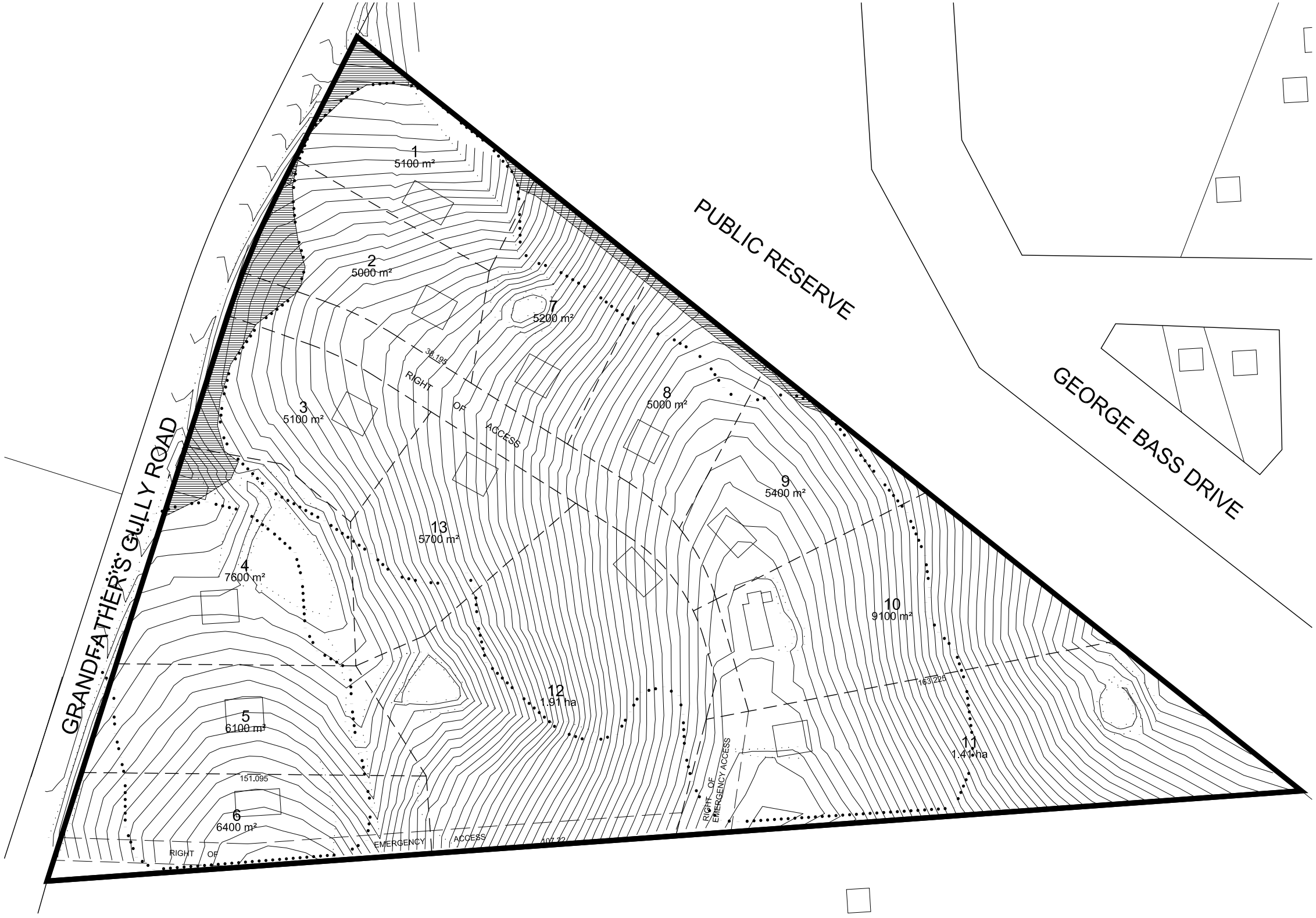
SITE BOUNDARY

PROPOSED APZ

PROPOSED DWELLING

CLEARED WITH SCATTERED TREES

OPEN FOREST



POST DEVELOPMENT SITE PLAN

SCALE 1:2000 (A3)

FINAL

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AMENDMENTS

SITE PLAN
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SCALE AS SHOWN
SITE CLASS
REVISION △
JOB No. 05033-M102
SHEET No. 2of 2

Appendix 3

PMA CONSULTING

Table A3-1: Threatened plant species recorded within a 10 km radius of the subject land.

Family/Name	*Common Name*	*Legal Status*	*Species Information*
RUTACEAE *Correa baeuerlenii*	Chef's Cap Correa	Vulnerable ROTAP: 3VCi	▪ Small shrub ▪ Grows beneath wet eucalyptus forest in damp gullies in semi-shade ▪ Restricted to creeklines within moist forests

Table A3-2: NSW NPWS Atlas data of Threatened Species found within a 10 km radius of the subject land. (Sources: NSW Wildlife Atlas, 2004; NPWS, 2003, Cogger, 2000; Strahan, 1995; IUCN, 2004; Gillespie 1996; Lewis, 2003).

	Name	*Species Information*	*Threats*	*Known in Conservation Reserves*
Amphibians	**Green and Golden Bell Frog** *Litoria aurea* Endangered	▪ Found among vegetation within or at the edges of permanent water – streams, swamps, lagoons, farm dams and ornamental ponds ▪ Often found under debris on low oft-flooded river flats. ▪ Frequently active by day – is one of only a few frogs known to bask in the sunlight ▪ They are mostly nocturnal but also active by day, rarely climbing up vegetation ▪ Inhabits marshes, dams and streamsides, particularly those containing bulrushes Typha species or Spikerushes *Eleocharis* species ▪ Optimum habitat includes water bodies which are unshaded, free of predatory fish *Gambusia holbrooki*, have a grassy area nearby and diurnal sheltering sites available such as vegetation and/or rocks ▪ Has been associated with almost every type of water body except fast flowing streams ▪ Some sites (particularly in the Greater Sydney region, are in highly disturbed areas such as disused industrial sites, brick pits, landfill areas and even cleared land (NPWS, 2003) ▪ Show some tolerance to pollutants and salinity ▪ All habitats are characterised by stationary water ▪ Virtually all isolated water bodies are free of native fish species and typically have dense emergent vegetation ▪ Can be found in a diversity of terrestrial habitats including lowland forest, *Banksia* woodland, wet heathland, riparian scrub complex, riparian shrubland, riparian forest, damp forest, shrubby dry forest and cleared pastoral lands	▪ Alteration of drainage patterns and stormwater runoff ▪ Fungal pathogen ▪ Water quality changes ▪ Predation by feral animals ▪ Herbicides and other weed control measures ▪ Road mortality ▪ Predation by exotic fish ▪ Loss of suitable breeding habitat through alteration by infilling and destruction of wetlands	**National Parks** Ben Boyd, Botany Bay, Hat Head, Jervis Bay, Kooragang Island, Myall Lakes, [+]Royal, Seven Mile Beach, Yuragir **Nature Reserves** Nadgee, Towra Point, [+]Tyagarah. **State Recreation Areas** Killalea [+]No longer considered present

	Name	Species Information	Threats	Known in Conservation Reserves
Birds	**Barking Owl** *Ninox connivens* Vulnerable	▪ Most common in woodlands, although they inhabit well-forested hill and riverine woodlands and partially cleared areas also appearing occasionally near or in rural towns and well-treed suburbs ▪ Ideal habitat is open country with a choice of large trees for roosting and nesting in ▪ In the southern districts creeks and rivers are preferred, particularly with River Red Gums, isolated stands of trees and open woodland ▪ Often return to same roost for months or years ▪ Nest in large hollows up to 30 m above the ground, in trunks or large limbs of trees ▪ Occasionally nest in deep tree forks, rock crevices and rabbit burrows	▪ Habitat loss and degradation ▪ Predation by feral species ▪ Clearing of forest and woodlands ▪ Logging and firewood harvesting	Reserved areas including: **National Parks** Scheyville, Dharug, Wollemi, Lane Cove, Garigal (Others listed in Recovery Plan NPWS, 2003)
	Black-browed Albatross *Diomeda melanophris* Vulnerable	▪ Circumpolar in distribution ▪ In Australian waters occurs along the east coast from Stradbroke Island along the entire south coast of the continent to Western Australia ▪ Migrates to waters off the continental shelf from approximately May to November ▪ Islands of Australia and New Zealand provide breeding habitat ▪ Spends the majority of time at sea, feeding on fish, crustaceans, offal and cephalopods ▪ Known breeding locations include Macquarie, Heard and Antipodes Islands	▪ Long-line fishing operations ▪ Disturbance to nesting colonies by predators ▪ Pollution from plastics, oils and chemicals	**National Parks** Botany Bay
	Fleshy-footed Shearwater *Puffinus carneipes* Vulnerable	▪ Pelagic trans-equatorial migrant, and in the breeding season is widely distributed across the southern Indian Ocean and southeastern Pacific Ocean ▪ A breeding and non-breeding visitor to the coastal and pelagic waters of southern Australia ▪ Locally common and present in southern Australia in all months of the year ▪ Breeding may occur on islands within the Australasian region and Indian Ocean ▪ Nests are made in burrows on gentle to steep slopes ▪ A variety of vegetation communities including forests, shrublands and grasslands provide suitable nesting sites ▪ Oceanic ▪ Coastal	▪ Predation by raptors, King Skinks, cats and foxes ▪ Human settlement destroying habitat ▪ Historically slaughtered in large numbers for food, feathers and oil	**World Heritage Areas** Lord Howe Island **National Parks** Ben Boyd, Bundjalung **State Recreation Areas** Munmorah

Name	*Species Information*	*Threats*	*Known in Conservation Reserves*
Glossy Black-Cockatoo *Calyptorhynchus lathami* Vulnerable	▪ Forests on sites with low soil nutrient status, generally reflecting the distribution of key Allocasuarina spp. on which they feed ▪ Drier forest types with intact and less rugged landscapes preferred	▪ Habitat fragmentation ▪ Loss of habitat through clearing and associated activities ▪ Logging of nest trees within the proximity of food resources ▪ Inappropriate fire regimes	Likely to be reserved locally in nearby national parks
Hooded Plover ***Thinornis rubricollis*** Endangered Vulnerable **(**Cwth**)**	▪ Sandy beaches, rarely on coastal lakes ▪ Inland salt lakes ▪ Species occurs along the coast from Jervis Bay to the western Eyre Peninsula in South Australia, along the coast of Tasmania and in the Bass Strait islands and on south Western Australian Coast ▪ Within NSW occurs along the southern coast to Jervis Bay with occasional vagrants sighted further north at Wollongong ▪ Found most often on long stretches of sandy shore with wide wave-wash zone, backed by tussock and creeper covered dunes with seaweed for feeding and backed by sparsely vegetated sanddunes for shelter and nesting ▪ Species is both diurnal and nocturnal	▪ Artificially high populations of Silver Gulls around human settlements leading to increased predation ▪ Predation by foxes and raptors ▪ Loss of habitat ▪ Human disturbance, particularly during the breeding season ▪ Destruction of nests by stock	**National Parks** Ben Boyd, Mimosa Rocks, Bournda, Eurobodalla, Murramarang **Nature Reserves** Nadgee, Narrawallee Creek
Little Shearwater *Puffinus assimilis* Vulnerable	▪ Subtropical/tropical waters of Atlantic, Pacific and Indian Oceans ▪ Feeds in continental shelf waters ▪ Breeds on subtropical and Antarctic Islands where soil is soft and suitable for burrowing ▪ Burrows located in tussock grassland, shrubland, woodlands and under mats of succulents including *Carpobrotus, Nitraria, Rhagodia, Atriplex, Tetragonia, Melaleuca,* or among loose rocks	▪ Loss of nesting habitat due to resort development and dune erosion ▪ Disturbance of breeding birds by humans ▪ Desertion of breeding colonies with intro of predators including rats, feral cats and dogs	**World Heritage Areas** Lord Howe Island **National Parks** Royal, Yuragir **State Recreation Areas** Munmorah

Name	*Species Information*	*Threats*	*Known in Conservation Reserves*
Little Tern *Sterna albifrons* Endangered	▪ Migratory/partly migratory, breeding in spring and summer along the entire east coast from Tasmania to North Queensland ▪ Almost exclusively coastal, prefers sheltered environments ▪ May occur several kilometres from sea in harbours, inlets and rivers ▪ Occasionally in offshore islands or coral cays. ▪ Nests in small scattered colonies on sandy beaches or shingle pits	▪ Nesting at flood prone locations ▪ Predation on eggs and chicks ▪ Human disturbance ▪ Coastal developments including sand and rutile mining and establishment of waste disposal dumps and construction ▪ Modification of drainage patterns including damming of tidal creeks, intertidal area reclamation, destruction of seagrass beds, mangroves and saltmarshes ▪ Potentially susceptible to pesticides and contamination of estuaries by oil spills and heavy metals	**World Heritage Areas** Lord Howe Island **National Parks** Broadwater, Eurobodalla, Bongil Bongil, Booti Booti, Mimosa Rocks, Myall Lakes, Bournda, Yuragir, Bundjalung **Nature Reserves** Nadgee, Wyrrabalong, Comerong Island, Towra Point, Moon Island, Kooragang, Narrawallee
Masked Owl *Tyto novaehollandiae* Vulnerable	▪ Forest and open woodland ▪ Also found in treeless country where cave shelters are available ▪ Roosts in the day in tree hollows, caves or heavy foliage	▪ Inappropriate fire regimes reducing prey ▪ Conversion of native forests to plantations ▪ Habitat destruction and fragmentation ▪ Loss of tree hollows for breeding	Likely to be reserved locally in nearby national parks
Pied Oystercatcher *Haematopus longirostris* Vulnerable	▪ Coastal areas throughout Australia apart from areas of unbroken sea-cliffs ▪ Prefers mudflats, sandbanks and sandy ocean beaches ▪ Less common along rocky or shingle coastlines	▪ Predation on nest sites ▪ Loss of habitat	Information unavailable.
Powerful Owl *Ninox strenua* Vulnerable	▪ Wet, hilly sclerophyll forest with dense gullies adjacent to more open forest ▪ Also occurs in smaller, drier forest, as long as there are some large tree hollows and an adequate supply of prey ▪ Roosting sites include dense canopy and understorey trees within closed and open forest, often in gullies and canopy trees in woodland ▪ Nest in large hollows, nearly always in the trunk or broken off top of a large eucalypt, in tall forest nest are usually found at the head of gully or on hillside at heights from 20-45 m ▪ Where tall trees not available, nest may be in open forest or amongst part-cleared timber at levels as low as 6 m ▪ Home range 600 ha of high quality forest to over 1000 ha for low quality habitat	▪ Inappropriate fire regimes reducing prey ▪ Conversion of native forests to plantations ▪ Habitat destruction and fragmentation ▪ Loss of tree hollows for breeding ▪ Predation on Brushtail and ringtail possums by dogs	Likely to be reserved locally in nearby national parks

Name	*Species Information*	*Threats*	*Known in Conservation Reserves*
Providence Petrel *Pterodroma solanderi* Vulnerable	▪ Pelagic distribution, particularly during non-breeding season ▪ Mainly subtropical in southwest Pacific Ocean, including the Tasman Sea ▪ During breeding season the species can be found in coastal waters of the eastern Australian Coast ▪ In NSW species occurs along the entire coast, however most often on the northern coast ▪ Breeding sites include Mount Lidgbird and Mount Gower on Lord Howe Island ▪ Species nests in burrows or rock crevices on forested, upper slopes	▪ Predation by cats ▪ Sensitive to impact of feral animals such as pigs and goats ▪ Historically eaten by humans	Migratory species
Regent Honeyeater *Xanthomyza phrygia* Endangered	▪ Temperate eucalypt woodland and open forest ▪ Mostly recorded from box-ironbark eucalyptus associations and we lowland coastal forests dominated by Swamp Mahogany, Spotted Gum, and riverine Casuarina woodland ▪ Remnant timber stands, roadside reserves, travelling stock reserves, and street trees also provide habitat at certain times ▪ Nests frequently located in Red Ironbark and Red River Gum but also may be in other eucalypts, mistletoe clumps and Casuarinas	▪ Loss and fragmentation of habitat through clearing ▪ Reduction in large flowering eucalyptus in woodlands ▪ Grazing by domestic stock and rabbits preventing habitat regeneration ▪ Competition with other honeyeaters	**National Parks** Yengo, Warrumbungle, Wollemi, Scheyville, Goulburn River, Broadwater, Bundjalung, Yuragir, Nattai, Brisbane Waters, Ingalba, Hat Head, Royal, Seven Mile Beach **Nature Reserves** Munghorn Gap, Pilliga, Cocklebay, The Charcoal Tank
Sanderling *Canlidris alba* Vulnerable	▪ Breeds in the northern hemisphere ▪ Uncommon to locally common migrant from Siberia and other breeding grounds within the Arctic ▪ Arrives in coastal areas in September and leaves by May, however some individuals may overwinter in Australia ▪ In Australia found mainly along the northern and eastern coasts, but also occasional sightings in South Australia, southwestern Victoria, and some parts of Tasmania ▪ Rare Inland, however sightings have been recorded ▪ In non-breeding season usually occur in coastal areas on low beaches of firm sand near reefs and inlets, along tidal mudflats and bare open coastal lagoons ▪ Prefers open sandy beaches exposed to open sea-swell, exposed sandbars, and spits ▪ Individuals are rarely recorded in near-coastal wetlands such as lagoons, hypersaline lakes, saltponds and samphire flats ▪ Small flocks run up and down at breaking waves	▪ Hydrological changes to estuaries and similar waterbodies my impact habitat ▪ Tourism or agricultural development which reduces coastal and inland habitat areas	**National Parks** Boumda, Bundjalung, Eurobodalla **Nature Reserves** Comerong Island, Kinchega, Nadgee
Sooty Owl *Tyto tenebricosa* Vulnerable	▪ Deep gullies in eucalypt forest usually with big, old, smooth-barked gums and an understorey of treeferns and Lilly Pilly ▪ May move into drier forest to hunt	▪ Clearing and fragmentation of habitat ▪ Short rotation of logging cycles (<80 years) reducing the number of nesting sites	Likely to be reserved locally in nearby national parks

Name	*Species Information*	*Threats*	*Known in Conservation Reserves*
Sooty Oystercatcher *Haematopus fuliginosus* Vulnerable	▪ Concentrated in areas such as the Bass Strait Islands and Illawarra ▪ Nest on offshore islands that are free from predators such as foxes, cats, dogs and people	▪ Predation on nest sites ▪ Nest disturbance	Important breeding sites are the Five Islands off Port Kembla, Bowen Island, Brush and Blowla Islands and Tollgate Island.
Southern Giant Petrel *Macronectes giganteus* Endangered	▪ Circumpolar pelagic range from Antarctica to approximately 20°S ▪ Common visitor off the entire length of the New South Wales coast ▪ Nests over summer in small colonies amongst open vegetation on Antarctic and subantarctic islands, including Macquarie and Heard Islands and in Australian Antarctic territory	• Mortality via longline fishing • Predation from feral cats and black rats • Habitat degradation from feral species • Hunting • In NSW loss of southern cuttlefish populations • Illegal longline fishing • Oilspills	Species is migratory
Square-tailed Kite *Lophoictinia isura* Vulnerable	▪ Coastal forested and wooded lands of tropical and temperate Australia ▪ May be recorded inland along timbered watercourses. ▪ Absent from waterless desert ▪ In NSW associated with ridge and gully forests dominated by Woollybutt *Eucalyptus longiflora,* Spotted Gum *E. maculata* or Peppermint Gum *E. elata*, *E. smithii* ▪ Has been sighted in forests containing other eucalypts, *Angophora* spp. And *Callitris* spp. with a shrubby understorey and Box-Ironbark woodland ▪ Appears to have a large hunting range, hunting in morning and afternoons or evenings	▪ Loss of habitat through clearing and associated activities, particularly along water courses in the west ▪ Illegal shooting ▪ Disturbance to nest trees ▪ Inappropriate fire and/or grazing regimes that reduce nesting and feeding resources	**Nature Reserves** Nocoleche, Morrisons Lake Macquarie Marshes **National Parks** Mount Kaputar, Ingalba Mootwingee, Ben Boyd **State Recreation Areas** -
Superb Parrot *Polytelis swainsonii* Vulnerable	▪ Riverine and flood-plain open forest and woodland, particularly River Red Gum ▪ Also found in stubble and at roadsides ▪ Small flocks	▪ Loss of habitat	Likely to be reserved locally in nearby national parks
Superb Fruit-Dove *Ptilinopus superbus* Vulnerable	▪ Summer visitor to drier types of rainforest, regrowth and adjacent vegetation ▪ Generally seen alone or in pairs but sometimes groups gather at fruit trees ▪ Spend most of the time in upper foliage of rainforest, however the nest is often placed a few metres above the ground	▪ Poor recovery potential	Information unavailable
Swift Parrot *Lathamus discolor* Endangered	▪ Drier open forests, woodlands, parks and gardens ▪ Woodlands and forests in NSW from May to August ▪ Feeds on eucalypt nectar, pollen and associated insects ▪ Breeds in Tasmania ▪ Dependent on flowering resources across a wide range of habitats	▪ Loss of winter food sources through conversion of native woodlands and forests to other land uses associated with human development	Information unavailable

	Name	Species Information	Threats	Known in Conservation Reserves
Mammals (Excl Bats)	**Turquoise Parrot** *Neophema pulchella* Vulnerable	▪ Steep rocky ridges and gullies, rolling hills, valleys, river flats and nearby plains of the Great Dividing Range ▪ Forests/woodlands usually have mixed assemblages of native pine *Callitris* and a variety of *Eucalyptus* species, particularly White Box *E. albens,* Yellow Box, *E. melliodora,* Blakely's Red Gum *E. blakelyi,* Red Box *E. polyanthemos,* Red Stringybark *E. Macrorhyncha,* Bimble Box *E. populnea* or Mulga Ironbark *E. sideroxylon* ▪ Also recorded in savannah and riparian woodland and farmland in edges of forest and pasture or other grasslands	▪ Loss of habitat through clearing, intensive logging, burning and grazing ▪ Destruction of sites containing hollows which may be used for nesting ▪ Inappropriate fire regimes which remove nesting and feeding resources	Likely to be reserved locally in nearby national parks
	Wandering Albatross *Diomedea exulans* Endangered	▪ Breeds on sub-Antarctic Islands ▪ Visits waters extending from Fremantle across the southern waters of Australia to the Whitsunday Islands in Queensland ▪ Has been recorded along the length of the NSW coast	▪ Longline fishing	Information unavailable. Species is migratory.
	Brush-tailed Phascogale *Phascogale tapoatafa* Vulnerable	▪ Patchy distribution around the coast of Australia from near sea level up to 1500 m ▪ In NSW it appears to be most abundant in the northeast and southeast of the State, particularly within forest habitats on the Great Dividing Range ▪ Prefers dry sclerophyll open forest with a sparse ground cover of herbs, grasses, scleromorphic shrubs or leaf litter ▪ Individuals may also inhabit heathland, swamps, rainforest and wet sclerophyll forest ▪ Occurs primarily where annual rainfall exceeds 500 mm ▪ Arboreal, foraging preferentially in rough-barked trees of 25 cm DBH or greater ▪ Nocturnal and carnivorous ▪ Females inhabit territories of approximately 20-60 ha, while the males maintain territories of up to 100 ha ▪ Nests in shelters in tree hollows 25-40 mm wide lined with leaves and shredded bark, may utilise many different hollows over a short time span	▪ Loss and fragmentation of habitat through clearing for agriculture and urban development ▪ Logging of hollow bearing trees suitable for nesting ▪ Inappropriate fire regimes leading to a reduction in foraging and shelter resources ▪ Predation by foxes and cats ▪ Competition for suitable hollows with the introduced honeybee	Has been recorded in National Parks, Nature Reserves and State Recreation Areas on the south, mid-north and north coast and adjacent inland areas of New South Wales

Name	*Species Information*	*Threats*	*Known in Conservation Reserves*
Southern Brown Bandicoot *Isoodon obesulus* Endangered	▪ Historically distributed along southeastern seaboard of Australia, however now is patchily distributed and has contracted at both ends of its range by 50-90% since European settlement ▪ Species currently appears to be restricted to areas around Sydney and the far southeast of the state ▪ Inhabits heath, heathy forest, shrubland and woodland, which are usually supported by well-drained soils. ▪ Mosaic of post-fire vegetation is an important habitat component ▪ Shelters in a concealed nest which is usually a shallow depression in the ground lined with grass, leaves, and other plant material during the day ▪ Species is nocturnal and feeds mainly on earthworms and other invertebrates ▪ Apparently solitary in the wild with home ranges as large as 7 ha	▪ Loss of habitat through clearing ▪ Predation by foxes ▪ High fire frequency reducing availability of dense ground cover ▪ Genetic insecurity of remnant populations	**National Parks** Blue Mountains, Bournda, Budderoo, Garigal, Ku-ring-gai Chase, Morton, Myall Lakes, South East Forests **Nature Reserves** Nadgee
Squirrel Glider *Petaurus norfolcensis* Vulnerable	▪ Dry sclerophyll forest and woodland, Box-Ironbark forest and woodland ▪ Diverse range of communities including Blackbutt, Forest Red Gum, Red Bloodwood Forests, Coastal Banksia heathland and Grey Gum/Spotted Gum/Grey Ironbark dry hardwood forests of Central Coast ▪ Requires hollow-bearing trees and mix of acacias and banksias, suitable vegetation communities have winter flowering plants and smooth barked eucalypts	▪ Loss, fragmentation and degradation of habitat through clearing of native vegetation and subsequent development, logging and frequent fire ▪ Loss of den sites such as hollow logs ▪ Competition with feral species ▪ Spread of disease by feral species ▪ Dingo baiting	Numerous conservation reserves throughout eastern NSW
Yellow-bellied Glider *Petaurus australis* Vulnerable	▪ Tall mature forest in regions of high rainfall ▪ Productive tall open sclerophyll forests with mature trees to provide shelter and nesting hollows and all year food resources from eucalypts ▪ Critical elements include sap-site trees, winter flowering eucalypts, mature trees, den site and a mosaic of different forest types. Known feed trees include *Corymbia gummifera, Eucalyptus maculata, E. viminalis, E. ovata, E. cypellocarpa, E. obliqua, E. propinqua, E. punctata dydyma, E. fastigata, E. radiata, E. intermedia, E. globoidia, E. muellerana, E. agglomerata, E. bosistoana, E. elata, E. signata, E. tereticornis, E. amgophiroides, E. pilularis E. maidenii* and *Acacia spp*	▪ Loss and fragmentation of habitat through clearing and associated activities ▪ Removal of hollow bearing nesting trees through logging of old growth elements ▪ Reduction in food resources and isolation of populations through inappropriate fire regimes ▪ Predation by feral animals	Various conservation reserves along the east coast and adjacent inland areas in NSW

	Name	Species Information	Threats	Known in Conservation Reserves
Microchiropteran Bats	**Grey-headed Flying-fox** *Pteropus poliocephalus* Vulnerable	▪ Subtropical and temperate rainforests, tall sclerophyll forest and woodland, heaths and swamps	▪ Loss and Fragmentation of habitat through clearing and associated activities ▪ Inappropriate fire regimes may deplete food resources and isolate populations ▪ Making them susceptible to regional catastrophic events ▪ Predation by foxes and cats	Likely to be reserved locally in nearby national parks. Known colony in Comerong Island Nature Reserve
	Eastern Bent-wing Bat *Miniopterus schreibersii oceanensis* Vulnerable	▪ Found in naturally-formed caves and human made structures including mines and road culverts ▪ Wet and dry sclerophyll forest, open woodland, paperbark forests, rainforest and open grassland (North J. & Pasic V., 2003) ▪ Forages above tree canopy (Strahan, 1995)	▪ Disappearance of mature trees containing suitable hollows for nesting ▪ Inappropriate logging cycles not allowing time for tree hollows to form ▪ Habitat destruction/fragmentation ▪ Land degradation ▪ Reduction in prey abundance	Likely to be reserved locally in nearby national parks
	Eastern False Pipistrelle *Falsistrellus tasmaniensis* Vulnerable	▪ May roost in stem holes of living eucalypts ▪ Probably forages mostly above the forest canopy, in open woodland or over water (Strahan, 1995)	▪ Disappearance of mature trees containing suitable hollows for nesting ▪ Inappropriate logging cycles not allowing time for tree hollows to form ▪ Habitat destruction/fragmentation ▪ Land degradation ▪ Reduction in prey abundance	Likely to be reserved locally in nearby national parks
	Eastern Freetail-bat *Mormopterus norfolkensis* Vulnerable	▪ Tree hollows or under loose bark of trees in open forests in small colonies (Australian Museum, 2004) ▪ Most records from dry eucalypt forest and woodland east of the Great Dividing Range ▪ Some individuals caught over a rocky river through rainforest and we sclerophyll forest (Strahan, 1995)	▪ Disappearance of mature trees containing suitable hollows for nesting ▪ Inappropriate logging cycles not allowing time for tree hollows to form ▪ Habitat destruction/fragmentation ▪ Land degradation ▪ Reduction in prey abundance	Likely to be reserved locally in nearby national parks

Name	*Species Information*	*Threats*	*Known in Conservation Reserves*
Greater Broad-nosed Bat *Scoteanax rueppellii* Vulnerable	▪ Gullies and river systems draining the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland in Queensland ▪ Extends to the coast over much of its range ▪ Inhabits a variety of habitats from woodland through moist and dry eucalypt forest to rainforest, but does not occur at altitudes above 500 m ▪ Open nature of eucalypt woodlands and forests suits its direct flight pattern ▪ May tend to use human made openings in forests such as roads and clearings ▪ Creeks and small rivers are favoured corridors ▪ Usually roosts in tree hollows	▪ Habitat reduction	Information unavailable.
Large-footed Myotis *Myotis adversus* Vulnerable	▪ Occur near bodies of water, ranging from rainforest streams to large lakes and reservoirs ▪ Forage over the water on aquatic insects	▪ Loss of habitat	Information unavailable. Likely to be reserved locally in nearby national parks