Appendix B Flora and Fauna Report

Bamarang 330kV Network Connection

FLORA AND FAUNA ASSESSMENT

- June 2009

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Sinclair Knight Merz
ABN 37 001 024 095
710 Hunter Street
Newcastle West NSW 2302 Australia
Postal Address
PO Box 2147 Dangar NSW 2309 Australia
Tel: +61 2 4979 2600
Fax: +61 2 4979 2666
Web: www.skmconsulting.com

Contents

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1. Introduction

1.1 Project Description

Delta Electricity is currently developing gas fired power generation options for its generating portfolio and, as part of this process, has identified a site at Bamarang on the south coast of NSW for a gas turbine generation plant.

Delta Electricity has been granted Project Approval under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to build a gas turbine power generation facility at Bamarang west of Nowra (the Bamarang Gas Turbine Project). The Stage 1 works comprise construction of two open cycle gas turbines (OCGTs) and associated infrastructure with a power generation capacity of approximately 300 MW to be used as a peaking plant or a Stage 2 base-load CCGT plant with generating capacity of approximately 400 MW. The Part 3A Project Approval for the works incorporated a new 132 kV transmission line connecting the Bamarang facility to the 132kV Shoalhaven Substation and associated Integral Energy 132 kV sub-transmission system at West Nowra.

Delta Electricity has investigated an alternative for an electricity grid connection to the existing TransGrid Kangaroo Valley-Canberra 330kV Transmission Line (Line 6) located approximately five kilometres to the west of the proposed Bamarang Gas Turbine Project site.

If the 330 kV option is approved, Delta seeks to retain the approved 132 kV transmission line option.

The decision on the transmission line connection will be made during the final design.

1.2 Scope of the Assessment

The report documents the methods and results of an assessment of the flora and fauna species, communities and habitats located in the vicinity of the proposed powerline location. The information presented is based on a review of available ecological data pertaining to the study area and field surveys along the proposed powerline route. The data has been used to assess the significance of potential impacts from the proposal on listed species, ecological communities and populations of local, regional, state and national conservation significance, and their habitats, which are known or considered likely to occur within the study area.

1.3 Legislative Context

The Project will be assessed under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) also applies to the Project.

Further state legislation and planning policies relevant to the protection of biodiversity include:

- *Threatened Species Conservation Act 1995*
- *Native Vegetation Act 2003*
- *Fisheries Management Act 1994*
- *National Parks and Wildlife Act 1974*
- *State Environmental Planning Policy No. 44 – Koala Habitat Protection.*

Although licences and approvals under these state Acts and policies are not required in addition to approval under Part 3A of the *EP&A Act*, consideration has been given to their intent.

1.4 Definitions

The following terms are used in this report:

- Proposal Area: The area of potential impact comprising a 60 m wide easement for this project which was the focus of the field surveys.
- Study Area: Comprising a 200 m wide corridor surrounding the proposal area in which there is potential for indirect impacts and vegetation communities were mapped.
- Local Area: Comprising a 10 km radius surrounding the proposal area.

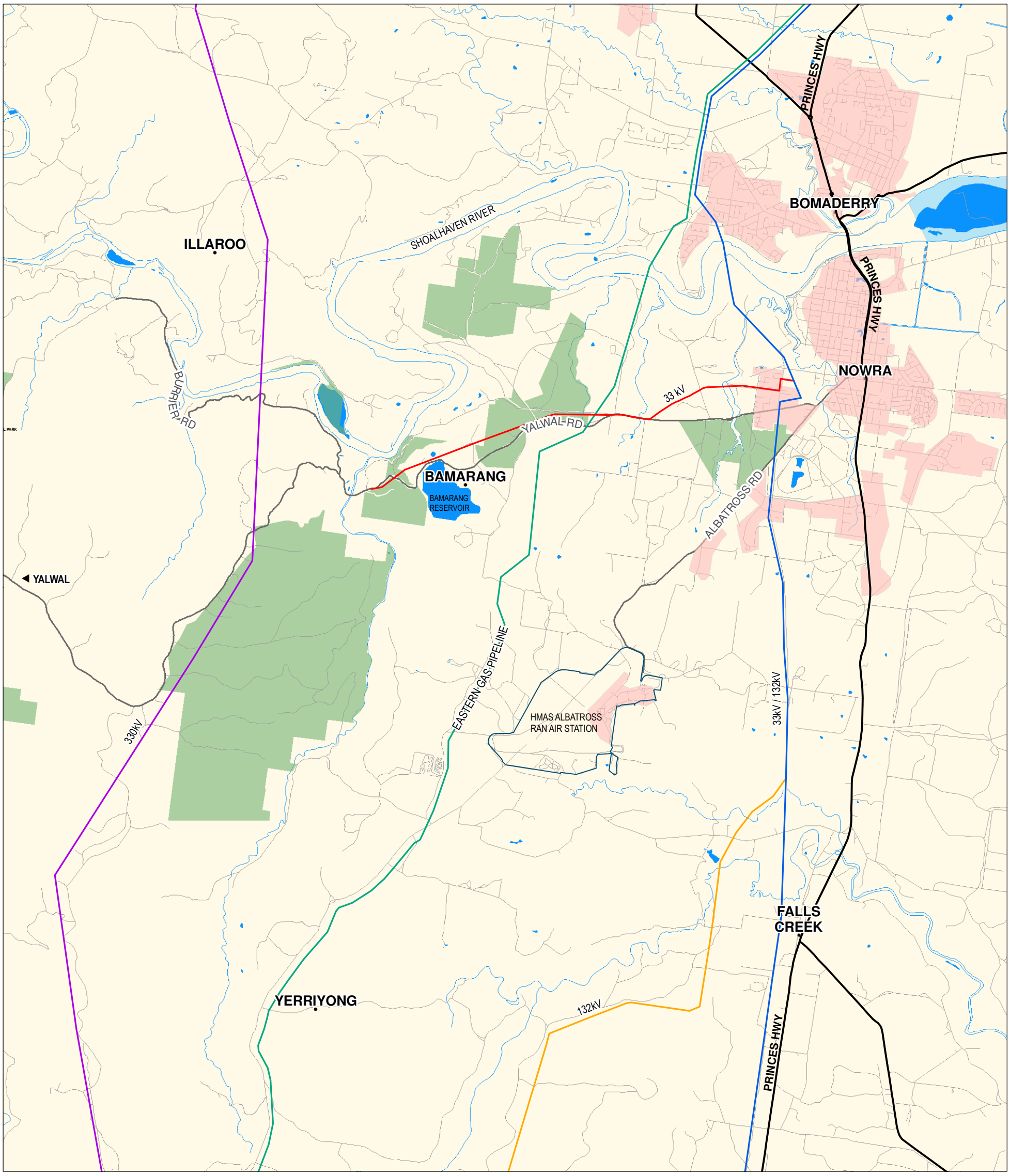

FIGURE 1-1: REGIONAL MAP

BAMARANG GENERATION 330 kV NETWORK CONNECTION

GDA 1994 | MGA Zone 56

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2. Literature and Database Review

As a preliminary phase of the assessment a desktop review of relevant ecological literature, government maintained databases pertaining to the locality, broad-scale vegetation mapping and aerial photography was undertaken. From the review a list of threatened flora and fauna species, populations and communities listed under the TSC Act and EPBC Act which have potential to occur in the locality was compiled and assessed to determine the potential presence of threatened biota in the study area.

2.1 Biodiversity Databases

The data sources used in this review included the following:

- Department of Environment and Climate Change (DECC) Atlas of NSW Wildlife (records of threatened flora and fauna species);
- Database of the Royal Botanic Gardens, PlantNET and Australian Museum FaunaNET;
- Records published in scientific journals, consultants reports and general flora and fauna distribution texts;
- Broad-scale vegetation mapping - Native Vegetation of the Southern Forests: South-east Highlands, Australian Alps, South-west Slopes, and SE Corner bioregions (Gellie 2005).
- Threatened Species, Population and Ecological Communities of NSW - Department of Environment and Climate Change (DECC 2008). (http://www.threatenedspecies.environment.nsw.gov.au/index.aspx).
- Protected Matters Search Tool - Department of the Environment, Water, Heritage and the Arts (DEWHA 2008) (http://www.environment.gov.au/erin/ert/epbc/index.html).
- Lists of Rare and Threatened Australian Plants (RoTAP) (Briggs and Leigh 1996)

This information has been utilised in conjunction with the results of field investigations to prepare and list of threatened species, populations and communities that are considered to potentially occur in the study area and are therefore subject to further assessment of the significance of impacts from the Project.

2.2 Existing Environment

The vegetation communities/fauna habitat types identified in the study area from broad-scale mapping data (Gellie 2005) is described below:

Dry Shrub Forests

Occurs on shallow, infertile soils in moderately exposed areas. This is the most abundant community, occurring as large patches throughout the majority of the study area. This broad vegetation community type is further divided into three separate vegetation map units with varied ecological attributes comprising:

- Coastal Lowland Dry Shrub Forest
- Jervis Bay Lowlands Dry Shrub Forest
- Shoalhaven Gorge Dry Shrub-Grass Forest

Heath Forests/Mallee Low Forests/Heathlands

Occurs on exposed plateaus, slopes and escarpments on infertile sediments derived from Permian sandstone or granites. This vegetation community is relatively abundant in the study area, occurring as several medium-sized patches (ca. 60 ha). This broad vegetation community type is further divided into two separate vegetation map units with varied ecological attributes comprising:

- Northern South Coast Hinterland Heath Dry Shrub Forest
- Northern Plateau and Escarpment Heath Shrub Dry Forest

Wet Sclerophyll Forest

Occurs on protected slopes and gullies. This community is restricted to several small-medium areas (20-40 ha) in the study area, and is most extensive to the south of the study area in Colymea State Recreation Area. This broad vegetation community type has only the single vegetation map units in the study area comprising South Coast Foothills Moist Shrub Forest.

2.3 Threatened Flora

Of the 22 threatened flora species with potential to occur in the study area (**Table 2-1**), 14 of these have a high potential to occur, two have a moderate-high potential and four have a moderate potential to occur in the study area based on the habitats identified in the broad-scale mapping data (Gellie 2005). The remaining two species have a low potential to occur in the habitats in the study area. The locations of known records of these species are displayed in **Figure 2**.

- **Table 2-1 Threatened flora species of the study locality.**

Threatened Flora	Conservation Status			Distribution and Habitat Requirements*	Potential to occur in proximity to proposed options
	Cwlth	NSW	ROTAP		
Acacia bynoeana	V	E	3VC-	Found in central eastern NSW, from the Hunter District south to the Southern Highlands and west to the Blue Mountains. It has recently been found in the Colymea and Parma Creek areas west of Nowra. Occurs in heath or dry sclerophyll forest on sandy soils. Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches. Associated overstorey species include *Corymbia gummifera, Eucalyptus haemastoma, Eucalyptus parramatensis, Banksia serrata Angophora bakerii.*	High – potential suitable habitat present
Caladenia tesselata	V	E	3VCa	Occurs in the Sydney area, Wyong, Ulladulla and Braidwood. Populations in Kiama and Queanbeyan are presumed extinct. Has been recorded in the Huskisson area in the 1930s. Generally found in grassy sclerophyll woodland on clay loam or sandy soils, however the population near Braidwood is in low woodland with stony soil.	High – potential suitable habitat present
Cryptostylis hunteriana	V	V	3VC-	Recorded from as far north as Gibraltar Range National Park south into Victoria around the coast as far as Orbost. It is known historically from a number of localities on the NSW south coast and has been observed in recent years at many sites between Batemans Bay and Nowra although it is uncommon at all sites. Also recorded at Nelson Bay, Wyee, Washpool National Park, Nowendoc State Forest, Ku-Ring-Gai Chase National Park, Ben Boyd National Park. Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum (Eucalyptus sclerophylla), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black Sheoak (*Allocasuarina littoralis*). Seems to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (*C. subulata*) and the Tartan Tongue Orchid (*C. erecta*).	High – potential suitable habitat present
Cynanchum elegans	E	E	3ECi	Occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; Coastal Tea-tree (*Leptospermum laevigatum*) – Coastal Banksia (*Banksia integrifolia subsp. integrifolia*) coastal scrub; Forest Red Gum (*Eucalyptus tereticornis*) aligned open forest and woodland; Spotted Gum (*Corymbia maculata*) aligned open forest and woodland; and Bracelet Honeymyrtle (*Melaleuca armillaris*) scrub to open scrub.	Moderate – potentially present in wet sclerophyll forests
Eucalyptus langleyi	V	V	2V	Main occurrence is to the south-west of Nowra as far as Yarramunmun Creek. It is also found to a limited extent north of the Shoalhaven River in the vicinity of Bomaderry Creek. Found in mallee shrubland on poorly-drained, shallow, sandy soils on sandstone.	High – potential suitable habitat present

Threatened Flora	Conservation Status			Distribution and Habitat Requirements*	Potential to occur in proximity to proposed options
	Cwlth	NSW	ROTAP		
Eucalyptus sturgissiana		V	2RCa	Mostly restricted to the Northern Budawang Range in Morton National Park, with a few occurrences on the nearby coastal plain. Usually grows as an emergent in low shrub-heath. Grows on sandy, swampy soils.	Moderate – marginal habitat present
Galium australe	V	V		Widespread in Victoria and is also found in South Australia and Tasmania. Once regarded as presumed extinct in NSW, this species is now known from the Towamba Valley near Bega, Lake Yarrunga near Kangaroo Valley, Cullendulla Creek Nature Reserve near Batemans Bay, Conjola National Park, Swan Lake near Swanhaven, and the Big Hole in Deua National Park. It was recorded historically from the Clyde River near Batemans Bay and the Mongarlowe area near Braidwood. The species also occurs beside Lake Windemere in the Australian Capital Territory at Jervis Bay. In NSW it is found in moist gullies of tall forest including Forest Red Gum (Eucalyptus tereticornis) forest, coastal Banksia shrubland, and Allocasuarina nana heathland. In other States the species is found in a range of near-coastal habitats, including sand dunes, sand spits, shrubland and woodland.	Moderate to High – potential suitable habitat present, although not known from locality
Genoplesium baureri		V	3RC-	Recorded from locations between Nowra and Pittwater and may occur as far north as Port Stephens. About half the records were made before 1960 with most of the older records being from Sydney suburbs including Asquith, Cowan, Gladesville, Longueville and Wahroonga. No collections have been made from those sites in recent years. The species has been recorded at locations now likely to be within the several conservation reserves including Berowra Valley Regional Park, Royal National Park and Lane Cove National Park. May occur in the Woronora, O'Hares, Metropolitan and Warragamba Catchments. Found in sparse sclerophyll forest and moss gardens over sandstone	High – potential suitable habitat present
Irenepharsus trypherus	E	E	2RC-	Recorded from 18 sites within the local government areas of Kiama, Shellharbour, Shoalhaven, Tallaganda, Wingecarribee, and Wollongong. Found at such places as Minnamurra Falls, the Jamberoo area, and the Morton and Macquarie Pass National Parks. The vast majority of sites are recorded from the upper slopes of the ridge systems that extend south and east of the Illawarra escarpment, however the species has also been recorded from the deep sandstone gorges of the Shoalhaven River. Typically inhabits steep rocky slopes near cliff lines and ridge tops. The species is less typically found growing out of rock crevices or on narrow benches along cliff lines. Associated vegetation includes moist sclerophyll forest, Ironwood *Backhousia myrtifolia* thicket, and rainforest.	High – potential suitable habitat present
Melaleuca biconvexa	V	V		Found only in NSW, with scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north. Generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or	Low – Habitat not suitable

Threatened Flora	Conservation Status			Distribution and Habitat Requirements*	Potential to occur in proximity to proposed options
	Cwlth	NSW	ROTAP		
				sheltered aspects.	
Melaleuca deanei	V	V	3RC-	Deane's Paperbark occurs in two distinct areas, in the Ku-ring-gai, Berowra, Holsworthy and Wedderburn areas, and there are also more isolated occurrences at Springwood, Wollemi National Park, Yalwal and the Central Coast areas. The species grows in heath on sandstone.	High – potential suitable habitat present
Pomaderris cotoneaster	E	E	3ECi	Has a very disjunct distribution, being known from the Nungatta area, northern Kosciuszko National Park, the Tantawangalo area in South-East Forests National Park and adjoining freehold land, Badgery's Lookout near Tallong, the Yerranderie area, the Canyonleigh area and Ettrema Gorge in Morton National Park. Recorded in a range of habitats comprising predominantly forested country. The habitats include forest with deep, friable soil, amongst rock beside a creek, on rocky forested slopes and in steep gullies between sandstone cliffs.	Moderate to High – potential suitable habitat present, although not known from locality
Prasophyllum affine	E	E	2E	Known from three areas south-east of Nowra on South Coast. These are Kinghorne Point, Wowly Gully near the town of Callala Bay and near the township of Vincentia. Grows on poorly drained clay soils that support low heathland and sedgeland communities.	High – potential suitable habitat present
Prostanthera densa	E	E	2E	Recorded from the Currarong area in Jervis Bay, Royal National Park, Cronulla and Port Stephens. Found on sandstone in sclerophyll forest and shrubland on coastal headlands.	High – potential suitable habitat present
Pterostylis gibbosa	E	E	2E	Known from a small number of populations in the Hunter region (Milbrodale), the Illawarra region (Albion Park and Yallah) and the Shoalhaven region (near Nowra). It is apparently extinct in western Sydney which is the area where it was first collected (1803). All known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage. In the Illawarra region, the species grows in woodland dominated by Forest Red Gum *Eucalyptus tereticornis*, Wollybutt *E. longifolia* and White Feather Honey-myrtle *Melaleuca decora*. Near Nowra, the species grows in an open forest of Spotted Gum *Corymbia maculata*, Forest Red Gum and Grey Ironbark *E. paniculata*. In the Hunter region, the species grows in open woodland dominated by Narrow-leaved Ironbark *E. crebra*, Forest Red Gum and Black Cypress Pine *Callitris endlicheri*.	High – potential suitable habitat present
Rhizanthella slateri		V	3KC-	Occurs from south-east Queensland to south-east NSW. In NSW, currently known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra. Habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest.	High – potential suitable habitat present
Solanum celatum		E		Restricted to an area from Wollongong to just south of Nowra, and west to Bungonia. Majority of records are prior to 1960 and the majority of populations are likely to have been lost to	High – potential suitable habitat present

Threatened Flora	Conservation Status			Distribution and Habitat Requirements*	Potential to occur in proximity to proposed options
	Cwlth	NSW	ROTAP		
				clearing. Grows in rainforest clearings, or in wet sclerophyll forests.	
Syzygium paniculatum	V	V	3VCi	The Magenta Lilly Pilly is found only in NSW, in a narrow, linear coastal strip from Bulahdelah to Conjola State Forest. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	Moderate – marginal habitat present
Thesium australe	V	V	3VCi+	Austral Toad-flax is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Occurs in grassland or grassy woodland. Often found in damp sites in association with Kangaroo Grass (*Themeda australis*). A root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass.	Moderate – marginal habitat present
Triplarina nowraensis	E	E	2V	There are five known populations of Nowra Heath Myrtle. Three of these form a cluster to the immediate west of Nowra. A fourth, much smaller population is found 18km south-west of Nowra in the Boolijong Creek Valley. The fifth population is located north of the Shoalhaven River on the plateau above Bundanon. Found on poorly drained, gently sloping sandstone shelves or along creek lines underlain by Nowra Sandstone. The sites are often either treeless or have a very open tree canopy due to the impeded drainage.	High – potential suitable habitat present
Wilsonia backhousei		V		Found on the coast between Mimosa Rocks National Park and Wamberal north of Sydney. It grows in all southern states. This is a species of the margins of salt marshes and lakes, both coastal and inland.	Low – Habitat not suitable
Zieria baeuerlenii	E	E		Occurs in only one location north-west of Nowra. The population occurs in a total of 43 colonies in six discrete clusters. These clusters are confined within a 0.5 km x 1.0 km and occur on both sides of Bomaderry Creek. Grows on skeletal sandy loam overlaying sandstone, on a rocky plateau amongst sandstone boulders in either shrubby open forest, shrubby woodland or closed scrub.	High – potential suitable habitat present

RoTAP Codes

2 = geographic Range in Australia less than 100km
3 = geographic Range in Australia greater than 100km
V = Vulnerable – at risk over longer period (20-50years)
E= Endangered – at risk within 10-20 years.
R = Rare – uncommon plants with no current threats
C = Reserved
a = 1000 plants or more know from conservation reserves
i = less than 100 plants in conservation reserves
- = reserved population size not accurately known

EPBC Act and TSC Act Codes

E = Endangered
V = Vulnerable

* Distribution and habitat requirement information adapted from the Department of Environment and Conservation Threatened Species Website (http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/browse_allspecies.aspx)

2.4 Threatened Ecological Communities

Threatened ecological communities which potentially occur in the study area are listed in Table 2-2. Based on the vegetation communities identified by in the study area by Gellie (2005), and by the topography and soils of the study area, none of these threatened ecological communities are likely to occur in the study area. However vegetation with affinities to river-flat eucalypt forest and Illawarra subtropical rainforests has a moderate-High chance of occurring around Calymea Creek and rainforest areas may occur on protected escarpment areas.

Table 2-2: Threatened ecological communities potentially occurring in area

Community	Status	Potential to occur in proximity to proposed options
River-flat eucalypt Forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Endangered, TSC Act	Moderate-High – potential to occur surrounding Calymea Creek
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered, EPBC Act Endangered, TSC Act	Low – mostly forested vegetation has been identified in the area, with no woodland areas identified (Gellie 2005)
Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps	Endangered, TSC Act	Low – No peatlands or swamps have been identified in broad-scale mapping (Gellie 2005)
Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	Endangered, TSC Act	Moderate-High – potential to occur surrounding Calymea Creek and/or on protected escarpment areas and gullies
Natural Temperate Grassland of the Southern Tablelands (NSW and ACT	Endangered, TSC Act	Low – No grasslands have been identified in broad-scale mapping (Gellie 2005)

2.5 Threatened Fauna

Of the 41 threatened fauna species with potential to occur in the study area (**Table 2-3**), 34 of these have a high potential to occur in the study area based on the habitats identified in the broad-scale mapping data (Gellie 2005). A further five of these have a moderate-high potential to occur based on predicted suitable habitat attributes within Calymea Creek. The remaining two species have a low potential to occur in the habitats of the study area.

- **Table 2-3 Threatened fauna species recorded from the study locality**

Species*	Status		Associated preferred habitat	Potential to occur in proximity to proposed options
	EPBC Act	TSC Act		
Australasian Bittern *Botaurus poiciloptilus*		V	Freshwater wetlands, rivers and streams	Moderate, potentially present in Calymea Creek
Barking Owl *Ninox connivens*		V	Woodlands and riparian habitats	Moderate, potential suitable habitat present
Black Bittern *Ixobrychus flavicollis*		V	Freshwater wetlands, rivers and streams	Moderate, potentially present in Calymea Creek
Broad-headed Snake *Hoplocephalus bungaroides*	V	E	Exposed sandstone cliffs with forested areas	Moderate, potential suitable habitat present
Brush-tailed Rock Wallaby *Petrogale penicillata*	E1	E1	Open forest on sandstone ridges	Moderate, potential suitable habitat present
Bush Stone-Curlew *Burhinus grallarius*	V	E1	Woodlands, open forest	Moderate, potential suitable habitat present
Eastern Bent-Wing Bat *Miniopterus schreibersii oceanenis*		V	Woodlands, open forest	High, potential suitable habitat present
Eastern False Pipistrelle *Falsistrellus tasmaniensis*		V	Woodlands, open forest	High, potential suitable habitat present
Eastern Freetail-Bat *Mormopterus norfolkensis*		V	Woodlands, open forest	High, potential suitable habitat present
Eastern Pigmy-possum *Cercartetus nanus*		V	Rainforest through to sclerophyll (including Box-Ironbark) forest and woodland to heath	High, potential suitable habitat present
Freckled Duck *Stictonetta naevosa*		V	Open wetlands & adjoining agricultural areas	Moderate, potentially present in Calymea Creek and in the Bamerang offstream storage dam
Gang Gang Cockotoo *Callocephalon fimbriatum*		V	Woodlands, open forest	High, potential suitable habitat present
Giant Burrowing Frog *Heleioporus australiacus*	V	V	Heath, woodland and open forest with sandy soils.	High, potential suitable habitat present
Glossy Black-Cockatoo *Calyptorhynchus lathami*		V	Woodlands, open forest	High, potential suitable habitat present
Greater Broad-Nosed Bat *Scoteanax rueppellii*		V	Woodlands, open forest	High, potential suitable habitat present
Green and Golden Bell Frog *Litoria aurea*	E1	E1	Open wetlands & adjoining agricultural areas	Low, marginal
Grey-headed Flying-Fox *Pteropus poliocephalus*	V	V	Diversity of forest and modified habitats	High, potential suitable habitat present
Hooded Plover *Thinornis rubricollis*		E	Sandy open beaches, tidal bays and estuaries, rock platforms and rocky or sand-covered reefs near sandy beaches	Low potential, no suitable habitat
Koala *Phascolarctos cinereus*		V	Woodlands, open forest	High, potential suitable habitat present
Large-eared Pied Bat		V	Woodlands, open forest	High, potential suitable

Species*	Status		Associated preferred habitat	Potential to occur in proximity to proposed options
	EPBC Act	TSC Act		
Chalinolobus dwyeri				habitat present
Large-footed Myotis *Myotis adversus*		V	Woodlands, open forest near water	High, potential suitable habitat present
Little Bentwing-Bat *Miniopterus australis*		V	Woodlands, open forest	High, potential suitable habitat present
Littlejohn's Tree Frog *Litoria littlejohni*	V	V	Wet sclerophyll forests and rainforest streams	High, potential suitable habitat present
Long-nosed Potoroo *Potorous tridactylus*	V	V	Coastal heaths and dry and wet sclerophyll forests, with dense understorey and occasional open areas	Moderate, potential suitable habitat present
Masked Owl *Tyto novaehollandiae*		V	Woodlands, open forest	Moderate, potential suitable habitat present
Orange-bellied Parrot *Neophema chrysogaster*	CE	E	Bays, lagoons, estuaries, coastal dunes and saltmarshes	Unlikely potential no suitable habitat
Painted Snipe *Rostratula benghalensis*		E	Open wetlands & adjoining agricultural areas	Moderate, potentially present in Calymea Creek and in the Bamerang offstream storage dam
Parma Wallaby *Macropus parma*		V	Rainforest and wet sclerophyll forests	High, potential suitable habitat present
Powerful Owl *Ninox strenua*		V	Woodlands, open forest	High, potential suitable habitat present
Regent Honeyeater *Xanthomyza phrygia*	E1	E1	Woodlands, open forest	High, potential suitable habitat present
Rosenberg's Goanna *Varanus rosenbergi*		V	heath, open forest and woodland.	High, potential suitable habitat present
Sooty Owl *Tyto tenebricosa*		V	Rainforest and wet sclerophyll forests	High, potential suitable habitat present
Southern Brown Bandicoot *Isoodon obesulus obesulus*	E1	E	Heath or open forest with a heathy understorey on sandy or friable soils	Moderate, potential suitable habitat present
Spotted-tailed Quoll *Dasyurus maculatus*		V	Woodlands, open forest	High, potential suitable habitat present
Square-tailed Kite *Lophoictinia isura*		V	Woodlands, open forest	High, potential suitable habitat present
Stuttering Frog *Mixophyes balbus*	V	E1	Rainforest and wet sclerophyll forests	High, potential suitable habitat present
Swift Parrot *Lathamus discolor*	E1	E1	Woodlands, open forest	High, potential suitable habitat present
Turquoise Parrot *Neophema pulchella*		V	Woodlands, open forest	Moderate, potential suitable habitat present
White-footed Dunnart *Sminthopsis leucopus*		V	Coastal dune vegetation, coastal forest, tussock grassland and sedgeland, heathland, woodland and forest	High, potential suitable habitat present
Yellow-bellied Glider		V	Woodlands, open forest	High, potential suitable

Species*	Status		Associated preferred habitat	Potential to occur in proximity to proposed options
	EPBC Act	TSC Act		
Petaurus australis				habitat present
Yellow-bellied Sheathtail-Bat *Saccolaimus flaviventris*		V	Woodlands, open forest	High, potential suitable habitat present

E1 = endangered species; CE = Critically endangered species; V = vulnerable species

2.6 Migratory Species

The results of the EPBC Act 'Protected Matters' database search undertaken for the project indicated that there are 18 listed migratory species that could potentially occur within the study area (**Table 2-4**). Four of these species, the Regent Honeyeater, Swift Parrot, Orange-bellied Parrot and Painted Snipe, are also listed under as threatened species under the EPBC Act and/or the TSC Act (**Table 2-3**).

Table 2-4: EPBC Act listed migratory species with potential to occur in the study area

Listed migratory species	EPBC Act listing status	TSC Act listing status	Type of presence
Black-faced Monarch *Monarcha melanopsis*	Migratory	Not listed	Breeding may occur within area.
Cattle Egret *Ardea ibis*	Migratory	Not listed	Species or species habitat may occur within area.
Eastern Curlew *Numenius madagascariensis*	Migratory	Not listed	Species or species habitat likely to occur within area
Fork-tailed Swift *Apus pacificus*	Migratory	Not listed	Species or species habitat may occur within area.
Great Egret, White Egret *Ardea alba*	Migratory	Not listed	Species or species habitat may occur within area
Latham's Snipe, Japanese Snipe *Gallinago hardwickii*	Migratory	Not listed	Species or species habitat may occur within area.
Lesser Sand Plover *Charadrius mongolus*	Migratory	Schedule 2 Vulnerable	Species or species habitat likely to occur within area
Orange-bellied Parrot *Neophema chrysogaster*	Critically Endangered, Migratory	Schedule 1, Endangered	Species or species habitat may occur within area.
Pacific Golden Plover *Pluvialis fulva*	Migratory	Not listed	Species or species habitat likely to occur within area
Painted Snipe *Rostratula benghalensis s. lat.*	Migratory	Schedule 1, Endangered	Species or species habitat may occur within area.
Rainbow Bee-eater *Merops ornatus*	Migratory	Not listed	Species or species habitat may occur within area.
Ruddy Turnstone	Migratory	Not listed	Species or species habitat likely to occur within area

Listed migratory species	EPBC Act listing status	TSC Act listing status	Type of presence
Arenaria interpres			
Rufous Fantail *Rhipidura rufifrons*	Migratory	Not listed	Breeding may occur within area.
Satin Flycatcher *Myiagra cyanoleuca*	Migratory	Not listed	Breeding likely to occur within area.
Swift Parrot *Lathamus discolor*	Endangered, Migratory	Schedule 1, Endangered	Species or species habitat may occur within area.
White-bellied Sea-Eagle *Haliaeetus leucogaster*	Migratory	Not listed	Species or species habitat likely to occur within area.
White-throated Needletail *Hirundapus caudacutus*	Migratory	Not listed	Species or species habitat may occur within area.
Xanthomyza phrygia Regent Honeyeater	Endangered, Migratory	Schedule 1, Endangered	Species or species habitat likely to occur within area

2.7 Critical Habitat

A search was undertaken of the State and Commonwealth critical habitat registers, maintained respectively by the NSW Department of Environment and Climate Change (DECC), the NSW Department of Primary Industries (DPI) and the Commonwealth Department of the Environment, Water Heritage and the Art (DEWHA).

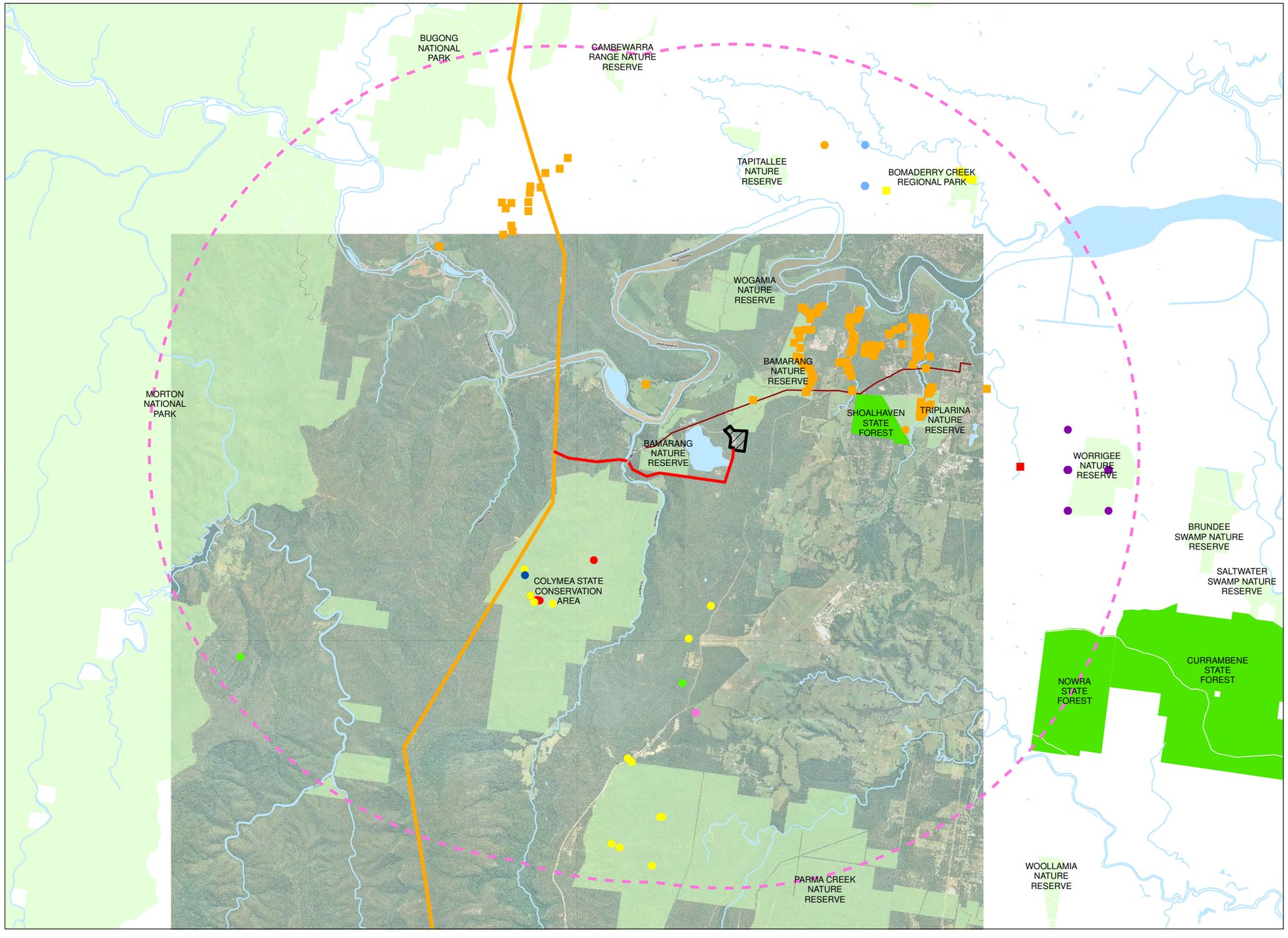
There is currently no registered critical habitat that is likely to be impacted by the proposed transmission line route. DECC have prepared a recommendation for the identification of critical habitat for the Bomaderry Zieria (*Zieria baeuerlenii*) within the Bomaderry bushland, located to the north east of the study area (DECC). This area would not be impacted by the transmission line route.

2.8 Conservation Reserves

There are two protected conservation areas within the study area, namely:

- Bamarang Nature Reserve
- Colymea State Conservation Area

These areas have been gazetted under the *National Parks and Wildlife Act 1974* (NPW Act) and fall under the jurisdiction of the NSW Department of Environment and Climate Change (DECC). Both reserves are located in close proximity to the proposal area and presented constraints to the original route selection for the proposed transmission line route. The potential impacts to these conservation reserves are assessed in this report.



Legend

- Existing 330 kV
- Proposed 330 kV
- 33 kV
- 10km buffer
- Proposed PS Site
- State Forest
- National Parks

Threatened Flora

- Acacia bynoeana
- Cryptostylis hunteriana
- Eucalyptus langleyi
- Eucalyptus sturgissiana
- Genoplesium baueri
- Melaleuca deanei
- Pterostylis gibbosa
- Solanum celatum
- Syzygium paniculatum
- Triplarina nowraensis
- Zieria baeuerlenii

Data Sources

Aerial Photograph - LPI, NSW
Topodata - Streetworks
Cadastre - LPI, 2007
Threatened Flora - DECC, NSW

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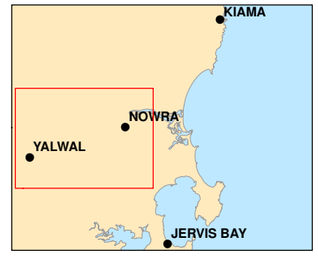

FIGURE 2-1: REGIONAL THREATENED FLORA RECORDS

BAMARANG GENERATION 330 kV NETWORK CONNECTION

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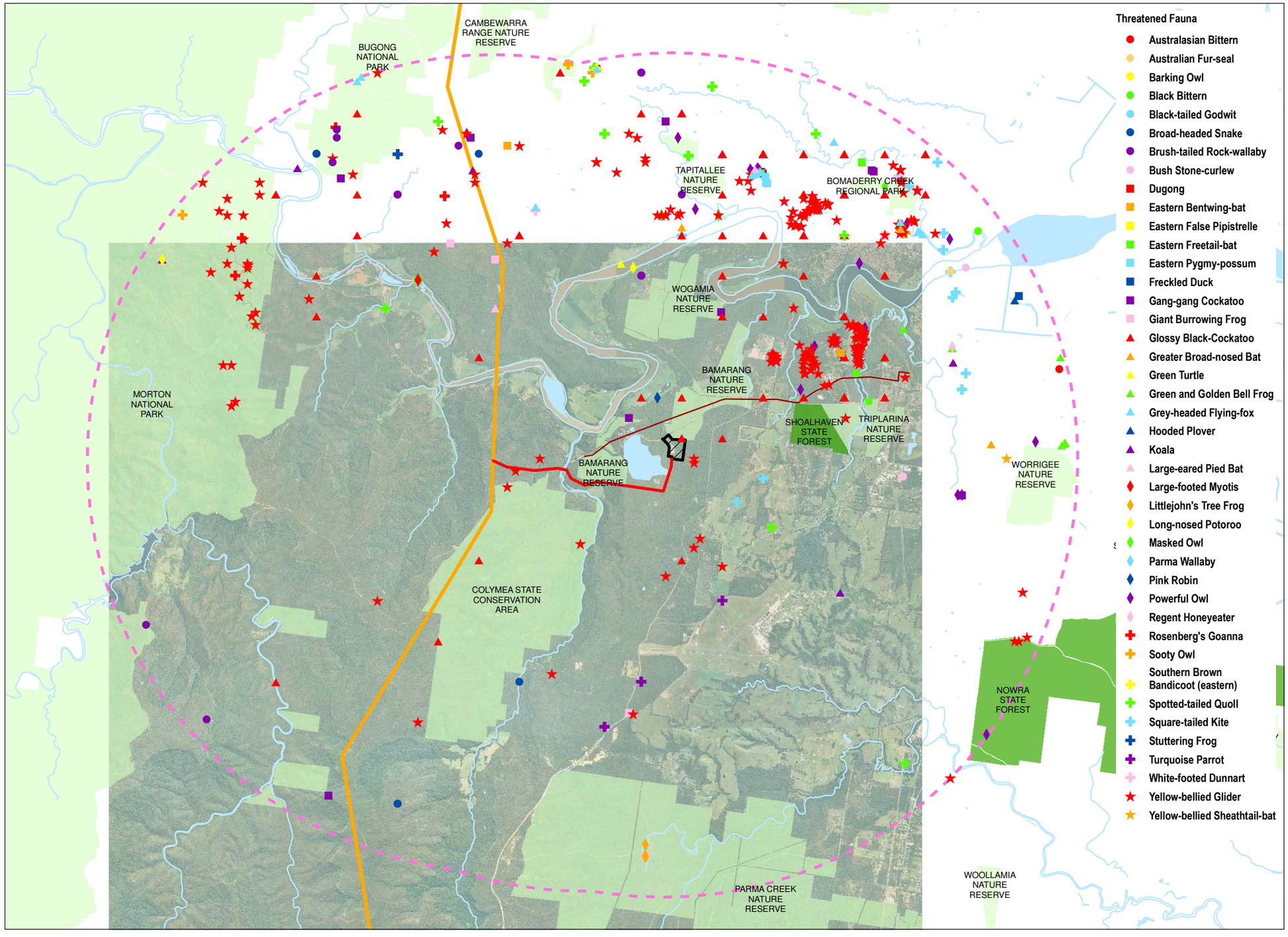

Legend

- Existing 330 kV
- Proposed 330 kV
- 33 kV
- 10km buffer
- Drainage
- Proposed PS Site
- State Forest
- National Parks

Data Sources

Aerial Photograph - LPI, NSW
Topodata - Streetworks
Cadastre - LPI, 2007
Threatened Fauna - DECC, NSW

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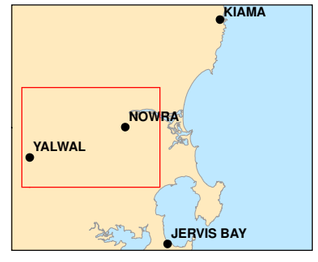

FIGURE 2-2: REGIONAL THREATENED FAUNA RECORDS

BAMARANG GENERATION 330 kV NETWORK CONNECTION

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3. Survey Methods

Site assessments for the proposed transmission route were conducted from the 23-27 February 2009. The extent and quality of native vegetation, fauna habitats and species diversity were recorded from an area approximately 100 metres wide along the proposed route, assessing the presence of endangered ecological communities and threatened species listed previously and assessing the habitat qualities in the study area for threatened species. General vegetation and habitat data was also collected for the surrounding proximal lands.

3.1 Flora Survey Methods

A flora survey was conducted along the entire proposal area concentrating on a search area approximately 50 m either side of the proposed easement centreline (i.e. direct impact area). The survey involved identification of the floristic diversity and structure of the vegetation and the type and distribution of vegetation communities which were mapped up to 100 m either of the project centreline. Field surveys were generally conducted as traverses along the study area with closer inspections of any areas of ecological significance. The condition of any vegetation within the study area was noted, including the extent of modification and weed invasion.

The vegetation and flora survey was based on the following broad objectives:

- Develop an inventory of flora species within the study area.
- Identify, describe and map the vegetation communities within the study area.
- Identify, describe and map threatened flora species (as defined under the EPBC Act and TSC Act), their habitat and distribution within the study area.
- Identify, describe and map endangered ecological communities (as defined under the EPBC Act and TSC Act) within the study area.
- Provide recommended mitigation measures for avoiding or minimising impacts to any significant species and/or vegetation communities for input into the Concept Design.

The methods adopted for the vegetation surveys followed a structured approach surveying the entire corridor through vegetated areas and comprising the following steps:

- A thorough review of available literature and scientific databases to gain an appreciation of the diversity of flora species that potentially occur in the local area.
- General replicate sampling to define vegetation communities, threatened species habitat and develop an inventory of flora species specific to each vegetation association.
- Targeted searches for threatened flora species in areas of suitable habitat.

The survey involved standard quadrat and transect based sampling, in conjunction with general traverses across the study area. Quantitative data on species richness was collected from quadrats (400m^2) sampled within each vegetation association. The dominant species within each plot were given a cover abundance score using a modified Braun-Blanquet cover scale. Data collected within each sample plot included:

- Height of structural layers (i.e. canopy, sub-canopy, shrub and groundcovers).
- Abundance/cover of each layer.
- Landscape features (i.e. slope, gully, aspect etc).
- Soil features (soil type, rocks, organic matter etc).
- Geographical coordinates and a photographic record.

Transect sampling was used to identify vegetation community boundaries. The mapping of vegetation communities was completed using field data, aerial photograph interpretation and other data sources such as contours and soils. All survey data were collected and digitised to produce descriptive maps of the vegetation communities present along the route.

General traverses comprised random searches throughout targeted areas and were used to develop a flora inventory and complete searches for threatened species, as well as opportunistically record the distribution of vegetation communities, significant habitat attributes and any other factors that may be of interest. Targeted transects were used in the surveys to determine the:

- Approximate boundaries between vegetation communities.
- Density and distribution of threatened flora species.
- Floristic composition of vegetation communities.

All areas of remnant vegetation were ground-truthed to determine the presence and extent of endangered ecological communities as previously listed in the report. Targeted searches for rare and threatened plant species were undertaken and if located, waypoints were recorded in the field using a global positioning system (GPS). A handheld GPS was also used to mark the presence of vegetation community boundaries hollow-bearing trees and any other matters of significance or interest.

3.2 Fauna Survey

The study site has the potential to provide habitat for a range of fauna and consequently a number of methods were employed to ascertain the potential importance of this area for native fauna, and in particular threatened species.

Habitat Assessment

A general fauna habitat assessment was undertaken to identify areas of potential habitat within the study area. Specific resources such as shelter, basking, roosting, nesting and foraging sites for amphibians, birds, bats, arboreal mammals, ground-dwelling mammals and reptiles were noted.

Animal scats found during the surveys were collected and identified to species level were possible using Triggs (1996). In addition, any indirect evidence of fauna (i.e. feathers, fur, tracks, dens, nests, scratches, chew marks and owl pellets) was recorded.

The presence of faunal species in the study area was determined primarily through the consideration of suitable habitats. Habitats were assessed by examining characteristics such as the structure and floristics of the canopy, understorey and ground vegetation, structure of the litter layer and other microhabitat features considered important for feeding, roosting and breeding, such as hollows trees and logs, creeks and wet areas and keystone flora species.

Avifauna

General

Surveys were conducted in the early morning or late afternoon using sample plot counts involving a 20-minute auditory and visual search within a 1 ha area. All species heard or sighted during this period were recorded and the location of any threatened species was mapped. The search area for each location is illustrated in Figure 3-2.

Glossy Black Cockatoo Feeding Habitat

The Glossy Black Cockatoo is listed as vulnerable on the TSC Act and is frequently recorded within the Shoalhaven area where it known to feed on the cones of *Allocasuarina* species. To ascertain the potential for the study area to provide foraging habitat for this threatened species, areas supporting stands of Black She-oak (*Allocasuarina littoralis*) or *Allocasuarina distyla* were mapped using GPS and aerial photography.

Mammals

In addition to the fauna habitat assessment spotlighting was conducted to detect the presence of any nocturnal arboreal mammals, some of which are listed as threatened under the TSC Act and EPBC Act. Spotlighting was conducted at four sites spaced along the length of the proposed powerline easement for at least one person hour per site.

Hollow-bearing Tree Counts

Hollow-bearing trees are a vital resource for the many native fauna species which are dependent on this resource for roost, nest and den sites, including microchiropteran bats, arboreal mammals and birds. A total of four transects approximately 100 m x 10 m wide were sampled across the proposed power easement to assess the density of hollow-bearing trees. Details recorded along each transect included:

- Tree Species;
- Height;
- Number of hollows; and
- Average hollow diameter.

The location of each transect is shown in Figure 3-2.

Ultrasonic Bat Call Detection

Two stationary ultrasonic bat call detectors (Anabat II, Titley Electronics) were used with storage Compact Flash Zero Crossing Analysis Interface Modules (CF ZCAIM) to record bat calls at 4 sites. Calls were recorded continuously between 1800 and 0500 hours on each occasion for 1 to 2 nights. This survey period ensured that the full spectrum of bat activity was recorded throughout the night.

Where possible calls were identified to genus or species level where possible using zero-crossing analysis and Analook software by visually comparing call traits with reference calls.

Spotlighting and listening for calls of megachiropteran bats (*Pteropus* spp) was conducted during spotlighting activities.

Hair-tube survey

Hair collection tubes were used to sample for arboreal and terrestrial mammals at four sites along the proposed power easement. A total of 10 tree-based and 10 ground-based hair tubes were placed at each site and baited with a either rolled oats and peanut butter or some tubes were baited with meat baits as an attractant for carnivores such as the Spotted-tailed Quoll. Hair-tubes were left in place for four nights and collected samples were sent to Barbara Triggs for analysis.

Opportunistic Records

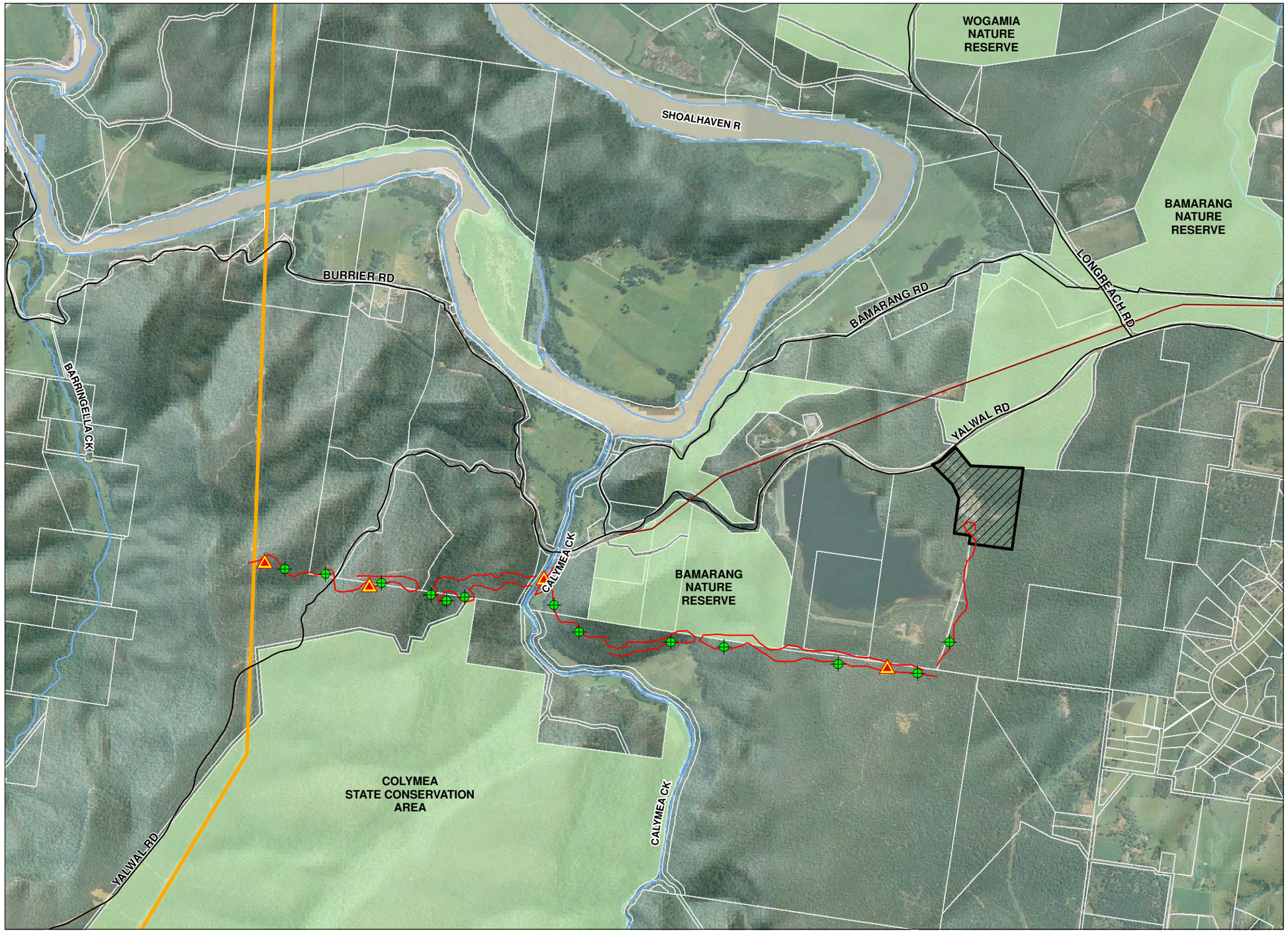
Incidental records of bird, amphibian and mammal species were collected during the entire survey period.

2.2.3 Weather conditions

Weather conditions during the survey period were fine, cool and sunny with average daytime temperatures of 23^0 C and minimum night temperatures 12^0 C.

3.3 Limitations

Several threatened orchid species are potentially present in the study area which if present were most likely undetectable during the survey period. Therefore the presence of these species in the study area has been assumed and an assessment of significance has been undertaken for these species.



Legend

- 330 kV
- 33 kV
- Roads
- Waterways
- Proposed PS Site
- National Parks
- Flora Quadrats
- Fauna Survey Site
- General Traverses

Data Sources

Aerial Photograph - LPI, NSW
Topodata - Streetworks
Cadastre - LPI, 2007

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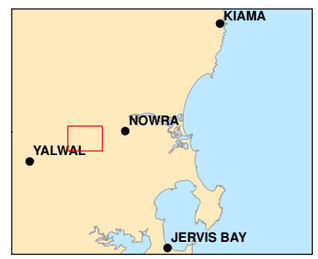

FIGURE 3-1: FLORA AND FAUNA SURVEY METHODS

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4. Results

The majority of the proposed powerline easement is situated within an un-disturbed landscape comprising naturally vegetated lands with little disturbance from agriculture, weed invasion or development. Some areas at the eastern end of the study area include cleared easements/ fire-breaks 10-15 m wide along fencelines surrounding Shoalhaven Water land.

4.1 Vegetation Communities

Eight native vegetation associations and two modified associations were identified along the proposed easement comprising:

- Map Unit 1: Scribbly Gum - Red Bloodwood Heathy Forest
- Map Unit 2: Spotted Gum - Red Bloodwood Forest
- Map Unit 3: Blackbutt - Peppermint Forest
- Map Unit 4: Wet Heath
- Map Unit 5: Escarpment Heathy Woodland
- Map Unit 6: Red Bloodwood - Apple Banksia/Paperbark Forest
- Map Unit 7: Rainforest
- Map Unit 8: Blue Gum/Bangalay Riparian Forest
- Map Unit 9: Cleared - Powerline Easement
- Map Unit 10: Cleared - Pasture

Description

Map Unit 1: Scribbly Gum - Red Bloodwood Heathy Forest

This community is confined to the eastern end of the study area on higher elevated plateau areas with shallow soils. The dominant canopy species comprise Scribbly Gum (*Eucalyptus sclerophylla*) and Red Bloodwood (*Corymbia gummifera*) with Grey Gum (*Eucalyptus punctata*) and White Stringybark (*Eucalyptus globoidea*) occurring less frequently although they may be locally dominant in sections of this community. The canopy is approximately 12-15m high.

The understorey comprises a heathy understorey 1-2 m high with a high diversity of shrub species and the occasional grass and sedge species. Dominant understorey shrubs include Hairpin Banksia (*Banksia spinulosa*), Mountain Devil (*Lambertia formosa*), Silky Hakea (*Hakea sericea*), Heath Phyllota (*Phyllota phylicoides*), Common Fringe-myrtle (*Calytrix tetragona*) and Round-leaf Teatree (*Leptospermum rotundifolium*). Other groundcover species included Wiry Panic (*Entolasia stricta*), *Austrostipa pubescens* and Screw Fern (*Lindsaea linearis*).

There is little disturbance within this community and is in a relatively good condition with the exception of some areas within private lands south of the Shoalhaven Water land which are disturbed from grazing and slashing. Areas of this community have been cleared along the boundary fence of the Shoalhaven Water lands (Plate 1).

Map Unit 2: Spotted Gum – Blackbutt – Red Bloodwood Forest

This is the most widespread association in the study area occurring on slope areas in central portions of the study area. The association is characterised by the dominance of Spotted Gum (*Corymbia maculata*), Blackbutt (*Eucalyptus pilularis*) and Red Bloodwood up to 18 m high. Other canopy species include Grey Gum, Turpentine (*Syncarpia glomulifera*), White Stringybark and Yellow Stringybark (*Eucalyptus muelleriana*). The sub-canopy layer varies from a sparse to moderate foliage cover and includes Old man Banksia (*Banksia serrata*) and Black She-oak (*Allocasuarina littoralis*) 5-10 m high.

The shrub and groundcover layers vary in structure and composition in this community in the study area depending on previous disturbances such as wildfire, aspect, slope and elevation. Some areas support dense thickets of Hop Bush (*Dodonaea triquetra*) (Plate 2). Other common shrub species include Burrawang (*Macrozamia communis*), Gorse Bitter-pea (*Daviesia ulicifolia*), Narrow-leaved Geebung (*Persoonia linearis*), *Platylobium formosum*, Hairy Bush-pea (*Pultenaea villosa*), Sunshine Wattle (*Acacia terminalis*), Rice Flower (*Pimelea linifolia*) and *Aotus ericoides*. Dominant grass species include Wiry Panic, Sword Sedge (*Lepidosperma laterale*), Kangaroo Grass (*Themeda australis*) and several *Lomandra* species. This community is in high condition with little disturbance apparent, apart from wildfire in several areas. Some areas appear to be regrowth areas recovering from past clearing.

Map Unit 3: Blackbutt - Peppermint Forest

This association occurs on protected slopes and gullies at the western end of the study area. The association is characterised by the dominance of Blackbutt and Sydney Peppermint (*Eucalyptus piperita*) 18-20 m high. Other canopy species include Red Bloodwood, Grey Gum and Turpentine. The sub-canopy includes a low cover of Black She-oak and Old Man Banksia.

Dominant understorey species include Hop Bush, Burrawang, *Acacia irrorata*, Broad-leaved Geebung (*Persoonia levis*), Maiden's Wattle (*Acacia maidenii*) and Bearded Heath (*Leucopogon ericoides*). In more protected areas such as gullies and east facing slopes the understorey is dominated by mesic shrub, fern and vine species such as Scentless Rosewood (*Synoum glandulosum*), *Myrsine variabilis*, Gristle Fern (*Blechnum cartilagineum*), Soft Bracken Fern (*Calochlaena dubia*), Wonga Vine (*Pandorea pandorana*) and Five-leaf water Vine (*Cissus hypoglauca*). This community is in good condition supporting a diversity of flora species and

various microhabitats such as rocky outcrops supporting orchid species, ferns, mosses and herbs which grow in these niche habitats.

Plate 1. Cleared easements/firebreaks through Map Unit 1 along boundary fence of Shoalhaven Water lands

Plate 2. Map Unit 2 showing dominance of Hop Bush

Map Unit 4: Wet Heath

This community is restricted to a broad drainage swale at the eastern end of the study area. It is characterised by a lack of a tree canopy and dense growth of a diversity of shrub and sedge species (Plate 3). Dominant species include Needle Hakea (*Hakea teretifolia*), Thyme Paperbark (*Melaleuca thymifolia*), Small-leaf Heath (*Epacris microphylla*), Chaffy Scale-rush (*Lepyrodia scariosa*) and several Tea-tree species (*Leptospermum* spp.). This community is exposed to grazing cattle and may have been slashed in the past.

Map Unit 5: Escarpment Heathy Woodland

This community is similar to Map Unit 1 apart from having a woodland structure with a sparse canopy cover and very dense heathy understorey which supports several species unique to this community. This association occurs on the escarpment areas towards the western end of the study area. Dominant canopy species comprise Grey Gum, Scribbly Gum and Red Bloodwood 10-12 m high with a low-moderate foliage cover. Dominant shrub species include Tick Bush (*Kunzea ambigua*), Small-leaf Tea-tree (*Leptospermum parvifolium*), Net-veined Wattle (*Acacia subtilnervis*), Mountain Devil, Hairpin Banksia and Heath Phyllota. Groundcovers are sparse in this area and include Wiry Panic, Sword Sedge and Chaffy Scale-rush.

This community is in good condition and is relatively free of disturbance besides several trails and a dumped car body. Three species were recorded in this community which are listed under the rare and Threatened Australian Plants (RoTAP) database (Briggs and Leigh 1996) comprising

Pultenaea villifera var. *Villifera, Leptospermum epacridoideum* and Net-veined Wattle (*Acacia subtilnervis*).

Map Unit 6: Red Bloodwood - Apple Banksia/Paperbark Forest

This association occurs in the central area of the study area on a higher elevated bench on the slope with sandy soils. The canopy is dominated by a mix of species including Red Bloodwood, Rough-barked Apple (*Angophora floribunda*), *Eucalyptus saligna x botryoides* and Blackbutt up to 18 m high. The sub-canopy is well developed and includes Snow-in-summer (*Melaleuca linariifolia*), *Acacia irrorata*, Maiden's Wattle and Old Man Banksia 5-10 m high. A diversity of shrubs and groundcovers are also present including Hairpin Banksia, Lance-leaf Beard-heath (*Leucopogon lanceolatus*), Stinkwood (*Zieria arborescens*), Mat-rush (*Lomandra longifolia*), Blunt-leaf Guinea-flower (*Hibbertia obtusifolia*), Coffee Bush (*Breynia oblongifolia*), Corkwood (Duboisia myoporoides) and Margined Panic (*Entolasia marginata*).

This community is in good condition having no obvious past disturbances. This community is quite unique in that it includes several species associated with moister floodplain areas such as Rough-barked Apple, *Eucalyptus saligna x botryoides* and Snow-in-summer.

Plate 3. Map Unit 4 Wet Heath showing lack of tree cover and dominance of shrubs

Plate 4. Calymea Creek on low tide showing adjacent River-flat Eucalypt Forest (Map Unit 8)

Map Unit 7: Rainforest

This community is restricted to a small area below a cliff line towards the western end of the study area (Plate 5 and 6). This presence of this community indicates a relatively protected easterly aspect which is somewhat protected from wildfire. The community supports a diversity of species not occurring in other areas of the study area. The canopy is dominated by Native Laurel (*Cryptocarya glaucescens*), Lilly Pilly (*Acmena smithii*), Guioa (*Guioa semiglauca*), Rusty Fig

(*Ficus rubignosa*) and Grey Myrtle (*Backhousia myrtifolia*) 10-20 m high. The understorey includes a diversity of shrubs, ferns, forbs and climbers including Bolwarra (*Eupomatia laurina*), Orange Thorn (*Pittosporum multiflorum*), Yellow Pittosporum (*Pittosporum revolutum*), Gristle Fern, Soft Bracken Fern, Basket Grass (*Oplismenus* spp.), Lawyer Vine (*Smilax australis*), Wonga Vine and Morinda (*Morinda jasminoides*). This community is in a good condition with little disturbance from weed invasion or wildfire evident. This community conforms to Lowland Rainforest a listed Endangered Ecological Community (EEC) under the TSC Act.

Map Unit 8: Blue Gum/Bangalay Riparian Forest

This community occurs along Calymea Creek in the central area of the study area which is tidal (Plate 4), and also a smaller distribution in a gully area adjacent to the paddock areas to the east of Calymea Creek. The canopy is up to 22 m high and is dominated by *Eucalyptus saligna x botryoides* with Rough-barked Apple also occurring in low abundance. A relatively dense sub-canopy is present 10-12 m high and is dominated by Grey Myrtle, Cheese Tree (*Glochidion ferdinandi*), Black Wattle (*Acacia mearnsii*) and Lilly Pilly. The shrub and ground layers include Yellow Pittosporum, Basket Grass (*Oplismenus* spp.), Margined Panic and Weeping Grass (*Microlaena stipoides*). There are also several vine species present including Silkypod (*Parsonsia straminea*), Scrambling Lily (*Geitonoplesium cymosum*) and Entire-leaf Clematis (*Clematis glycinoides*).

This community occurs adjacent to areas of pasture and weed species are invading the edges of this area. Although this the riparian zone is currently fenced it is likely to have been disturbed in the past from grazing and slashing. This community conforms to River-flat Eucalypt Forest an EEC listed under the TSC Act.

Map Unit 9: Cleared - Powerline Easement

The powerline easement at the western end of the study area comprises dense native shrubs forming a heathland structure. Few exotic species are present in this area with the dense shrub cover and low nutrient soils excluding their establishment. Native shrubs comprise species occurring the understorey of adjacent vegetation communities such as Tea-trees (*Leptospermum* spp.) and various pea species (*Pultenaea* spp., *Bossiaea* spp.).

Map Unit 10: Cleared - Pasture

Areas of pasture are present surrounding riparian vegetation Calymea Creek and also to the south of the proposal area to the east of Calymea Creek. These areas support a diversity of pasture grasses and herbs including Carpet Grass (*Axonopus affinis*), Pigeon Grass (*Setaria* spp.), Flatweed

(*Hypochaeris radicata*), Dandelion (*Taraxacum officinale*), Paddy's Lucerne (*Sida rhombifolia*), Purple-top (*Verbena bonariensis*) and White Clover (*Trifolium repens*).

Plate 5. Map Unit 7 Rainforest with *Ficus* spp. and epiphytic ferns

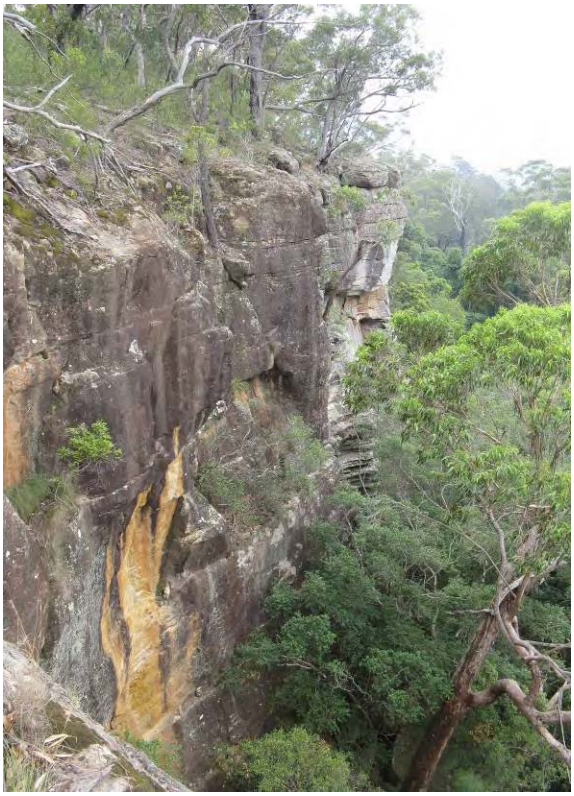
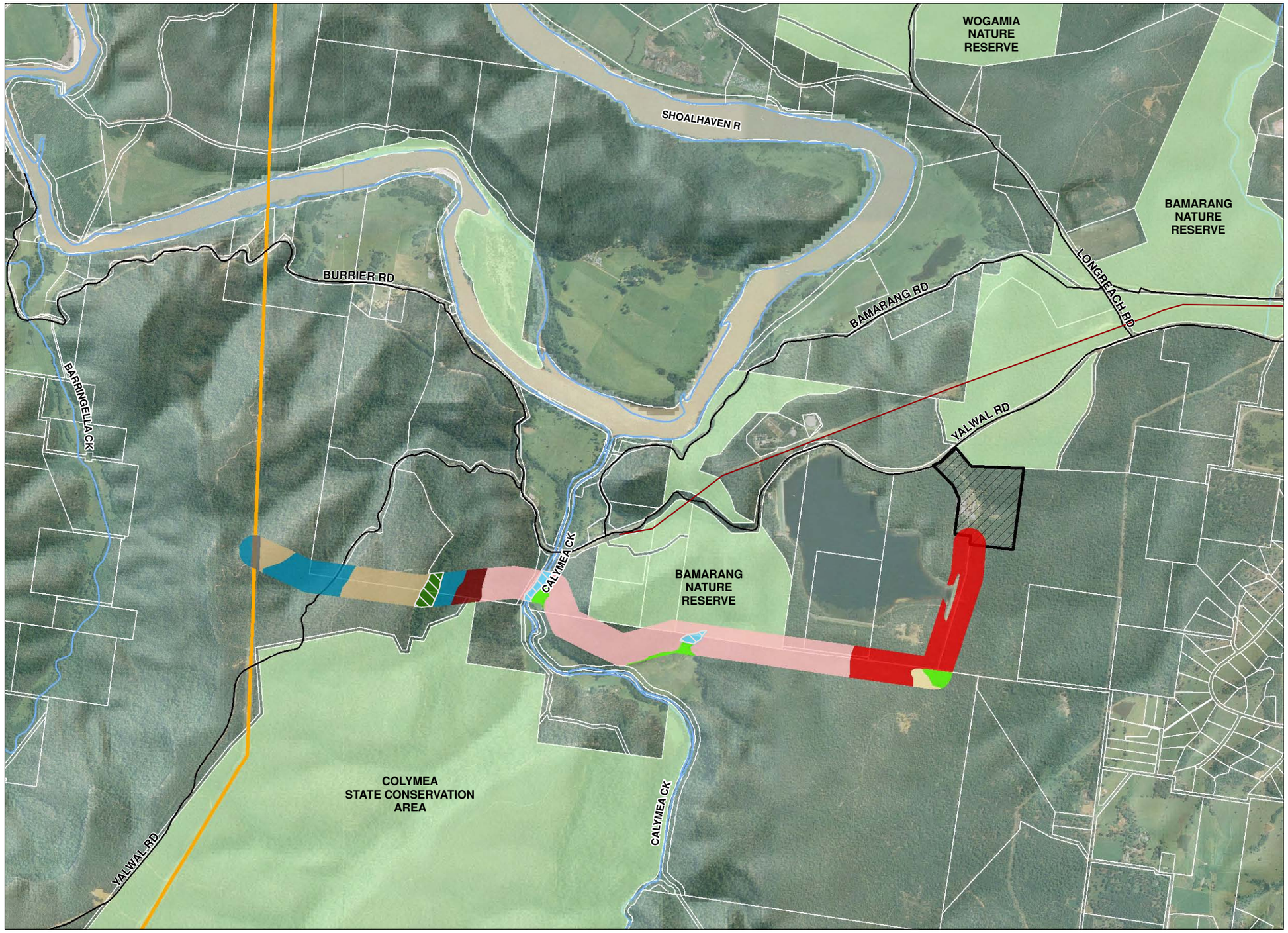


Plate 6. Cliff area in the study area above Map Unit 7



Legend

- 330 kV
- 33 kV
- Roads
- Waterways
- Proposed PS Site
- National Parks
- Endangered Ecological Communities

Vegetation Communities

- 1 - Scribbly Gum - Red Bloodwood Heathy Forest
- 2 - Spotted Gum - Blackbutt - Red Bloodwood Forest
- 3 - Blackbutt - Peppermint Forest
- 4 - Wet Heath
- 5 - Escarpment Heathy Woodland
- 6 - Red Bloodwood - Apple Banksia/ Paperbark Forest
- 7 - Rainforest
- 8 - Blue Gum/Bangalay Riparian Forest
- 9 - Cleared - Powerline Easement
- 10 - Cleared - Pasture

Data Sources

Aerial Photograph - LPI, NSW
Topodata - Streetworks
Cadastre - LPI, 2007

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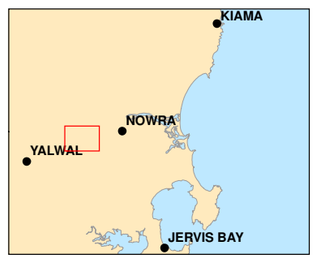

FIGURE 4-1: VEGETATION COMMUNITIES

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4.2 Floristic Diversity

Native flora species richness is high within the study area, with a total of 365 plant species from 82 families identified. This total comprised 268 species of dicotyledons, 74 species of monocotyledons, 20 species of fern, 1 conifer species and 1 cycad species,. Of the total species recorded only 16 species of introduced flora were identified mainly within disturbed areas such as pastures, representing approximately 4% of the total species recorded. A comprehensive list of the flora species present within the study area has been included as **Appendix C**.

4.3 Endangered Ecological Communities

The presence of two EECs (Schedule 1 part 3; TSC Act) was confirmed within the study area comprising:

- Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregion (Map Unit 7)
- River-flat Eucalypt forest of the NSW North Coast, Sydney Basin and Southeast Corner Bioregions (Map Unit 8)

These EECs occur within a restricted area of the study area comprising approximately 2.21 ha in total of River-flat Eucalypt Forest and approximately 1.93 ha of Lowland Rainforest. These distributions have been mapped within a 200 m corridor (the study area) and impacts will be restricted to a 60 m easement

4.4 Rare and Threatened Flora

Three rare flora species were recorded within the study area, notes on their distribution and abundance are provided below in Table 4-1. The potential presence of cryptic flora species unable to be detected during the survey period is also assessed.

- **Table 3-1 Rare flora species recorded from the study area and potentially occurring threatened flora**

Species	Status			Distribution and abundance within the study area and potential impacts
	EPBC Act	TSC Act	RoTAP	
RoTAP species recorded in/near the study area				
Acacia subtilnervis	-	-	3RCa	This species occurs throughout the Escarpment Heathy Woodland (Map Unit 5) in the central portion and at the western end of the study area. This species was relatively abundant in this map unit.
Leptospermum epacridoideum	-	-	2RC-	Only one individual of this species recorded in the vicinity of the Escarpment Heathy Woodland (Map Unit 5) in the central portion of the study area. Although not recorded in the study area it has potential to occur.
Pultenaea villifera var. *villifera*	-	-	3RC-	This species was recorded in low abundance in the study area on the western edge of the Escarpment Heathy Woodland (Map Unit 5) on the ecotone area between this community and

				the Blackbutt-Peppermint Forest (Map Unit 3) in the central portion of the study area.
Cryptic threatened species potentially occurring in the study area				
Caladenia tessellata	V	E	3VCa	Generally found in grassy sclerophyll woodland on clay loam or sandy soils. Areas of grassy understorey are limited in the study area, therefore this species is regarded as having a lower potential to occur, however could still be present. Flowers appear between September and November and so would not have been flowering during the survey period.
Cryptostylis hunteriana	V	V	3VC-	Larger populations typically occur in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black Sheoak (*Allocasuarina littoralis*) all of which are in the study area. Flowers from December to February so could potentially have been flowering during the survey period, however could easily be missed due to its generally cryptic nature. This species has a high potential to occur.
Genoplesium baueri	-	V	3RC-	Found in sparse sclerophyll forest and moss gardens over sandstone which were present on rocky outcrops within the study area. Surveys were conducted during the flowering period (Dec-March) and areas of suitable habitat were searched. However this species could easily be missed due to its small size and cryptic nature.
Prasophyllum affine	E	E	2E	Known from three areas south-east of Nowra on South Coast. Grows on poorly drained clay soils that support low heathland and sedgeland communities. Habitat is generally limited in the study area and is unlikely to be present.
Pterostylis gibbosa	E	E	2E	All known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage. Near Nowra, the species grows in an open forest of Spotted Gum (*Corymbia maculata*), Forest Red Gum (*Eucalyptus tereticornis*) and Grey Ironbark (*Eucalyptus paniculata)*. This type of vegetation association is not present in the study area however it could potentially occur in other associations in the study area. The flowering period is from August to November and so could not be detected if present during the field survey period. This species is regarded as having potential to occur.

RoTAP Codes
2 = geographic Range in Australia less than 100km
V = Vulnerable – at risk over longer period (20-50years)
R = Rare – uncommon plants with no current threats
C = Reserve
K = Poorly known
i = less than 100 plants in conservation reserves

EPBC Act and TSC Act Codes
V = Vulnerable

4.5 Fauna habitats

The naturally vegetated areas to be impacted by the proposal comprise open dry and wet sclerophyll forest habitats with a range of topographic variation from river flat floodplain to steep sandstone escarpment. Much of the vegetation identified is characterised by a dense canopy and dense mid- and understorey strata with high structural and floristic diversity. Tree cover is represented by a diversity of age classes and mature and hollow-bearing trees are well represented in naturally forested areas. Logs and rocks are also abundant.

The habitats present provide a diversity of features for a high diversity of fauna due to the expansive areas of intact vegetation and presence of mature, hollow-bearing trees. The diversity of resources present ranging from the low open canopy of the heathy woodland with dense shrub cover to the rainforest and escarpment forests provide a diversity of habitat suited to a large variety of fauna species.

Colymea Creek and the associated instream vegetation provides potential habitat for the Black Bittern (*Ixobrychus flavicollis*) which has been recorded in the past along the nearby Flat Rock Creek. However, all other creeks and drainage lines within the study. A complete list of fauna species recorded during the surveys is included in Appendix B.

The sandy soils and heathy vegetation provided potential habitat for ground-dwelling mammals such as bandicoots and the threatened Eastern Pygmy Possum (*Cercartetus nanus*). The hollow-bearing trees, extensive areas of Red Bloodwood and intact and connected vegetation also provided habitat for arboreal mammals such as the Greater Glider (*Petauroides volans*), Common Brushtail Possum (*Trichosurus vulpecula*) and Yellow-bellied Gliders (*Petaurus australis*) all of which were recorded from the surveys.

The numerous drainage lines across the study area provide potential habitat for a diversity of common frog species as well as the threatened Giant Burrowing Frog (*Heleioporus australiacus*). Limited habitat was also present for the Green and Golden Bell Frog along Calymea Creek and the adjacent drainage line that supported *Eleocharis sphacelata*. However given that the majority of the riparian vegetation along the creek supported a heath rather than grassy understorey, this is considered marginal habitat for the Green and Golden Bell Frog.

The open and exposed rocky escarpment areas along parts of the proposed easement are likely to provide suitable habitat for a diversity of reptiles including the threatened Broad-headed Snake Vegetation along the proposed easement supported abundant leaf litter, rocky areas and fallen logs and is therefore likely to provide good habitat for common reptiles.

A number of microbats were detected through echolocation recordings which included the

- Eastern Freetail Bat (*Mormopterus* sp.2);
- Large-eared Pied Bat (*Chalinolobus dwyeri*);
- Gould's Wattled Bat (*Chalinolobus gouldii*); an

4.6 Threatened Fauna

These habitats provide value to a diversity of bird, mammal, frog and reptile species. Populations of hollow-dependent fauna are expected to be well represented. Indeed the surveys identified the presence of the threatened fauna and potential habitat for threatened species, in particular:

- Grey-headed Flying-fox;
- Yellow-bellied Glider
- Forest Owls;
- Glossy Black Cockatoo;
- Broad-headed Snake;
- Large-eared Pied Bat; and
- Tree-roosting bats

The Square-tailed Kite (*Lophoictinia isura*) and Regent Honeyeater (*Xanthomyza phrygia*) have been recorded in close proximity to the study area and potentially would occur in the habitats identified along the power easement. Indeed the extensive areas of Spotted Gum (*Corymbia maculata*) present throughout the study area are likely to provide foraging habitat for the latter species as well as the endangered Swift Parrot (*Lathamus discolor*).

Potential habitat is also present throughout the study area for the Bush-stone Curlew (*Burhinus grallarius*) and Eastern Pygmy Possum. This species feeds on pollen and nectar of *Banksia*, Eucalypts and understorey plants. Extensive areas of potential habitat for the Eastern Pygmy Possum are associated with vegetation with a heathy understorey.

Potential habitat for the Southern Brown Bandicoot is also present throughout the majority of the study area. The dense heathy understorey, sandy soils and presence of groundcover species such as Spiny Mat Rush and Grass trees (*Xanthorrhoea* sp.) have the potential to provide breeding habitat for this species while the areas of grassy understorey would provide foraging habitat.

Similarly, the Long-nosed Potoroo has the potential to occur across the study area and particularly in areas where there is a mosaic of heath for shelter and open areas for foraging.

Potential habitat for the White-footed Dunnart is present throughout the study area and in particular in areas where there was an open understorey.

Extensive areas of potential feeding habitat for the Glossy Black Cockatoo were recorded within and adjacent to the proposed power easement.

The study area provides extensive habitat for threatened forest owls including Masked Owl (*Tyto novaehollandiae*), Powerful Owl (*Ninox strenua*) and Sooty Owl (*Tyto tenebricosa*).

Potential habitat for threatened bats occurs throughout the study area as evidence by the abundance of tree hollows and sandstone cave overhang.

4.6.1 Wildlife corridors and fragmentation

While there are no obvious wildlife corridors represented in the study area, the large expanse of connective habitat suggests that the proposed easement has potential to cause a degree of fragmentation which may impact on small ground-dwelling fauna. Mobile and wide-ranging species are not expected to be impacted significantly and in fact the opening up of an easement may benefit some species of fauna, such as edge and opening adapted species including the Masked Owl and microchiropteran bats.

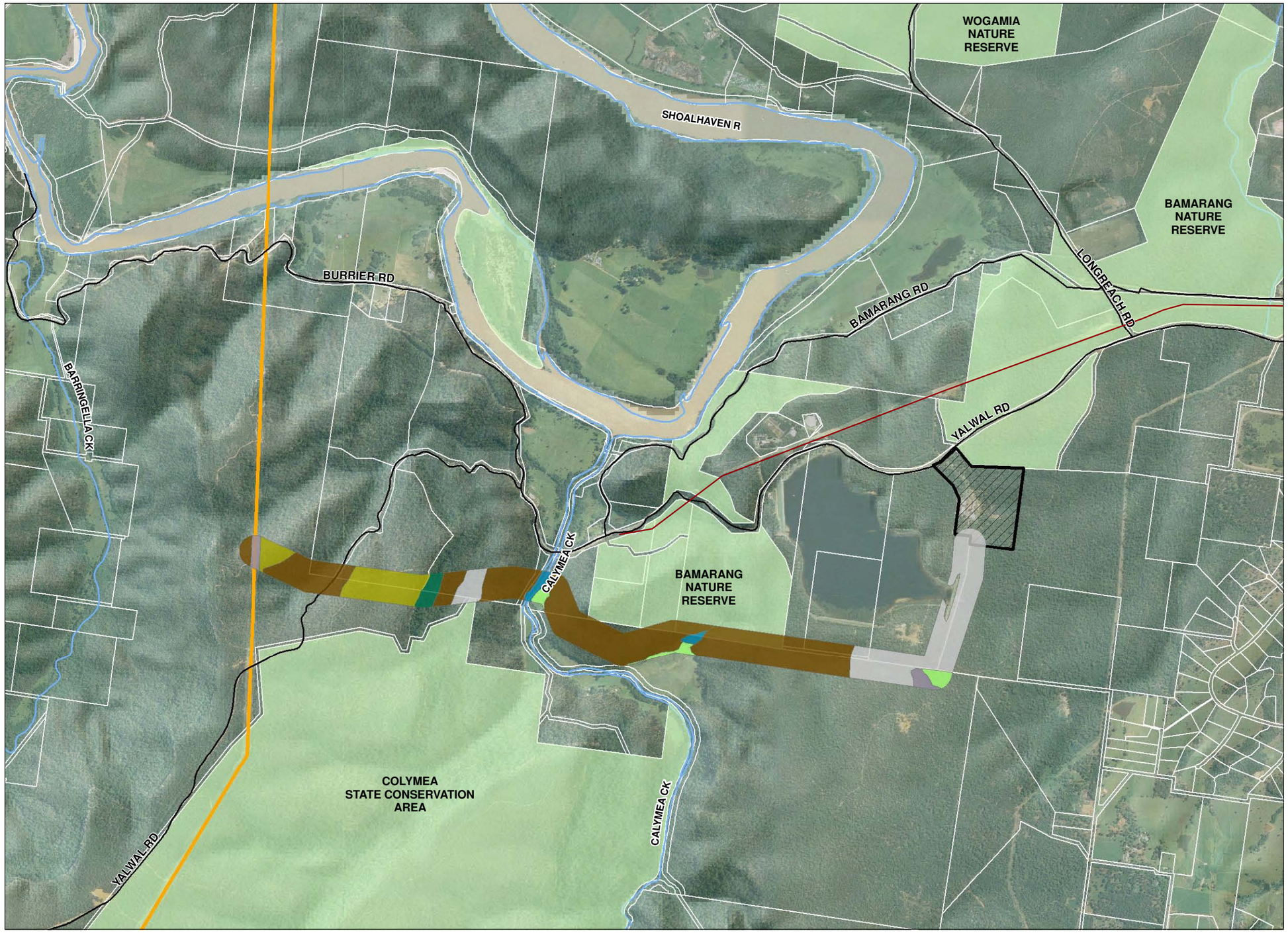
4.6.2 Habitat trees

Table 4-2 lists the density of hollow-bearing trees reported from counts along transects, most common tree species that supported hollows. Hollow-bearing trees are present across the majority of the study corridor and mostly represented in Scribbly Gums with hollows also present in Grey Gum, Red Bloodwood and stags.

Table 4-2. Number of hollow-bearing trees recorded from transect counts

Transect No.	Number of hollow bearing trees	Most common hollow-bearing species
1	15	Grey gum, Stringybark (mostly small to medium sized hollows)
2	12	Grey Gum, Rainforest species
3	20	Grey Gum, Bloodwood
4	18	Grey Gum, and Silvertop Ash (mostly small to medium sized hollows)

The exact numbers of hollow-bearing trees that would need to be removed for the current proposal is unknown but where possible hollow-bearing trees are to be avoided. The density reported is considered comparable with the surrounding landscape.



Legend

- 330 kV
- 33 kV
- Roads
- Waterways
- Proposed PS Site
- National Parks

Fauna Habitat

- Heathland
- Open Forest
- Open Forest with rocky outcrops
- Open Grassland
- Rainforest with cave habitats
- Riparian Forest - Tidal Creek
- Woodland / Heath

Data Sources

Aerial Photograph - LPI, NSW
Topodata - Streetworks
Cadastre - LPI, 2007

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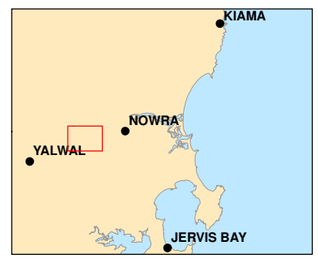

FIGURE 4-2: FAUNA HABITATS

BAMARANG GENERATION 330 kV NETWORK CONNECTION

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5. Impact Assessment

5.1 General Impacts Associated with the Proposal

The proposed construction of the 330 kV transmission line will require the partial removal/modification of approximately 30 ha of remnant vegetation based on clearing a 60 m wide easement. An additional area is required for the connecting substation site which is to be located in the southwest side of the approved gas power facility site. A review of the previous ecological field survey conducted for the power facility site EIS (GHD 2006) identifies the flora and fauna in this area. Accordingly it was determined that the site comprises open woodland dominated by Red Bloodwood / Scribbly Gum and Thin-leaved Stringybark which is not part of an Endangered Ecological Community. There are a total of four hollow-bearing trees present on the substation site.

The area of each vegetation community to be removed as to accommodate the 330 kV transmission easement is specified in **Table 5-1**. There is some scope to limit the amount of clearing in areas where vegetation will be below the required buffer distance between the vegetation and the proposed powerlines. Areas where minimal vegetation disturbance can be achieved include:

- Clearing of the rainforest area below the cliff line (Map Unit 7) could be avoided by spanning across this area from the top of the cliff area, as an adequate buffer is likely to be achieved between the spanning powerlines and the rainforest canopy.
- The Escarpment Heathy Woodland area (Map Unit 5) west of the cliff area which supports a sparse canopy approximately 10-12 m high and a dense shrub layer including several rare species. Clearing in this area could be restricted to taller trees and leaving the shrub layer intact, maintaining some biodiversity values.
- Gully areas where the powerlines can span across above the existing canopy minimising the need for clearing such as Calymea Creek.

Table 5-1: Potential removal / modification of vegetation communities required for the proposal

Map Unit	Community	Potential Removal / Modification (ha)
1	Scribbly Gum - Red Bloodwood Heathy Forest	6.6
2	Spotted Gum - Red Bloodwood Forest	13.57
3	Blackbutt - Peppermint Forest	3.25
4	Wet Heath	0.38
5	Escarpment Heathy Woodland	3.58
6	Red Bloodwood - Apple Banksia/Paperbark Forest	0.97
7	Rainforest (EEC)	0.67
8	Blue Gum/Bangalay Riparian Forest (EEC)	0.98
Total		**30 ha**

5.2 Rare and Threatened Flora Species

Impacts to rare flora species recorded in the study area will be limited to any individuals in the vicinity of the proposed pole locations and access trails provided the shrub layer can be retained within the proposed easement. Similarly for threatened species which potentially occur in the study area as many of these are shrub, herb or orchid species which can be retained within the easement, with direct impacts limited to the proposed pole locations and access trails. However it is likely that clearing of the canopy and larger shrubs will result in changes to the species composition and vegetation structure of the understorey, which may or may not advantage some of these species.

5.3 Endangered Ecological Communities

The proposal will potentially result in impacts to up to 0.7 ha of Lowland Rainforest and 0.3 ha of River-flat Eucalypt Forest. There is potential for the powerlines to span across these EECs as the topography surrounding these areas is likely to provide adequate height between the existing canopies and the spanning powerlines. For the purposes of this assessment it has been assumed that these areas will be impacted.

5.4 Threatened Fauna Species

The proposal will remove 30 ha of habitat which is potentially occupied by populations of several threatened fauna in particular the Grey-headed Flying-fox, Yellow-bellied Glider, Glossy Black Cockatoo, Eastern Pygmy Possum, Forest Owls, Ground-dwelling mammals and threatened microchiroperan bats. The loss of habitat will also remove hollow-bearing trees used by hollow-dependent fauna and important foraging resources for birds as well as fragment currently continuous areas of intact habitat.

Of particular consideration is the potential level of impact on local populations of the Grey-headed Flying-fox. The potential for impact on this species exists due to the presence of powerlines and not the associated small loss of foraging habitat which is widespread and expansive in the region. Indeed continued use of the habitat surrounding the easement is expected and this will bring bats in potential contact with the overhead wires, a known threat to the species through contact and electrocution.

The location of the powerline itself will not occur in close proximity to an identified roost camp such that frequent collisions and interruption to movements in the vicinity of a roost site will not occur. However, there is a risk associated with bats colliding and being electrocuted on the newly established overhead powerlines while accessing foraging habitat. This risk can potentially be mitigated if the powerlines are constructed so that the wires are not arranged in one plane or are greater than 1.6 metres apart, that is, greater than the wingspan of a flying-fox.

5.5 Erosion and Sedimentation

The sloping topography in the proposal area suggests there could be significant impacts from erosion of disturbed soils during rainfall. Sedimentation and erosion controls are to be used during construction proposed easement and powerlines and maintained where applicable. These structures should aim to limit excess nutrients and sediment leaving the proposed easement area.

5.6 Impacts to National Park Estates

The proposal will potentially have impacts to the following National Park Estates:

- Bamarang Nature Reserve to the south of the proposed easement area in the central area of the study area east of Calymea Creek.
- Colymea State Conservation Area to the west of Calymea Creek.

Clearing will be required to establish the proposed easement along the boundary of Bamarang Nature Reserve. This will potentially result edge effects affecting Bamarang Nature Reserve, however the lack of weed invasion prevalent in this area suggests edge effects will not be significant. Weed management mitigation measures will be implemented with the proposal to ensure weeds are not spread along the proposed easement. The proposed easement is downslope of Bamarang nature Reserve and therefore indirect impacts from erosion and run-off are not anticipated.

No impacts to Colymea State Conservation Area are anticipated with the proposed easement being situated to the north of the park boundary.

5.7 Key Threatening Processes

A number of Key Threatening Processes are likely or have potential to be activated with the proposal including:

- Clearing of native vegetation
- Removal of dead wood and trees
- Predation by the European Red Fox and Feral Cats
- Bush rock removal
- Infection of native plants by *Phytophthora cinnamomi*

Many of these key threatening processes can be avoided through implementation of the proposed mitigation measures. However several cannot be avoided only minimised such as clearing of native vegetation, removal of hollow trees and predation by foxes.

5.8 Potential Subject Species, Populations and Communities

Threatened species, populations and communities which will potentially be impacted from the proposal area listed in **Table 5-2**.

Table 5-2: Potential Subject Species and communities

Threatened Species and Communities	Potential Impacts	Assessment of significance undertaken
Endangered Ecological Communities		
River-flat Eucalypt Forest	Potential removal of 0.98 ha of this community along Calymea Creek and to the east of this area within a gully area. There is potential for clearing to be minimised in these areas	Yes
Lowland Rainforest	Potential removal of approximately 0.67 ha of this community below an escarpment area west of Calymea Creek	Yes
Threatened Flora Species		
Acacia bynoeana	This species was not recorded in the study area despite targeted searches. Large areas of potential habitat for this species are present in the study area. Shrub cover will be maintained within the proposed easement which is likely to continue to provide potential habitat for this species.	No
Caladenia tessellata	Generally found in grassy sclerophyll woodland on clay loam or sandy soils. Areas of grassy understorey are limited in the study area, therefore this species is regarded as having a lower potential to occur, however could still be present. Flowers appear between September and November and so would not have been flowering during the survey period.	Yes
Cryptostylis hunteriana	Flowers from December to February so could potentially have been flowering during the survey period. This species has potential to occur in the study area. Shrub cover will be maintained within the proposed easement which is likely to continue to provide potential habitat for this species.	Yes
Cynanchum elegans	This species was not recorded in the study area despite targeted searches within areas of the rainforest. Habitat for this species is restricted in the study area.	No
Eucalyptus langleyi	This species was not recorded in the study area despite targeted searches.	No
Eucalyptus sturgissiana	This species was not recorded in the study area despite targeted searches.	No
Genoplesium baureri	Found in sparse sclerophyll forest and moss gardens over sandstone which were present on rocky outcrops within the study area. Surveys were conducted during the flowering period (Dec-March) and areas of suitable habitat were searched. However this species could easily be missed due to its small size and cryptic nature.	Yes
Irenepharsus trypherus	This species was not recorded in the study area despite targeted searches within areas of the rainforest. Habitat for this species is restricted in the study area.	No
Melaleuca deanei	This species was not recorded in the study area despite targeted searches. Relatively large areas of potential habitat for this species are present in the study area. Shrub cover will be maintained within the proposed easement which is likely to continue to provide potential habitat for this species.	No
Pomaderris cotoneaster	This species was not recorded in the study area despite targeted searches. Habitat for this species is restricted in the study area.	No
Prasophyllum affine	Habitat is generally limited in the study area and is unlikely to be present.	No

Threatened Species and Communities	Potential Impacts	Assessment of significance undertaken
Prostanthera densa	This species was not recorded in the study area despite targeted searches. Large areas of potential habitat for this species are present in the study area. Shrub cover will be maintained within the proposed easement which is likely to continue to provide potential habitat for this species.	No
Pterostylis gibbosa	The flowering period is from August to November and so could not be detected if present during the field survey period. This species is regarded as having potential to occur. Shrub cover will be maintained within the proposed easement which is likely to continue to provide potential habitat for this species.	Yes
Rhizanthella slateri	This species is highly cryptic and extremely difficult to detect during field investigations. Shrub cover will be maintained within the proposed easement which is likely to continue to provide potential habitat for this species.	Yes
Solanum celatum	This species was not recorded in the study area despite targeted searches within areas of the rainforest. Habitat for this species is restricted in the study area.	No
Syzygium paniculatum	This species was not recorded in the study area despite targeted searches. Habitat for this species is restricted in the study area.	No
Triplarina nowraensis	This species was not recorded in the study area despite targeted searches. Large areas of potential habitat for this species are present in the study area. Shrub cover will be maintained within the proposed easement which is likely to continue to provide potential habitat for this species.	No
Zieria baeuerlenii	This species was not recorded in the study area despite targeted searches. Relatively large areas of potential habitat for this species are present in the study area. Shrub cover will be maintained within the proposed easement which will potentially continue to provide potential habitat for this species.	No
Threatened Fauna Species		
Grey-headed Flying Fox	The species was recorded at several locations during nocturnal surveys along the route, up to 40-50 bats in total were reported foraging on blossom/nectar from flowering Eucalypts. This potential for impact on this species exists due to the presence of powerlines and not the small loss of foraging habitat which is widespread and expansive in the region. Indeed continued use of the habitat surrounding the easement is expected and this will bring bats in potential contact with the overhead wires, a known threat through electrocution. The location of the powerline itself will not occur in close proximity to an identified roost camp such that frequent collisions and interruption to movements in the vicinity of a roost site will not occur. However, there is a risk associated with bats colliding and being electrocuted on the newly established overhead powerlines while accessing foraging habitat. This risk can potential be mitigated if the powerlines are constructed so that the wires are not arranged in one plane or are greater than 1.6 metres apart, that is, greater than the wingspan of a flying-fox.	Yes
Tree-roosting bats	Yellow-bellied Sheathtail Bat, Greater Broad-nosed Bat, Eastern Freetail Bat, Eastern False Pipistrelle. The route will remove up to 26 ha of open forest vegetation associated with narrow linear strips up to 60 m wide. While this clearing will involve the removal of hollow-bearing trees, the potential impact on these species is expected to be isolated and short term duration construction only and therefore unlikely to impose a significant or long term impact to local populations. Foraging and sheltering resources are abundant and widespread in open forest habitats surrounding the development and not impacted by the proposal.	No
Yellow-bellied Glider	The route will impact on known foraging habitat for several groups of gliders as well	Yes

Threatened Species and Communities	Potential Impacts	Assessment of significance undertaken
	as the loss of hollow-bearing trees (potential den habitat)	
Glossy Black-cockatoo	The route will remove up to approximately 26 ha of open forest vegetation comprises food resources for this species.	Yes
Swift Parrot	Impact on potential foraging habitat (up to 15 ha)	Yes
Regent Honeyeater	Impact on potential foraging habitat (up to 15 ha)	Yes
Australasian Bittern, Black Bittern Freckled Duck Painted Snipe Giant Burrowing Frog Littlejohns Tree Frog Stuttering Frog	Impacts to preferred or potential habitat for these species will be avoided by nature of the type of infrastructure proposed and the minimal disturbance expected to creeks, streams, ponds or wet areas by a requirement to site poles on higher topographic areas and the spanning of lines over low and naturally depressed areas.	No
Gang-gang Cockatoo	The route will remove up to 26 ha of open forest vegetation associated with narrow linear strips up to 60 m wide. While this clearing will involve the removal of potential foraging and sheltering habitat, the potential impact on this species is expected to be isolated and short term during construction only and therefore unlikely to impose a significant or long term impact to the local population. Foraging and sheltering resources are abundant and widespread in open forest habitats surrounding the development and not impacted by the proposal.	No
Turquoise Parrot	Habitat is marginal for this species where dense understorey occurs. Up to 3.5 ha of potential habitat may be removed via narrow linear strip up to 60 m wide. No expected to significantly impact on the presence of this species.	No
Eastern Pygmy Possum	Impact on potential habitat associated with a heathy understorey (approximately 10 ha).	Yes
Cave-roosting Bats	Refers to Large-eared Pied Bat, Eastern Bent-wing Bat, Little Bent-wing Bat, Large-footed Myotis. No impact on potential cave roosting habitat as the line will span over escarpment areas. Foraging habitat comprises all forest and modified landscapes including opening creating by clearings. No significant impacts expected on this species.	No
Broad-headed Snake Rosenbergs Goanna	Some disturbance may be required at tower locations however overall minimal impact expected on potential sandstone rocky landscapes as the line will span these features.	No
Southern Brown Bandicoot	Impact on approximately 25-30ha of potential habitat for this species particularly where dense understorey vegetation occurs.	Yes
Long-nosed Potoroo Parma Wallaby Spotted-tailed Quoll	The route will remove up to 26 ha of open forest vegetation associated with narrow linear strips up to 60 m wide. While this clearing will involve the removal of potential foraging and sheltering habitat, the potential impact on these species is expected to be isolated and short term during construction only and therefore unlikely to impose a significant or long term impact to local populations. Foraging and sheltering resources are abundant and widespread in open forest habitats surrounding the development and not impacted by the proposal.	No
Brush-tailed Rock Wallaby	Some disturbance may be required at tower locations however overall minimal impact expected on potential sandstone rocky landscapes as the line will span these features.	No
Koala	The route will remove up to 26 ha of open forest vegetation associated with narrow linear strips up to 60 m wide. While this clearing will involve the removal of potential food resources (mainly Grey Gum *Eucalyptus punctata*), the potential impact on this species is expected to be isolated and short term during construction only and therefore unlikely to impose a significant or long term impact to the local population.	No

Threatened Species and Communities	Potential Impacts	Assessment of significance undertaken
	Food resources are abundant and widespread in open forest habitats surrounding the development and not impacted by the proposal.	
Square-tailed Kite	No nest sites observed along the route. A wide ranging species that would forage over a large home range, continued use of the study area would be expected.	No
Bush stone Curlew	Habitat is marginal for this species where dense understorey occurs. Up to 3.5 ha of potential habitat may be removed via narrow linear strip up to 60 m wide. No expected to significantly impact on the presence of this species.	No
White-footed Dunnart	Impact on approximately 25-30 ha of potential habitat for this species particularly where dense understorey vegetation occurs	Yes
Forest Owls	Refers to Barking Owl, Powerful Owl, Sooty Owl and MaskedOwl Small strips of potential nesting and foraging habitat would be removed for forest owls along the proposed transmission line easements (approx 30ha). In addition, all of the areas adjacent to the study area support hollow-bearing trees and therefore potential roosting habitat for these species would remain within the locality and where possible construction would be undertaken to avoid hollow-bearing trees. The proposed vegetation removal is unlikely to represent a significant area of potential habitat in terms of owl use as much of it occurs on the fringes of stands and the majority of large hollow-bearing trees would be avoided where possible.	Yes

5.9 Environmental Planning and Assessment Act 1979

An assessment of the impacts of this proposal on species, populations and ecological communities listed under Schedules 1, and 2 of the TSC Act was undertaken. The proposal would be assessed under Part 3A of the EP&A Act and consequently this impact assessment was undertaken in accordance with the Draft *Guidelines for Threatened Species Assessment* (DEC 2005).

The assessment has concluded that the proposed development is unlikely to impose a 'significant impact' on local populations of threatened species, endangered communities or their habitats as listed under the TSC Act, provided the recommendations of this report are adequately implemented.

This conclusion is based on the premise that the proposed development will not significantly reduce the area of land currently occupied by Endangered Ecological Communities and threatened species in the local area given its narrow linear footprint. The high conservation value of remnant vegetation in the area has been recognised and the proposed infrastructure associated with the project has been located where possible to minimise impacts on native vegetation including threatened flora, fauna and ecological communities.

5.10 Environment Protection and Biodiversity Conservation Act, 1999

The Proponent has a statutory responsibility to comply with the requirements and intent of the Commonwealth *Environment Protection and Biodiversity Conservation Act*, 1999 (EPBC Act) in relation to the protection and management of threatened species. This assessment deals specifically

with the significance of impacts from the Proposal on nationally threatened species and commonwealth migratory species.

The assessment of nationally threatened species present within or known to utilise the study area has been undertaken in accordance with the significant impact criteria for endangered and vulnerable species as outlined in the Significant Impact Guidelines relating to matters of national environmental significance (DEH 2006) to determine whether the proposal would have a significant impact on any of these species, and hence on a matter of national environmental significance. The assessment is provided in **Appendix B**.

The assessment has concluded that the proposed development is unlikely to impose a 'significant impact' on local populations of national threatened species or their habitats as listed under the EPBC Act, provided the recommendations of this report are adequately implemented.

A number of listed migratory bird species have been recorded from the South Coast region which constitutes a part of the range area for migratory species such as the Satin Flycatcher, and Black-faced Monarch.

In regards to other migratory species, the areas proposed for upgrade of the power transmission project do not provide unique or critical habitat, preferred habitat, or habitat of significance for any of these species, and as discussed previously there would be very minimal impact on native vegetation resulting from the project. Construction of the proposed works would not affect the visitation rates and behaviours of these migratory species in the region.

6. Management Recommendations

6.1 Vegetation Clearance

- Where possible vegetation clearance should be minimised with pruning of tree branches preferred over full removal.
- Where possible access to power pole locations should utilise existing trails and disturbed areas.
- In gully areas and other topographic situations which allow for sufficient distance between the existing vegetation and the proposed powerlines, vegetation should be retained.
- The cleared easement areas along the boundary fence of Shoalhaven Water land at the western end of the study area should be utilised as part of the easement to minimise clearing in this area.

6.2 Endangered Ecological Communities

The topographic elements surrounding the EECs in the study area provide opportunities to avoid clearing in these areas.

- River-flat eucalypt Forest along Calymea Creek could possible be retained through spanning the proposed powerlines from pole locations higher on adjacent slopes. Above the existing vegetation.
- The area of Lowland Rainforest is situated beneath a steep escarpment area providing sufficient height to span across this area.

6.3 Fauna Habitat

Individual habitat features of conservation significance within the study area that should be avoided where possible by the proposed easement clearing include:

- Trees with hollows
- Trees with a trunk diameter greater than 20 cm
- Standing dead trees greater than 3 metres in height
- Trees with bird nests
- Riparian vegetation zones

General habitat features of importance and appropriate management practices in the study area include:

- Fallen logs encountered within the works corridor should be pushed aside and retained in their natural state. Timber felled for clearing should be retained on the ground as cover for terrestrial fauna.

- Shrub cover - The loss of shrub cover should be minimised and ameliorated by the retention of felled vegetation to facilitate natural regeneration.

Large mature trees and trees with hollow cavities are considered significant microhabitat features for fauna as they provide shelter and breeding resources for species from all groups including birds, mammals, reptiles and frogs. The removal of hollow-bearing trees and hollow logs should be supervised by an experienced ecologist to minimise direct impacts to fauna potentially sheltering in these habitats.

6.4 Weed and Pathogen Management

Although weed species are limited to areas adjacent to paddock areas surrounding Calymea Creek, weed management should be implemented during the construction phase of the Proposal to limit the spread of exotic weed species. This should include:

- All construction machinery should be thoroughly washed down and sterilised to ensure weed propagules and pathogens such as Root Rot Fungus (*Phytophora cinnamomi*) are removed from equipment.

- The appropriate disposal of any exotic species cleared during construction.

6.5 Vegetation Offset

To offset the impacts of vegetation clearance and impose a neutral or beneficial outcome to biodiversity as a result of the project it is proposed that a compensatory habitat package be developed that focuses on offsetting similar habitat conditions at a ratio of 2 to 1.

Comparable habitats are widespread in the locality providing a number of options for offsetting impacts. Specifications for the compensatory habitat, including location, composition, quality and management of the habitat would be determined in consultation with the Department of Environment and Conservation.

6.6 Minimising impacts to Grey-headed Flying-fox

This potential for impact on this species exists due to the presence of powerlines and not the small loss of foraging habitat which is widespread and expansive in the region. Indeed continued use of the habitat surrounding the easement is expected and this will bring bats in potential contact with the overhead wires, a known threat through electrocution.

The location of the powerline itself will not occur in close proximity to an identified roost camp such that frequent collisions and interruption to movements in the vicinity of a roost site will not occur. However, there is a risk associated with bats colliding and being electrocuted on the newly established overhead powerlines while accessing foraging habitat. This risk can potentially be

mitigated if the powerlines are constructed so that the wires are not arranged in one plane or are greater than 1.6 metres apart, that is, greater than the wingspan of a flying-fox.

6.7 Induction of construction personnel

Construction personnel should be aware of the importance of the vegetation and habitats in the area and other sensitive features including hollow-bearing trees, standing dead trees, trees with bird nests, fallen logs, and shrub cover. All construction personnel should be inducted to the study corridor and be aware of their environmental responsibilities, including the preservation of endangered ecological communities, threatened species, tree cover and riparian habitats. Construction personnel should inspect the trunk, foliage and limbs of any trees that require removal to prevent fauna mortality. If fauna species are present, these should be given the opportunity to move away from the construction zone prior to felling. Any animal injured during construction should be appropriately handled and transported to an animal care authority for attention. A stewardship should be encouraged over all fauna encountered, including poisonous snakes and no mortality of fauna should result knowingly from the construction.

7. Conclusions

This assessment has used the results of a comprehensive flora and fauna field survey in addition to records from threatened species databases and regional reports to identify the conservation value of the study area and assess the significance of impacts on State and Commonwealth listed ecological communities and threatened species as a result of the proposed project. It has concluded the following:

- The conclusions from an assessment of significance for all documented listed ecological communities and threatened and migratory species recorded or predicted to occur, indicates that there would be no significant impact as a result of the currently proposed power line project. This conclusion is based on the proposed design of the infrastructure including the narrow and limited nature of the disturbance, the size and extent of similar habitat throughout the locality, and the implementation of the recommended amelioration and mitigation measures of this report.
- The proposal would contribute to the key threatening process 'clearing of native vegetation' and in view of this comprehensive management recommendations are required to further minimise disturbance and impacts to vegetation adjacent to the corridor.
- Impacts on matters of National Environmental Significance as listed on the EPBC Act would be avoided.
- As a means of minimising the impact of the proposal on biodiversity, particular care and consideration should be given during the construction works in order to minimise threats and conserve areas of potential value to threatened species and the Endangered Ecological Communities. In this regard, strict construction management protocols as outlined in this report are to be implemented.

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Appendix A Assessment of Significance (Part 3A; EP&A Act)

A.1 Endangered Ecological Communities

Lowland Rainforest

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

Not Applicable

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The proposal will potentially result in the clearing of up to 0.67 ha of intact Lowland Rainforest which is in a high condition supporting little weed growth. There is potential to minimise impacts to this community through spanning the proposed powerlines above the existing canopy from the cliff area at the western end of the extant of this community. Small areas of Lowland Rainforest have been mapped in surrounding areas by Gellie (2005) to the south of the study area.

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

Not Applicable

How is the proposal likely to affect current disturbance regimes?

Current disturbance regimes within this area of Lowland Rainforest are minimal, as would be expected considering the isolated nature of this area and surrounding areas comprising relatively extensive areas of remnant vegetation. This area is protected from wildfire approaching from the west and northwest.

The proposal could potentially result in the introduction of exotic weed species from the construction of the powerlines. There is potential for weed propagules to be present on construction machinery which could spread into adjacent areas of remnant vegetation and are likely to be become established in areas disturbed by machinery. The proposal is unlikely to increase any other potential disturbance regimes.

How is the proposal likely to affect habitat connectivity?

Habitat connectivity could potentially be impacted to some degree if this area of Lowland rainforest is removed. There is a strip of Lowland Rainforest running along the base of the cliff which would be segregated by the proposed easement. However genetic exchange is unlikely to be significantly impacted as many insect pollinators are relatively mobile and wind pollination is likely to occur across a partially vegetated 60 m easement.

How is the proposal likely to affect critical habitat?

No critical habitat has been identified for this community.

River-flat Eucalypt Forest

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

Not Applicable

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The proposal will potentially result in the removal of 0.98 ha of this community surrounding Calymea Creek and in a gully area to the east of Calymea Creek. This area is in a moderate condition being affected by edge effects including weed invasion. This area was likely to have not been fenced in the past and subject to grazing and slashing activities. There is potential to minimise impacts to this community through spanning the proposed powerlines above the existing canopy from pole locations on the adjacent slopes.

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

Not Applicable

How is the proposal likely to affect current disturbance regimes?

Current disturbance regimes within River-flat Eucalypt Forest mainly comprise weed invasion and other edge effects. This area supports low-moderate abundances of pasture weeds and *Lantana camara*. If areas of this community are removed it is likely that the growth and spread of exotic species will increase in this area. The proposal is unlikely to affect other disturbance regimes such as grazing.

How is the proposal likely to affect habitat connectivity?

Habitat connectivity could potentially be impacted to some degree if this area of River-flat Eucalypt Forest is removed. The strip of River-flat Eucalypt Forest along the Calymea Creek would be segregated by the proposed easement. However genetic exchange is unlikely to be significantly impacted as many insect pollinators are relatively mobile and wind pollination is likely to occur across a partially vegetated 60 m easement.

How is the proposal likely to affect critical habitat?

No critical habitat has been identified for this community.

A.2 Threatened Flora

No threatened species were recorded in the study area, however there is potential for threatened orchid species to be present within the study area considering there cryptic nature and many of these were not flowering during the survey period. The following threatened orchid species will be assessed:

Crytostylis hunteriana (Vulnerable)

Genoplesium baueri (Vulnerable)

Pterostylis gibbosa (Endangered)

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

There is potential for the life cycle of these species to be impacted through:

- direct removal of individuals and areas of potential habitat
- modification of habitats resulting in them being unsuitable for the establishment of new individuals due to biophysical changes such as light and moisture levels and increased competition with other flora
- Impacts to habitat for pollinators of these orchid species resulting in decreased production of viable seeds.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

Potential habitat for these species will be removed in the vicinity of the proposed power pole locations and the access trail. Other areas will be modified from the proposal with impacts limited to removal of larger trees and shrubs resulting in some disturbance to the understorey. Microhabitat features potentially present for these species will be altered, however there is also potential for

additional microhabitats to be created in areas. The proposal is likely to lead to biophysical changes to areas of habitat.

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

Pterostylis gibbosa and *Genoplesium baueri* are at the limit of their distribution in the locality. Their southern distribution limit is identified as being the Nowra/Shoalhaven region.

How is the proposal likely to affect current disturbance regimes?

Current disturbance regimes areas of habitat are minimal, as would be expected considering the lack of development and agricultural within these areas and surrounding areas generally comprise relatively extensive areas of remnant vegetation besides a few areas of cleared paddocks.

The proposal could potentially result in the introduction of exotic weed species from the construction of the powerlines. There is potential for weed propagules to be present on construction machinery which could spread into adjacent areas of remnant vegetation and are likely to be become established in areas disturbed by machinery. The proposal also has the potential to increase erosion from slope areas along the study area with the clearing vegetation and associated soil disturbance.

How is the proposal likely to affect habitat connectivity?

The proposal will result in the fragmentation of areas of habitat for these species. However considering some vegetation will be retained within the proposed easement fragmentation is unlikely to be significant. Pollinators and seed dispersal mechanisms are unlikely to be significantly impacted.

How is the proposal likely to affect critical habitat?

No critical habitat has been identified for this species.

A.3 Threatened Fauna

The following threatened fauna species have been assessed:

- Grey-headed Flying Fox
- Swift Parrot and Regent Honeyeater
- Glossy Black-Cockatoo
- Eastern Pygmy Possum
- Southern Brown Bandicoot
- White-footed Dunnart
- Large Forest Owls

Grey-headed Flying Fox

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

This potential for impact on this species exists due to the presence of powerlines and not the small loss of foraging habitat which is widespread and expansive in the region. Indeed continued use of the habitat surrounding the easement is expected and this will bring bats in potential contact with the overhead wires, a known threat through electrocution. The location of the powerline itself will not occur in close proximity to an identified roost camp such that frequent collisions and interruption to movements in the vicinity of a roost site will not occur. However, there is a risk associated with bats colliding and being electrocuted on the newly established overhead powerlines while accessing foraging habitat. This risk can potentially be mitigated if the powerlines are constructed so that the wires are not arranged in one plane or are greater than 1.6 metres apart, that is, greater than the wingspan of a flying-fox.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

A number of roost camps of the Grey-headed Flying-fox are known from the Shoalhaven area including Bugong Creek, Comerong Island, Currockbilly Mountain, Kiola, and Yatteyattah. There is no existing roost sites within the areas selected for development of infrastructure for the transmission line project. Foraging resources for the Grey-headed Flying-fox occur throughout all naturally vegetated areas of the site and it is evident that this vegetation provides a portion of the foraging range of the local population of Grey-headed Flying-foxes given the number of individual bats observed during nocturnal surveys. The proposal would involve minimal removal of potential food resources (up to 30 ha in total) in the context of available habitat in the surrounding region.

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

The Grey-headed Flying-fox occurs along the east coast of Australia from Rockhampton in Queensland to western Victoria (Churchill 1998) and is not at the limit of its known distribution in the study area.

How is the proposal likely to affect current disturbance regimes?

Given the largely undisturbed nature of the majority of the habitats in the study area the proposed clearing a narrow linear strip through currently continuous habitat would potentially result in the introduction of exotic weed species and other edge effects up to 50 m from the edge of the easement clearing.

Further there is potential for weed propagules to be present on construction machinery which could spread into adjacent areas of remnant vegetation and subsequently become established in edge areas along the easement. The proposal also has the potential to increase erosion from slope areas along the study area with the clearing vegetation and associated soil disturbance leading to potentially increased sediment loads in local drainage areas.

Measures to mitigate the impact of these identified disturbances associated with clearing for the proposal are to be detailed in the statement of commitments.

How is the proposal likely to affect habitat connectivity?

While there are no obvious wildlife corridors represented in the study area, the large expanse of connective habitat suggests that the proposed easement has potential to cause a degree of fragmentation which may impact on small ground-dwelling fauna. Mobile and wide-ranging species are not expected to be impacted significantly and in fact the opening up of an easement may benefit some species of fauna, such as edge and opening adapted species including the Masked Owl and microchiropteran bats.

How is the proposal likely to affect critical habitat?

The proposal will not impact on roosting habitat of this species although will result in the loss of up to 30 ha of known and potential foraging habitat. The study area has not been identified as critical to this species in NSW, and similar value habitat is widespread in the Shoalhaven region.

Swift Parrot and Regent Honeyeater

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The distribution of records for both species in the south coast region has been consistently associated with lowland coastal forests dominated by Swamp Mahogany (*Eucalyptus robusta*) or drier forests and woodlands comprising a high density of Spotted Gum (*Corymbia maculata*) (Menkhorst 1999). This presence is a result of the winter flowering nature of these two keystone species and the reliance of these species on seasonally available winter food resources (nectar). The study area forms part of the larger regional area from the South Coast to upper Hunter Valley that is considered important as non-breeding habitat for a proportion of the population of these species.

It is likely that the clearing of 3.5 ha of Spotted Gum Forest will result in a loss of Spotted Gums (*Corymbia maculata*) from the local area. This species is widely distributed throughout the region including the surrounding landscape as well as conservation reserves and state forests. Approximately 6 300 ha of dry sclerophyll forest containing Spotted Gum as a component currently exists with the South Coast region alone (Gellie 2005). The vegetation proposed for removal represents a very low proportion of the potential habitat for these species in the region.

The Swift Parrot breeds solely in Tasmania (Swift Parrot Recovery Team 2000). There are no reported breeding records of the Regent Honeyeater in the locality. It is unlikely that the proposed vegetation removal will disturb nesting Regent Honeyeater habitat. The results of the literature review and field surveys along the route identify elements of the habitat that may be used by the assessed species, however it is evident that the impacts resulting from the clearing of vegetation for this proposal will be minimal and unlikely to be a significant impact on the life-cycles of the Swift Parrot and Regent Honeyeater.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The proposal will remove approximately 3.5 ha of vegetation potentially used by these species for foraging. This is a small percentage of the foraging habitat available throughout the distributional range of each species in the south coast region. The proposal is not expected to significantly impact on food resources available for either species in the South Coast Region. Both species are wide ranging a capable of exploiting seasonally available and wide spread food resources.

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

The Swift Parrot extends from its summer breeding grounds in Tasmania, from where it disperses to over-winter in south-east mainland Australia. Some individuals range north to Queensland, but the majority over-winter in Victoria and central and eastern New South Wales. The species returns to Tasmania in September.

The Regent Honeyeater was formerly distributed from much of the south-east mainland of Australia, with post-breeding dispersal to the north and west as far as South Australia and Queensland. Following severe population declines, the species appears generally restricted to north-east Victoria, some areas of the western slopes of New South Wales and the central coast. Some irruptions occur outside this range.

How is the proposal likely to affect current disturbance regimes?

Given the largely undisturbed nature of the majority of the habitats in the study area the proposed clearing a narrow linear strip through currently continuous habitat would potentially result in the introduction of exotic weed species and other edge effects up to 50 m from the edge of the easement clearing.

Further there is potential for weed propagules to be present on construction machinery which could spread into adjacent areas of remnant vegetation and subsequently become established in edge areas along the easement. The proposal also has the potential to increase erosion from slope areas along the study area with the clearing vegetation and associated soil disturbance leading to potentially increased sediment loads in local drainage areas.

Measures to mitigate the impact of these identified disturbances associated with clearing for the proposal are to be detailed in the statement of commitments.

How is the proposal likely to affect habitat connectivity?

While there are no obvious wildlife corridors represented in the study area, the large expanse of connective habitat suggests that the proposed easement has potential to cause a degree of fragmentation which may impact on small ground-dwelling fauna. Mobile and wide-ranging species are not expected to be impacted significantly and in fact the opening up of an easement may benefit some species of fauna, such as edge and opening adapted species including the Masked Owl and microchiropteran bats.

How is the proposal likely to affect critical habitat?

The proposal will not impact on breeding habitat for these species although will result in the loss of up to 3.5 ha of potential foraging habitat. The study area has not been identified as critical to these species in NSW, and similar value habitat is widespread in the Shoalhaven region.

Glossy Black-Cockatoo

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The proposal will remove up to 26 ha of open forest habitat comprising food resources (She-oaks *Allocasuarina* spp). The density of She-oaks within this area is not known or actually number of trees being utilised for foraging, although the evidence indicates that only select trees are sourced for foraging and these may be related to size and location. The removal of potential foraging habitat is small in comparison the extent of comparable habitat surrounding the proposed easement clearing and continued use of the study area for foraging is expected. Indeed Allocasuarina trees are a common component of the surrounding landscape.

The distribution of breeding pairs and location of nest sites is not known ad s surveys were concentrated along the actual easement area. However no nest sites were directly noted during the survey in the disturbance zone. There is potential for nest sites to be removed given the abundance of medium to large hollow cavities in the landscape. Opportunities for nesting will remain outside of the easement areas in the expansive forests adjoining.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The proposal will remove up to 26 ha of open forest habitat comprising food resources (She-oaks *Allocasuarina* spp). The density of She-oaks within this area is not known or actually number of trees being utilised for foraging, although the evidence indicates that only select trees are sourced for foraging and these may be related to size and location. The removal of potential foraging habitat is small in comparison the extent of comparable habitat surrounding the proposed easement clearing and continued use of the study area for foraging is expected. Indeed Allocasuarina trees are a common component of the surrounding landscape.

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

The species occurs in eastern Australia from central Queensland to Victoria.

How is the proposal likely to affect current disturbance regimes?

Given the largely undisturbed nature of the majority of the habitats in the study area the proposed clearing a narrow linear strip through currently continuous habitat would potentially result in the introduction of exotic weed species and other edge effects up to 50 m from the edge of the easement clearing.

Further there is potential for weed propagules to be present on construction machinery which could spread into adjacent areas of remnant vegetation and subsequently become established in edge areas along the easement. The proposal also has the potential to increase erosion from slope areas along the study area with the clearing vegetation and associated soil disturbance leading to potentially increased sediment loads in local drainage areas.

Measures to mitigate the impact of these identified disturbances associated with clearing for the proposal are to be detailed in the statement of commitments

How is the proposal likely to affect habitat connectivity?

While there are no obvious wildlife corridors represented in the study area, the large expanse of connective habitat suggests that the proposed easement has potential to cause a degree of fragmentation which may impact on small ground-dwelling fauna. Mobile and wide-ranging species are not expected to be impacted significantly and in fact the opening up of an easement may benefit some species of fauna, such as edge and opening adapted species including the Masked Owl and microchiropteran bats.

How is the proposal likely to affect critical habitat?

The proposal will potentially result in the loss of up to 30 ha of known and potential foraging habitat. The study area has not been identified as critical to this species in NSW, and similar value habitat is widespread in the Shoalhaven region.

Eastern Pygmy Possum

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The proposal will require the removal of up to 10 ha of forest habitat comprising a predominantly heathy understory and considered suitable for this species. The species feeds on the nectar of wide varietyof banksias, eucalypts, acacia and callistemon species. The extent of this habitat and associated food resources in the surrounding area is considerably larger than the area surveyed indicating potential habitat is widespread and a large population may occur. There will be sufficient areas of habitat remaining in the landscape to support a population of this species and any impacts would be imposed on only a small number of individuals, particularly given the small home ranges (males about 0.68 ha and females 0.35 ha)

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The proposal will require the removal of up to 10 ha of forest habitat comprising a predominantly heathy understory and considered suitable for this species. The species feeds on the nectar of wide variety of banksias, eucalypts, acacia and callistemon species and nests in tree hollows and small cavities in vegetation or under bark. The extent of this habitat and associated food resources in the surrounding area is considerably larger than the area surveyed indicating potential habitat is

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

The eastern pygmy possum occurs along eastern Australia from southern Queensland to Victoria and Tasmania

How is the proposal likely to affect current disturbance regimes?

Given the largely undisturbed nature of the majority of the habitats in the study area the proposed clearing a narrow linear strip through currently continuous habitat would potentially result in the introduction of exotic weed species and other edge effects up to 50 m from the edge of the easement clearing.

Further there is potential for weed propagules to be present on construction machinery which could spread into adjacent areas of remnant vegetation and subsequently become established in edge areas along the easement. The proposal also has the potential to increase erosion from slope areas along the study area with the clearing vegetation and associated soil disturbance leading to potentially increased sediment loads in local drainage areas.

Measures to mitigate the impact of these identified disturbances associated with clearing for the proposal are to be detailed in the statement of commitments

How is the proposal likely to affect habitat connectivity?

While there are no obvious wildlife corridors represented in the study area, the large expanse of connective habitat suggests that the proposed easement has potential to cause a degree of fragmentation which may impact on small ground-dwelling fauna. Mobile and wide-ranging species are not expected to be impacted significantly and in fact the opening up of an easement may benefit some species of fauna, such as edge and opening adapted species including the Masked Owl and microchiropteran bats.

How is the proposal likely to affect critical habitat?

The proposal will potentially result in the loss of up to 10 ha of potential habitat. The study area has not been identified as critical to this species in NSW, and similar value habitat is widespread in the Shoalhaven region.

Southern Brown Bandicoot

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The proposal will require the removal of up to 25-30 ha of forest habitat comprising a dense understorey and considered suitable for this species, particularly areas susceptible to occasional fire. The species feeds on earthworms and other invertebrates and prey species are expected to be in abundance throughout the surrounding landscape. The extent of suitable habitat and associated food resources in the surrounding area is considerably larger than the area surveyed indicating potential habitat is widespread and a large population may occur. There will be sufficient areas of habitat remaining in the landscape to support a population of this species and any impacts would be imposed on only a small number of individuals, particularly given the small home ranges (up to 7 ha).

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The proposal will require the removal of up to 25-30 ha of forest habitat comprising a dense understorey and considered suitable for this species, particularly areas susceptible to occasional fire. The extent of suitable habitat and associated food resources in the surrounding area is considerably larger than the area surveyed indicating potential habitat is widespread and a large population may occur. There will be sufficient areas of habitat remaining in the landscape to support a population of this species.

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

The northern limit of this species occurs in the Hawkesbury River area and extends south into Victoria, Tasmania, South Australia and Western Australia.

How is the proposal likely to affect current disturbance regimes?

Given the largely undisturbed nature of the majority of the habitats in the study area the proposed clearing a narrow linear strip through currently continuous habitat would potentially result in the introduction of exotic weed species and other edge effects up to 50 m from the edge of the easement clearing.

Further there is potential for weed propagules to be present on construction machinery which could spread into adjacent areas of remnant vegetation and subsequently become established in edge areas along the easement. The proposal also has the potential to increase erosion from slope areas along the study area with the clearing vegetation and associated soil disturbance leading to potentially increased sediment loads in local drainage areas.

Measures to mitigate the impact of these identified disturbances associated with clearing for the proposal are to be detailed in the statement of commitments

How is the proposal likely to affect habitat connectivity?

While there are no obvious wildlife corridors represented in the study area, the large expanse of connective habitat suggests that the proposed easement has potential to cause a degree of fragmentation which may impact on small ground-dwelling fauna. Mobile and wide-ranging species are not expected to be impacted significantly and in fact the opening up of an easement may benefit some species of fauna, such as edge and opening adapted species including the Masked Owl and microchiropteran bats.

How is the proposal likely to affect critical habitat?

The proposal will potentially result in the loss of up to 25-30 ha of potential habitat. The study area has not been identified as critical to this species in NSW, and similar value habitat is widespread in the Shoalhaven region.

White-footed Dunnart

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The extent of suitable habitat potentially impacted for this species is not known and difficult to predict. While the proposal will require the removal of up to 25-30 ha of forest habitat, much of this comprises a dense understorey and is probably unsuitable for this species which is known to prefer an open understorey and low density vegetation. The species feeds on a variety of invertebrates and possibly small skinks. Prey species are therefore expected to be in abundance throughout the surrounding landscape. The extent of suitable habitat and associated food resources in the surrounding area is considerably larger than the area surveyed indicating potential habitat is widespread and that there will be sufficient areas of habitat remaining in the landscape to support a population of this species and any impacts would be imposed on only a small number of individuals from the local population.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The extent of suitable habitat potentially impacted for this species is not known and difficult to predict. While the proposal will require the removal of up to 25-30 ha of forest habitat, much of this comprises a dense understorey and is probably unsuitable for this species which is known to prefer an open understorey and low density vegetation. The extent of suitable habitat and associated food resources in the surrounding area is considerably larger than the area surveyed indicating potential habitat is widespread and that there will be sufficient areas of habitat remaining in the landscape to support a population of this species.

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

The Shoalhaven is northern limit of this species range, however the distribution extends south through Victoria and Tasmania. Most records in the region are from the coastal plain and the Shoalhaven River escarpment.

How is the proposal likely to affect current disturbance regimes?

Given the largely undisturbed nature of the majority of the habitats in the study area the proposed clearing a narrow linear strip through currently continuous habitat would potentially result in the introduction of exotic weed species and other edge effects up to 50 m from the edge of the easement clearing.

Further there is potential for weed propagules to be present on construction machinery which could spread into adjacent areas of remnant vegetation and subsequently become established in edge areas along the easement. The proposal also has the potential to increase erosion from slope areas along the study area with the clearing vegetation and associated soil disturbance leading to potentially increased sediment loads in local drainage areas.

Measures to mitigate the impact of these identified disturbances associated with clearing for the proposal are to be detailed in the statement of commitments

How is the proposal likely to affect habitat connectivity?

While there are no obvious wildlife corridors represented in the study area, the large expanse of connective habitat suggests that the proposed easement has potential to cause a degree of fragmentation which may impact on small ground-dwelling fauna. Mobile and wide-ranging species are not expected to be impacted significantly and in fact the opening up of an easement may benefit some species of fauna, such as edge and opening adapted species including the Masked Owl and microchiropteran bats.

How is the proposal likely to affect critical habitat?

The proposal will potentially result in the loss of up to 25-30 ha of potential habitat. The study area has not been identified as critical to this species in NSW, and similar value habitat is widespread in the Shoalhaven region.

Large Forest Owls

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

Three species are considered for this assessment, the Masked Owl *Tyto novaehollandiae*, Sooty Owl *Tyto tenebricosa* and Powerful Owl *Ninox strenua*.

All three species are known to occupy very large territories, which is a reflection of their high mobility and diversity of prey species taken. Whilst the three species are known to occasionally roost by day in dense thickets of vegetation or foliage there nesting requirements are more specialised being totally dependent on suitably large tree-hollows generally found in the trunks of tall and mature trees.

Their dependence on this specific habitat feature restricts the local distribution of the species at least for breeding life-cycle requirements and highlights their vulnerability to increased clearing and fragmentation. Generally foraging territory is more widespread and may occur throughout a variety of habitat types depending on the species, with the Powerful Owl ranging from swamp forest to wet and dry sclerophyll, preferably with wet gullies for roosting, the Sooty owl preferring wet sclerophyll forest and rainforest and wet gullies and the Masked Owl favouring the more open forest and woodland types for foraging, particularly on the edge of open lands such as agricultural lands.

The proposal may remove existing or potential nest sites for these species, as large tree hollows do occur. Hover suitable hollows for nesting are not common in the easement area surveyed and were typically identified as small to medium sized hollows, too small for the large forest owls.

As mentioned the foraging needs of these species are meet by occupying large territories and any expected use of the proposed easement area would most likely be on occasion as other large areas of comparable foraging habitat also occur in the locality. The potential impacts on these large forest owl species as a result of the proposed clearing of vegetation are considered unlikely to impose a significant threat to the life-cycle components of the species.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The proposal will potentially remove between 10-20 ha of suitable habitat for each of these species. The area of habitat addressed within this assessment would constitute only a fraction of the area of potential habitat for these species which was identified throughout the surrounding landscape and greater Shoalhaven region. Furthermore, whilst the study area is expected to provide important habitat resources and assist in life-cycle events for these threatened forest owls, thus contributing as an area of known habitat, such resources are not solely restricted to the study area and are well replicated throughout the locality and region. Therefore the study area is not considered to be a significant area of known habitat in relation to the regional distribution of habitat for these threatened fauna.

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

None of these species are at the limit of their known distribution in the study area.

The southern subspecies of the Masked Owl is thinly distributed over much of eastern Australia, with the majority of records located over the broad coastal strip in forest and woodland around southern and eastern Australia. The scattering of records in inland Australia appear limited to those areas where River Red Gum (*Eucalyptus camaldulensis*) occurs (Debus & Rose 1994). Another subspecies occurs in north Australia.

Powerful Owls are distributed from south-western Victoria to about Yeppoon, in eastern Queensland, mostly on the coastal side of the Great Dividing Range, but distribution extends to the inland slopes in suitable areas (i.e. Pilliga scrub).

Sooty Owls occur along eastern Australia from central Queensland to Victoria and the Barking Owl is distributed throughout Australia, but is absent from the vast treeless deserts and heavily forested areas (Debus 1997).

How is the proposal likely to affect current disturbance regimes?

Given the largely undisturbed nature of the majority of the habitats in the study area the proposed clearing a narrow linear strip through currently continuous habitat would potentially result in the introduction of exotic weed species and other edge effects up to 50 m from the edge of the easement clearing.

Further there is potential for weed propagules to be present on construction machinery which could spread into adjacent areas of remnant vegetation and subsequently become established in edge areas along the easement. The proposal also has the potential to increase erosion from slope areas along the study area with the clearing vegetation and associated soil disturbance leading to potentially increased sediment loads in local drainage areas.

Measures to mitigate the impact of these identified disturbances associated with clearing for the proposal are to be detailed in the statement of commitments

How is the proposal likely to affect habitat connectivity?

While there are no obvious wildlife corridors represented in the study area, the large expanse of connective habitat suggests that the proposed easement has potential to cause a degree of fragmentation which may impact on small ground-dwelling fauna. Mobile and wide-ranging species are not expected to be impacted significantly and in fact the opening up of an easement may benefit some species of fauna, such as edge and opening adapted species including the Masked Owl and microchiropteran bats.

How is the proposal likely to affect critical habitat?

The proposal will potentially result in the loss of up to 25-30 ha of potential habitat. The study area has not been identified as critical to this species in NSW, and similar value habitat is widespread in the Shoalhaven region.

Appendix B Assessment of Significance on MNES (EPBC Act)

B.1 Threatened Fauna

This assessment deals specifically with the significance of impacts from the proposed development on the nationally endangered species Regent Honeyeater and Swift Parrot and the vulnerable species Grey-headed Flying-fox. The two bird species could be reasonably expected to utilise habitat that may be affected by the proposed activity. The vegetation to be removed is considered to represent a portion of important foraging habitat for a local population of the Grey-headed Flying-fox. All remaining nationally threatened fauna species are considered either not to occur in the study area, or the habitat is only very marginal in extent and quality and there would be no impacts on suitable habitat resulting from the proposed activity.

1. Lead to a long-term decrease in the size of an important population of a species.

- ***Swift Parrot and Regent Honeyeater***

The distribution of records for both species in the south coast region has been consistently associated with lowland coastal forests dominated by Swamp Mahogany (*Eucalyptus robusta*) or drier forests and woodlands comprising a high density of Spotted Gum (*Corymbia maculata*) (Menkhorst 1999). This presence is a result of the winter flowering nature of these two keystone species and the reliance of these species on seasonally available winter food resources (nectar). The study area forms part of the larger regional area from the South Coast to upper Hunter Valley that is considered important as non-breeding habitat for a proportion of the population of these species.

It is likely that the clearing of 3.5 ha of Spotted Gum Forest will result in a loss of Spotted Gums (*Corymbia maculata*) from the local area. This species is widely distributed throughout the region including the surrounding landscape as well as conservation reserves and state forests. Approximately 6 300 ha of dry sclerophyll forest containing Spotted Gum as a component currently exists with the South Coast region alone (Gellie 2005). The vegetation proposed for removal represents a very low proportion of the potential habitat for these species in the region.

The Swift Parrot breeds solely in Tasmania (Swift Parrot Recovery Team 2000). There are no reported breeding records of the Regent Honeyeater in the locality. It is unlikely that the proposed vegetation removal will disturb nesting Regent Honeyeater habitat. The results of the literature review and field surveys along the route identify elements of the habitat that may be used by the assessed species, however it is evident that the impacts resulting from the clearing of vegetation for this proposal will be minimal and unlikely to be a significant impact on the life-cycles of the Swift Parrot and Regent Honeyeater.

- ***Grey-headed Flying-fox***

Ongoing habitat removal, particularly in coastal areas is a continual threat to this species. Other threats include disturbance and modification of habitat near roosting camps and electrocution from contacting overhead wires. A number of roost camps of the Grey-headed Flying-fox are known from the Shoalhaven area including Bugong Creek, Comerong Island, Currockbilly Mountain, Kiola, and Yatteyattah. There are no existing roost sites within the areas selected for development of infrastructure for the transmission line project. Foraging resources for the Grey-headed Flying-fox occur throughout all naturally vegetated areas of the site and it is evident that this vegetation provides a portion of the foraging range of the local population of Grey-headed Flying-foxes given the number of individual bats observed during nocturnal surveys. The proposal would involve minimal removal of potential food resources (up to 30 ha in total) in the context of available habitat in the surrounding region.

This potential for impact on this species exists due to the presence of powerlines and not the small loss of foraging habitat which is widespread and expansive in the region. Indeed continued use of the habitat surrounding the easement is expected and this will bring bats in potential contact with the overhead wires, a known threat through electrocution. The location of the powerline itself will not occur in close proximity to an identified roost camp such that frequent collisions and interruption to movements in the vicinity of a roost site will not occur. However, there is a risk associated with bats colliding and being electrocuted on the newly established overhead powerlines while accessing foraging habitat. This risk can potential be mitigated if the powerlines are constructed so that the wires are not arranged in one plane or are greater than 1.6 metres apart, that is, greater than the wingspan of a flying-fox.

2. Reduce the area of occupancy of an important population

- ***Swift Parrot and Regent Honeyeater***

The proposal will remove approximately 3.5 ha of vegetation potentially used by these species for foraging. This is a small percentage of the foraging habitat available throughout the distributional range of each species in Australia. The proposal is not expected to significantly impact on food resources available for either species in the South Coast Region. Both species are wide ranging a capable of exploiting seasonally available and wide spread food resources.

- ***Grey-headed Flying-fox***

The proposal will remove approximately 30 ha of vegetation known to be used by this species for foraging habitat and comprising a diversity of seasonal food resources. This is a small percentage of the foraging habitat available throughout the distributional range of the Grey-headed Flying fox in the Shoalhaven region and indeed throughout Australia. The proposal is not expected to significantly impact on food resources available for local populations of the Grey-headed Flying-

fox. This species is wide ranging a capable of exploiting seasonally available and wide spread food resources.

3. Will the action adversely affect habitat critical to the survival of the species?

Habitat critical to the survival of a species refers to areas that are necessary:

- For activities such as foraging, breeding, roosting, or disposal;
- For the long-term maintenance of the species including the maintenance of other species essential to the survival of the species, such as pollinators;
- To maintain genetic diversity and long-term evolutionary development; or
- For the reintroduction of populations or recovery of the species.

- ***Swift Parrot and Regent Honeyeater***

As stated previously the study area forms part of the larger South Coast regional area that is considered important as non-breeding winter foraging habitat for a small proportion of the total populations of both species. It is likely that the clearing of 3.5 ha of Spotted Gum dominated forest will result in a loss of Spotted Gums (*Corymbia maculata*) from the local area which is the major keystone species attracting these birds to the region.

This small loss of Spotted Gum is not considered to significantly impact on future visitation rates or critical life-cycle events for these species. This resource and indeed the Spotted Gum Ironbark habitat is widely distributed throughout the region.

- ***Grey-headed Flying-fox***

The proposed area of disturbance represents a very small fraction of the known and potential foraging habitat for the Grey-headed Flying-fox in the South Coast region. This species typically exhibits very large home ranges and Grey-headed Flying-fox are known to travel distances of at least 15 km from roost sites to access seasonal foraging resources (Tidemann 1995). No evidence of a roosting colony of the Grey-headed Flying-fox was observed along the route.

4. Modify, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

- ***Swift Parrot and Regent Honeyeater***

The proposal will result in a comparatively small loss of Spotted Gum Ironbark forest habitat (i.e. 3.5 ha). This represents approximately a very small proportion of the total known occurrence of this community in the region (approximately 6300 ha). This loss of habitat will not lead to a decline in populations of either species or impact on future visitation rates in the region.

- ***Grey-headed Flying-fox***

The proposed area of disturbance represents a very small fraction of the potential foraging habitat for the Grey-headed Flying-fox in the South Coast region. This species typically exhibits very large home ranges and Grey-headed Flying-fox are known to travel distances of at least 15 km from roost sites to access seasonal foraging resources (Tidemann 1995). No evidence of a roosting colony of the Grey-headed Flying-fox was observed from the field surveys. The small loss of habitat is not expected lead to a decline in the local flying-fox population and continued use of the habitat surrounding the powerline is to be expected.

5. Result in invasive species that are harmful to a vulnerable species becoming established in the threatened species habitat.

Weeds have been recorded in the study area and could potentially spread to suitable habitat areas. The implementation of a weed management actions are required to target any weed invasions which could arise from the proposal will significantly reduce the potential impacts of weed species.

6. Interferes substantially with the recovery of the species

The proposal would not conflict with the recovery actions proposed for these nationally threatened species and would involve minimal impact to the potential habitat for these species in the regional area.

B.2 Migratory species

An action will require approval if the action has, will have, or is likely to have a significant impact on a listed migratory species. Several listed migratory bird species have been recorded from the region which constitutes a part of the range area for migratory species such as the Satin Flycatcher and Black-faced Monarch.

The EPBC Act Policy Statement 1.1 Significant Impact Guidelines (DEH 2006) were reviewed in assessing the significance of impacts from the modified proposal on migratory species. The guidelines indicate that an action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

1. Substantially modify (including fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species
2. Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for a migratory species; or
3. Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

The areas proposed for upgrade of the power transmission project do not provide unique or critical habitat, preferred habitat, or habitat of significance for these species, and as discussed previously there would be very minimal impact on native vegetation resulting from the project. Construction of the proposed works would not affect the visitation rates and behaviours of these species in the region.

Appendix C Flora Species List

Classification / Scientific name	Recent Synonyms	Common Name	Presence in Map Unit								
			1	2	3	4	5	6	7	8	10
Clubmosses, Quillworts and Fork-ferns											
SELAGINELLACEAE											
Selaginella uliginosa		Selaginella									
Ferns											
ADIANTACEAE											
Adiantum aethiopicum		Maidenhair Fern							1	1	
Adiantum formosum		Giant Maidenhair Fern							1		
Cheilanthes austrotenuifolia		Rock Cloak-fern			1						
Cheilanthes distans		Bristly Cloak-fern			1						
Cheilanthes sieberi subsp. *sieberi*		Slender Cloak-fern		1							
Pellaea calidirupium									1		
Pellaea falcata var. *falcata*		Sickle Fern			1						
ASPLENIACEAE											
Asplenium australasicum		Birds-nest Fern							1		
Asplenium flabellifolium		Necklace Fern			1				1		
BLECHNACEAE											
Blechnum cartilagineum		Gristle Fern			1						
Doodia aspera		Prickly Rasp-fern							1		
DAVALLIACEAE											
Arthropteris tenella		Arthropteris									
Davallia solida var. pyxidata		Hare's-foot Fern		1					1		
DENNSTAEDTIACEAE											
Calochlaena dubia	*Culcita dubia*	False Bracken		1	1				1	1	
Pteridium esculentum		Bracken	1	1	1					1	
GLEICHENIACEAE											
Gleichenia dicarpa		Pouched Coral-fern	1								
LINDSAEACEAE											

Classification / Scientific name	Recent Synonyms	Common Name	Presence in Map Unit								
			1	2	3	4	5	6	7	8	10
Lindsaea linearis		Screw Fern	1				1				
Lindsaea microphylla		Lacy Wedge-fern			1						
POLYPODIACEAE											
Platycerium bifurcatum		Elk-horn Fern									
Pyrrosia rupestris		Rock Felt-fern									
Cycads											
ZAMIACEAE											
Macrozamia communis		Burrawang	1	1	1						
Conifers											
PODOCARPACEAE											
Podocarpus spinulosus		Shrub Plum-pine									
Flowering Plants - Dicotyledons											
ACANTHACEAE											
Brunoniella australis		Blue Trumpet	1								
Brunoniella pumilio		Dwarf Blue Trumpet	1				1				
Pseuderanthemum variable		Pseuderanthemum		1					1	1	
APIACEAE											
Actinotus helianthi		Flannel Flower			1						
Actinotus minor		Lesser Flannel Flower					1				
Centella asiatica		Swamp Pennywort								1	
Hydrocotyle geraniifolia		Forest Pennywort								1	
Hydrocotyle peduncularis		Hairy Pennywort								1	
Hydrocotyle tripartita		Tre-foil Pennywort								1	
Platysace ericoides		Heathe Platysace					1				
Platysace lanceolata		Narrow-leaf Platysace		1							
Platysace linearifolia			1	1							

Classification / Scientific name	Recent Synonyms	Common Name	Presence in Map Unit								
			1	2	3	4	5	6	7	8	10
Xanthosia pilosa		Hairy Xanthosia	1	1	1						
Xanthosia tridentata		Three-tooth Xanthosia				1					
APOCYNACEAE											
Marsdenia rostrata		Common Milk Vine			1						
Parsonsia straminea		Common Silkpod								1	
Tylophora barbata		Bearded Tylophora			1				1	1	
ARALIACEAE											
Astrotricha latifolia		Broad-leaf Star-hair								1	
ASTERACEAE											
Bidens pilosa		Cobblers Peg	i								1
Cassinia aculeata		Dollybush			1						
Cassinia uncata		Sticky Cassinia		1							
Cirsium vulgare		Spear Thistle	i								1
Conyza spp.		Fleabane	i								1
Coronidium scorpioides		Button Everlasting	1								
Epaltes australis		Spreading Nut-heads								1	
Hypochoeris radicata		Catsear	i							1	1
Lagenophora gracilis	*Lagenifera gracilis*	Slender Bottle-daisy								1	
Microseris lanceolata		Yam Daisy	1								
Olearia microphylla				1							
Ozothamnus diosmifolius	*Helichrysum diosmifolia*	Tall Paperdaisy								1	
Senecio diaschides			1								
Senecio linearifolius		Fireweed Grounsel									
Senecio madagascariensis		Fireweed	i								1
Sigesbeckia orientalis		Indian Weed							1	1	
Taraxacum officinale		Dandelion	i								1
BIGNONIACEAE											
Pandorea pandorana		Wonga Vine			1						
CAMPANULACEAE											
Wahlenbergia spp.		Bluebell			1						
Wahlenbergia gracilis		Sprawling Bluebell		1	1						
CARYOPHYLLACEAE											
Stellaria flaccida		Forest Starwort							1		

Classification / Scientific name	Recent Synonyms	Common Name	Presence in Map Unit								
			1	2	3	4	5	6	7	8	10
CASUARINACEAE											
Allocasuarina nana	*Casuarina distyla*	Dwarf She-oak				1					
Allocasuarina littoralis	*Casuarina littoralis*	Black She-oak	1	1	1		1				
Casuarina cunninghamiana		River Oak								1	
CLUSIACEAE											
Hypericum gramineum		Narrow-leaf St. Johns Wort	1	1							
Hypericum japonicum		Matted St. Johns Wort	1								
CONVOLVULACEAE											
Dichondra repens		Kidney Weed								1	
Polymeria calycina		Woodland Bindweed								1	
CUNONIACEAE											
Callicoma serratifolia		Black Wattle			1						
Ceratopetalum gummiferum		Christmas Bush		1	1						
DILLENIACEAE											
Hibbertia aspera		Rough Guinea-flower			1						
Hibbertia dentata		Twining Guinea-flower			1						
Hibbertia fasciculata		Clustered Guinea-flower	1								
Hibbertia obtusifolia		Blunt-leaf Guinea-flower			1						
Hibbertia pedunculata		Peduncle Guinea-flower	1			1					
Hibbertia riparia		Erect Guinea-flower	1				1				
Hibbertia scandens		Climbing Guinea-flower		1						1	
DROSERACEAE											
Drosera sphathulata		Common Sundew	1								
EBENACEAE											
Diospyros australis		Black Plum									
ERICACEAE											
Astroloma pinifolium		Pine Heath									
Epacris microphylla		Small-leaf Heath	1			1	1				
Epacris pulchella		Coral Heath	1	1							
Leucopogon ericoides		Bearded Heath		1	1						
Leucopogon esquamatus			1								
Leucopogon juniperinus		Juniper Beard-heath		1	1						
Leucopogon lanceolatus var. lanceolatus		Lance-leaf Beard-heath		1	1						

Classification / Scientific name	Recent Synonyms	Common Name	Presence in Map Unit								
			1	2	3	4	5	6	7	8	10
Leucopogon virgatus		Common Beard-heath	1								
Lissanthe strigosa		Peach Heath		1			1				
Monotoca scoparia		Prickly Broom-heath		1	1		1				
Woollsia pungens		Woollsia		1							
ELAEOCARPACEAE											
Elaeocarpus reticulatus		Blueberry Ash		1	1						
Tetratheca thymifolia		Thyme-leaf Black-eyed Susan	1	1	1						
EUPHORBIACEAE											
Amperea xiphoclada		Broom Spurge	1	1							
Breynia oblongifolia		Breynia			1					1	
Glochidion ferdinandi var. ferdinandi		Cheese Tree							1	1	
Micrantheum ericoides			1			1					
Phyllanthus hirtellus	*Phyllanthus thymoides*	Thyme Spurge	1	1			1				
Poranthera ericifolia		Heath-leaf Poranthera	1				1				
Poranthera microphylla		Small Poranthera									
Ricinocarpos pinifolius		Wedding Bush		1	1						
EUPOMATIACEAE											
Eupomatia laurina		Bolwarra									
FABACEAE											
FABOIDEAE											
Aotus ericoides		Common Aotus	1	1	1		1				
Bossiaea ensata		Starggly Leafless Bossiaea	1								
Bossiaea heterophylla		Variable Bossiaea	1				1				
Bossiaea obocordata		Spiny Bossiaea	1	1	1		1				
Daviesia ulicifolia		Gorse Bitter-pea	1	1							
Desmodium rhytidophyllum		Rusty Tick-trefoil			1						
Desmodium varians		Slender Tick-trefoil			1						
Dillwynia ramosissima		Dwarf Parrot-pea	1		1						
Dillwynia retorta		Prickly Parrot-pea	1	1	1						
Dillwynia sieberi	*Dillwynia juniperina* pp	Prickly Parrot-pea					1				
Glycine clandestina agg.		Twining Glycine	1	1	1						
Glycine tabacina agg.					1						
Gompholobium grandiflorum		Large Wedge Pea	1	1			1				

Classification / Scientific name	Recent Synonyms	Common Name	Presence in Map Unit								
			1	2	3	4	5	6	7	8	10
Gompholobium huegelii		Small Wedge-Pea	1	1			1				
Gompholobium latifolium		Broad-leaf Wedge-pea		1							
Gompholobium minus		Dwarf Wedge-pea	1								
Goodia lotifolia var. *lotifolia*					1						
Hardenbergia violacea		Purple Twining-pea		1	1						
Hovea linearis		Narrow-leaf Hovea	1	1							
Indigofera australis		Native Indigo		1							
Kennedia rubicunda		Dusky Coral Pea			1						
Mirbelia rubiifolia		Mirbelia					1				
Phyllota grandiflora	*Phyllota phylicoides*	Heath Phyllota	1	1	1		1				
Platylobium formosum subsp. *formosum*		Handsome Flat-pea	1	1	1						
Pultanaea daphnoides		Large-leaf Bush-pea			1		1				
Pultenaea flexilis				1							
Pultenaea paleacea		Narrow-leaf Bush-pea									
Pultanaea retusa		Blunt-leaf Bush-pea	1	1	1						
Pultanaea tuberculata		Wreath Bush-pea	1			1	1				
Pultenaea villifera var. villifera DC			r		1						
Pultanaea villosa		Wallaby Tails			1						
Sphaerolobium vimineum		Sphaerolobium				1					
Trifolium repens		White Clover	i								1
MIMOSOIDEAE											
Acacia binervata		Two-veined Hickory								1	
Acacia brownei		Yellow Prickly Moses									
		Hedgehog Wattle		1	1		1				
Acacia echinula											
Acacia hispidula					1						
Acacia implexa		Hickory									
Acacia irrorata subsp. *irrorata*		Rough Green Wattle			1					1	
Acacia mearnsii		South Coast Green Wattle			1					1	
Acacia maidenii		Maiden's Wattle		1	1						
Acacia melanoxylon		Blackwood							1		
Acacia myrtifolia		Myrtle Wattle	1								
Acacia obtusifolia			1	1	1						

Classification / Scientific name	Recent Synonyms	Common Name		Presence in Map Unit								
				1	2	3	4	5	6	7	8	10
Acacia suaveolens		Sweet Wattle		1	1	1		1				
Acacia subtilnervis		Net-veined wattle	r									
Acacia terminalis		Sunshine Wattle		1	1	1		1				
Acacia ulicifolia		Prickly Moses			1	1						
GERANIACEAE												
Geranium solanderi var. *solanderi*		Native Cranesbill									1	
GESNERIACEAE												
Fieldia australis		Fieldia								1		
GOODENIACEAE												
Dampieria stricta		Blue Dampieria		1								
Goodenia hederacea subsp. *hederacea*		Ivy-leaf Goodenia		1	1			1				
Goodenia heterophylla		Variable-leaf Goodenia				1						
Goodenia ovata		Ovate Goodenia				1					1	
Goodenia paniculata		Panicled Goodenia		1			1					
Scaevola ramossissima		Purple Fan-flower		1	1			1				
HALORAGACEAE												
Gonocarpus micranthus subsp. *micranthus*	*Haloragis micrantha*	Creeping Raspwort		1			1					
Gonocarpus tetragynus		Poverty Raspwort		1								
Gonocarpus teucroides		Raspwort			1	1						
Myriophyllum spp.		Water-milfoil										
LAMIACEAE												
Plectranthus parviflorus		Cockspur Flower				1						
Prostanthera incana		Velvet Mint-bush										
Prostanthera incisa												
Prostanthera lasianthos		Victorian Christmas Bush										
LAURACEAE												
Cassytha glabella		Devils Twine		1								
Cassytha pubescens	*Cassytha paniculata*	Devils Twine									1	
Cryptocarya glaucescens		Native Laurel								1		
Cryptocarya microneura		Murrogun								1		
Endiandra sieberi		Cork Wood										
LOBELIACEAE												
Lobelia alata		Angled Lobelia		1								

Classification / Scientific name	Recent Synonyms	Common Name	Presence in Map Unit								
			1	2	3	4	5	6	7	8	10
Pratia purpurescens		White Root								1	
MALVACEAE											
Sida rhombifolia		Paddys Lucerene	i							1	1
MENISPERMACEAE											
Sarcopetalum harveyanum		Pearl Vine							1	1	
Stephania japonica		Snake Vine							1	1	
MONIMIACEAE											
Doryphora sassafras		Sassafras							1		
MELIACEAE											
Melia azedarach		White Cedar							1		
Synoum glandulosum		Scentless Rosewood			1				1		
MORACEAE											
Ficus coronata		Creek Sandpaper Fig							1		
Ficus rubiginosa		Port Jackson Fig			1				1		
MYRSINACEAE											
Myrsine howittiana	*Rapanea howittiana*	Brush Muttonwood		1					1		
Myrsine variabilis	*Rapanea variabilis*	Variable Muttonwood			1				1	1	
MYRTACEAE											
EUCALYPTS											
Angophora floribunda		Rough-barked Apple		1				1		1	
Corymbia eximia	*Eucalyptus eximia*	Yellow Bloodwood			1						
Corymbia gummifera	*Eucalyptus gummifera*	Red Bloodwood	1	1	1	1	1				
Corymbia maculata	*Eucalyptus maculata*	Spotted Gum		1	1						
Eucalyptus agglomerata		Blue-leaved Stringybark	1		1		1				
Eucalyptus beyeriana		Beyers ironbark		1	1						
Eucalyptus capitellata		Brown Stringybark									
Eucalyptus considiana			1								
Eucalyptus globoidea		White Stringybark		1							
Eucalyptus pilularis		Blackbutt		1	1						
Eucalyptus piperita	*Eucalyptus urceolaris*	Sydney Peppermint		1	1			1			
Eucalyptus punctata		Common Grey Gum	1	1	1		1				
Eucalyptus saligna x botryoides											
Eucalyptus saligna		Sydney Blue Gum			1						

Classification / Scientific name	Recent Synonyms	Common Name		Presence in Map Unit								
				1	2	3	4	5	6	7	8	10
Eucalyptus sclerophylla	*Eucalyptus haemostoma* var. *sclerophylla*	Scribbly Gum		1				1				
Eucalyptus sieberi		Silvertop Ash		1								
OTHER MYRTACEAE												
Acmena smithii		Lilly Pilly								1	1	
Harmogia densifolia	*Babingtonia densifolia*						1					
Backhousia myrtifolia		Grey Myrtle								1	1	
Callistemon linearis		Narrow-leaved Bottlebrush		1			1	1				
Callisteon rigidus		Stiff Bottlebrush			1							
Calytrix tetragona		Fringe-myrtle										
Kunzea ambigua		Tick Bush		1	1	1		1				
Leptospermum arachnoides		Spider Teatree										
Leptospermum continentale		Tea-tree		1			1	1				
Leptospermum epacridoideum			r									
Leptopspermum parvifolium		Small-leaf Tea-tree						1				
Leptospermum polygalifolium	*Leptospermum falvescens*	Yellow Tea-tree			1	1						
Leptospermum rotundifolium		Round Leaf Tea-tree		1			1	1				
Leptospermum trinervium	*Leptospermum attenuatum*	Flaky-bark Tea-tree			1	1	1	1				
Melaleuca linariifolia		Snow-in-Summer			1				1			
Melaleuca thymifolia		Thyme Paperbark		1			1					
Rhodamnia rubescens	*Rhodamnia trinervia*	Brush Turpentine								1		
Sannantha pluriflora												
Syncarpia glomulifera		Turpentine			1	1						
OLEACEAE												
Notelaea longifolia		Large Mock Olive									1	
Notelaea venosa		Smooth Mock Olive									1	
OXALIDACEAE												
Oxalis exilis		Yellow Oxalis									1	
PASSIFLORACEAE												
Passiflora edulis		Passion-fruit	i									
PIPERACEAE												
Piper novae-hollandiae		Giant Pepper Vine								1		
PITTOSPORACEAE												
Billardiera scandens		Apple-berry		1		1						

Classification / Scientific name	Recent Synonyms	Common Name	Presence in Map Unit								
			1	2	3	4	5	6	7	8	10
Bursaria spinosa		Blackthorn		1	1					1	
Pittosporum multiflorum	*Citriobatus multiflorus*	Orange Thorn							1		
Pittosporum revolutum		Yellow Pittosporum							1	1	
POLYGALACEAE											
Comesperma ericineum		Heath Comesperma	1								
PROTEACEAE											
Banksia marginata		Silver Banksia	1			1					
Banksia serrata		Saw Banksia	1	1	1			1			
Banksia spinulosa var. *collina*		Hill Banksia	1	1	1		1				
Hakea dactyloides		Broad-leaved Hakea	1		1	1	1				
Hakea sericea		Silky Hakea	1	1	1	1	1				
Hakea teretifolia		Needle Hakea				1					
Isopogon anemonifolius		Broad-leaf Drumsticks	1			1	1				
Isopogon prostratus		Prostrate Cone-bush	1								
Lambertia formosa		Mountain Devil	1	1			1				
Lomatia ilicifolia		Holly-leaf Lomatia	1	1			1				
Persoonia levis		Broad-leaf Geebung	1		1		1				
Persoonia linearis		Narrow-leaf Geebung		1	1		1				
Persoonia mollis subsp. leptophylla			1	1	1		1	1			
Petrophile pedunculata		Conesticks	1	1	1		1				
Telopea speciosissima		Waratah	1		1		1				
RANUNCULACEAE											
Clematis aristata		Toothed Clematis									
Clematis glycinoides		Entire-leaf Clematis			1					1	
RHAMNACEAE											
Alphitonia excelsa		Red Ash								1	
Pomaderris spp.		Pomaderris		1							
Pomaderris ferruginea							1				
ROSACEAE											
Rubus fruticosus agg.		Blackberry	i							1	
Rubus nebulosus		Green-leaved Bramble							1		
RUBIACEAE											
Morinda jasminoides		Morinda							1	1	

Classification / Scientific name	Recent Synonyms	Common Name		Presence in Map Unit								
				1	2	3	4	5	6	7	8	10
Opercularia varia		Small-leaved Stinkweed			1							
Pomax umbellata		Pomax		1	1							
Psychotria loniceroides		Hairy Psychotria								1		
Richardia brasiliensis		Mexican Clover	i									1
RUTACEAE												
Boronia ledifolia		Sydney Boronia		1		1		1				
Boronia pinnata		Pinnate Boronia				1						
Boronia polygalifolia		Waxy Boronia		1				1				
Correa reflexa		Common Correa			1							
Eriostemon australasius		Pink Wax-flower				1						
Melicope micrococca	*Euodia micrococca*	White Euodia								1		
Phebalium squamulosum		Scaly Phebalium									1	
Zieria arborescens		Stinkwood			1	1						
Zieria cytisoides		Downy Zieria				1						
Zieria pilosa		Hairy Zieria		1				1				
Zieria smithii		Sandfly Zieria		1		1		1			1	
SANTALACEAE												
Exocarpos cupressiformis		Cherry Ballart			1							
Leptomeria acida		Native Current		1	1							
SAPINDACEAE												
Alectryon subcinereus		Native Quince								1		
Dodonaea triquetra		Hop Bush			1	1		1			1	
Guioa semiglauca		Guioa										
SCROPHULARIACEAE												
Gratiola pedunculata												
SOLANACEAE												
Duboisia myoporoides		Poison Corkwood									1	
Solanum prinophyllum		Forest Nightshade				1						
Solanum pseudocapsicum		Jerusalem Cherry	i							1		
STERCULIACEAE												
Commersonia fraseri		Brush Kurrajong								1		
Rulingia dasyphylla		Kerrawang				1						
STYLIDIACEAE												

Classification / Scientific name	Recent Synonyms	Common Name	Presence in Map Unit								
				1	2	3	4	5	6	7	8	10
Stylidium graminifolium		Grass-leaf Trigger Plant		1								
Stylidium laricifolium		Larch-leaf Trigger Plant			1	1						
THEAPHRASTRACEAE												
Samolus valerandii		Common Brookweed									1	
THYMELEACEAE												
Pimelea linifolia subsp. *linifolia*		Slender Rice Flower		1	1	1		1				
ULMACEAE												
Trema tomentosa	*Trema aspera*	Native Peach				1					1	
URTICACEAE												
Urtica incisa		Scrub Stinging Nettle										
VERBENACEAE												
Clerodendrum tomentosum		Hairy Clerodendrum			1						1	
Lantana camara		Lantana	i								1	
Verbena bonariensis		Purple Top	i									1
VIOLACEAE												
Hybanthus monopetalus		Slender Violet-bush			1	1						
Melicytus dentatus	*Hymenanthera dentata*	Tree Violet									1	
Viola hederacea		Ivy-leaf Violet										
VITACEAE												
Cayratia clematidea		Slender Grape				1						
Cissus antarctica		Water Vine								1		
Cissus hypoglauca		Five-leaf Water Vine				1				1		
Flowering Plants - Monocotyledons												
ANTHERICACEAE												
Caesia parviflora var. parviflora		Pale Grass-lily		1								
Thysanotus tuberosus subsp. *tuberosus*		Common Fringe-lily					1					
ARACEAE												
Gymnostachys anceps		Caterpiller Flower								1		
ARECACEAE												
Livistona australis		Cabbage Tree Palm										
COLCHICACEAE												

Classification / Scientific name	Recent Synonyms	Common Name	Presence in Map Unit								
			1	2	3	4	5	6	7	8	10
Burchardia umbellata		Milkmaids	1								
CYPERACEAE											
Carex appressa		Tussock Tassel-sedge								1	
Caustis flexuosa		Curved Caustis	1			1					
Caustis recurvata		Curly Caustis				1					
Cyathochaeta diandra			1								
Cyperus gracilis		Slender Flat Sedge			1						
Gahnia spp.		Saw-sedge									
Gahnia sieberiana		Red-fruited Saw-sedge			1						
Isolepis inundata	*Scirpus inundatus*	Club-rush								1	
Lepidosperma forsythii		Zig-zag Rapier-sedge				1					
Lepidosperma gunnii		Small Rapier-sedge			1						
Lepidosperma laterale		Variable Sword-sedge	1	1	1		1				
Lepidosperma urophorum		Tussock Rapier-sedge	1	1		1	1				
Schoenus apogon		Common Bog-rush	1								
Schoenus melanostachys		Black Bog-rush		1		1					
ERIOCAULACEAE											
Eriocaulon scariosum		Common Pipewort									
HYPOXIDACEAE											
Hypoxis pratensis var. pratensis		Golden Weather-grass									
IRIDACEAE											
Patersonia glabrata		Cauline-leaf Purple-flag	1				1				
Patersonia sericea var. *sericea*		Basal-leaf Purple-flag	1	1	1		1				
JUNCACEAE											
Juncus prismatocarpus		Branching Rush	1								
LOMANDRACEAE											
Lomandra cylindrica			1								
Lomandra glauca subsp. *glauca*		Glaucous Mat-rush		1	1		1				
Lomandra filiformis subsp. *filiformis*		Wattle Mat-rush									
Lomandra longifolia subsp. *longifolia*		Spiny Mat-rush								1	
Lomandra multiflora subsp. *multiflora*		Many-flowered Mat-rush	1	1			1				
Lomandra obliqua		Twisted Mat-rush	1	1		1	1				
LUZURIAGACEAE											

Classification / Scientific name	Recent Synonyms	Common Name		Presence in Map Unit								
				1	2	3	4	5	6	7	8	10
Eustrephus latifolius		Wombat Berry				1					1	
Geitonoplesium cymosum		Scrambling Lily								1	1	
ORCHIDACEAE												
Bulbophyllum shepherdii		Wheat-leaved Orchid								1		
Cryptostylis spp.												
Cymbidium suave		Snake Flower										
Dendrobium speciosum var. *specisoum*	*Thelychiton speciosus*	Rock Orchid			1	1				1		
Dendrobium striolatum		Streaked Rock Orchid										
Thelymitra spp.		Sun-orchid					1					
PHILYDRACEAE												
Philydrum lanuginosum		Frogsmouth										
PHORMIACEAE												
Dianella caerulea var. *caerulea*		Leafy Blue Flax Lily		1	1	1		1				
POACEAE												
Anisopogon avenaceus		Oat Spear Grass		1	1			1				
Aristida benthamii		Three-awned spear grass										
Aristida ramosa		Three-awned Spear Grass		1	1			1				
Aristida vagans		Three-awned Spear Grass		1	1			1				
Austrodanthonia spp		Wallaby Grass		1								
Austrostipa pubescens	*Stipa pubescens*	Tall Spear Grass		1	1		1	1				
Austrostipa verticilliata	*Stipa verticilliata*	Slender Bamboo Spear Grass			1							
Axonopus affinis		Carpet Grass	i									1
Cynodon dactylon		Common Couch									1	1
Digitaria brownii		Cotton Panic Grass				1						
Echinopogon caespitosus		Hedgehog Grass									1	
Echinopogon ovatus		Hedgehog Grass									1	
Entolasia marginata	*Panicum marginatum*	Margined Panic									1	
Entolasia stricta		Wiry Panic		1	1	1	1	1				
Eragrostis brownii		Brown's Lovegrass		1								
Eragrostis tenuifolia		Elastic Grass	i									1
Imperata cylindrica		Blady Grass									1	
Microlaena stipoides var. *stipoides*		Weeping Grass									1	
Oplismenus aemulus		Broad-leaf Beard-grass									1	

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Classification / Scientific name	Recent Synonyms	Common Name	Presence in Map Unit								
			1	2	3	4	5	6	7	8	10
Oplismenus imbecillis		Narrow-leaf Beard-grass			1						
Panicum effusum		Hairy Panic	1								
Panicum simlie		Two-colour panic	1								
Paspalidium distans		Paspalidium								1	
Phragmites australis		Common Reed								1	
Plinthanthesis paradoxa		Wiry Wallaby Grass									
Setaria spp.		Pigeon Grass									1
Themeda australis	*Themeda triandra*	Kangaroo Grass	1	1							
RESTIONACEAE											
Empodisma minus		Spreading Rope-rush	1			1					
Lepyrodia scariosa		Chaffy Scale-rush	1			1	1				
SMILACACEAE											
Smilax australis		Lawyer Vine							1		
Smilax glyciphylla		Sweet Sarsparilla	1	1	1				1		
UVULARIACEAE											
Schelhammera undulata		Lilac Lily		1	1					1	
XANTHORRHOEACEAE											
Xanthorrhoea sp.		Grass-tree	1	1			1				
Xanthorrhoea concava		Grass-tree									
TOTALS											
Total Flora Species		*365*									
Total Number of Families		*82*									
Total Monocotyledons		*74*									
Total Dicotyledons		*268*									
Total Fern Species		*20*									
Total Conifer & Cycad Species		*2*									
Total Exotic Species		*16*									
Total RoTAP Species		*3*									

ABBREVIATIONS:
i = introduced (i.e. not indigenous to Australia)
n = native Australian species not considered to be indigenous to the site
c = cultivated (i.e. planted on the site)
t = listed as a threatened species under State and/or Commonwealth legislation

Classification / Scientific name	Recent Synonyms	Common Name	Presence in Map Unit								
			1	2	3	4	5	6	7	8	10
spp. = several species of the one genus (sometimes occurring as a hybrid swarm) sp. = unidentified species[4] sp. aff. = unidentified species with characteristics similar to the indicated species or genus[3] ? = unconfirmed species[4] var. = variety subsp. = subspecies cv. = cultivar (i.e. a anthropogenic form of the species) agg. = an aggregate of several yet to be defined species											
NOTES: 1. Recent 'synonyms' include misapplied names. 2. A sample flora assemblage obtained from a short term survey, such as the present one, cannot be considered to be comprehensive, but rather indicative of the actual flora assemblage. It can take many years of flora surveys to record all of the plant species occurring within any area, especially species that are only apparent in some seasons. 3. Not all species can be accurately identified in a 'snapshot' survey due to absence of flowering or fruiting material, etc.											
SCIENTIFIC NAMES & AUTHORITIES: Scientific names & families are those used in the *Flora of New South Wales* as maintained by the Royal Botanic Gardens (http://.plantnet.rbgsyd.gov.au). Orders and higher taxa are based on Angisperm Phylogeny Group (2003). For sake of simplicity, scientific names in this list do not include authorities. These can be found in the *Flora of New South Wales.*											

Appendix D Fauna Species

Key

DETECTION METHOD

MOD	Modified and cleared landscapes
EHW	Escarpment heathy woodland
RF	Rainforest
W	heard
P	indirect evidence (scats, chew marks, etc)
CD	Bat call detection

HABITATS

RPF	Riparian forest
MOD	Modified and cleared landscapes
EHW	Escarpment heathy woodland
RF	Rainforest
OF	Open forest communities (dry slerophyll)
OFHU	Open forest communities (heathy understorey)

FAMILY/Scientific Name	Common Name	OFHU	OF	RF	EHW	MOD	RPF
MAMMALIA							
TACHYGLOSSIDAE							
Tachyglossus aculeatus	Short-beaked Echidna				P		
DASYURIDAE							
VOMBATIDAE							
Vombatus ursinus	Common Wombat		O, P				P
PERAMELIDAE							
PETAURIDAE							
Petaurus australis	**Yellow-bellied Glider**		P				
Petaurus breviceps	Sugar Glider		O				
PSEUDOCHEIRIDAE							
Petauroides volans	Greater Glider		O				
Pseudocheirus peregrinus	Common Ringtail Possum		O				
ACROBATIDAE							
Acrobates pygmaeus	Feathertail Glider		O				
PHALANGERIDAE							
Trichosurus vulpecula	Common Brushtail Possum		O		O		O
MACROPODIDAE							
Macropus giganteus	Eastern Grey Kangaroo					O	
PTEROPODIDAE							
Pteropus poliocephalus	**Grey-headed Flying Fox**		O,W	O,W			O,W
RHINOLOPHIDAE							
Rhinolophus megaphyllus	Eastern Horseshoe Bat		CD				

FAMILY/Scientific Name	Common Name	OFHU	OF	RF	EHW	MOD	RPF
MOLOSSIDAE							
Mormopterus sp. 2	Freetail Bat	CD	CD		CD		
Mormopterus norfolkensis	Eastern Freetail-bat		CD				
Nyctinomus australis	White-striped Freetail-bat		W				
VESPERTILIONIDAE							
Chalinolobus dwyeri	**Large-eared Pied Bat**		CD		CD	CD	
Chalinolobus gouldii	Gould's Wattled Bat	CD	CD		CD	CD	
Chalinolobus morio	Chocolate Wattled Bat		CD				
ANATIDAE							
Chenonetta jubata	Australian Wood Duck					O	
Anas superciliosa	Pacific Black Duck					O	
CACATUIDAE							
Calyptorhynchus lathami	Glossy Black Cockatoo		P				
Calyptorhynchus funereus	Yellow-tailed Black Cockatoo	O,W			O		
PSITTACIDAE							
Trichoglossus haematodus	Rainbow Lorikeet		O,W				O
Platycercus elegans	Crimson Rosella	O,W	O		O		O
CENTROPODIDAE							
Centropus phasianinus	Pheasant Coucal		W				
HALCYONIDAE							
Dacelo novaeguineae	Laughing Kookaburra	W	O			O	
Todiramphus sanctus	Sacred Kingfisher						
CLIMACTERIDAE							
Cormobates leucophaeus	White-throated Treecreeper		O,W				
MALURIDAE							
Malurus cyaneus	Superb Fairy-wren		O			O	O
PARDALOTIDAE							
Pardalotus punctatus	Spotted Pardalote		W				W
Pardalotus striatus	Striated Pardalote						
Sericornis citreogularis	Yellow-throated Scrub-wren	O					
Gerygone olivacea	White-throated Gerygone		W				
Acanthiza pusilla	Brown Thornbill		O				
MELIPHAGIDAE							
Anthochaera chrysoptera	Little Wattlebird	O					
Anthochaera carunculata	Red Wattlebird	O, W	O		O, W		
Philemon corniculatus	Noisy Friarbird		W				
Manorina melanocephala	Noisy Miner					O	
Meliphaga lewinii	Lewin's Honeyeater			W			
Lichenostomus chrysops	Yellow-faced Honeyeater	W	W		W		W
Melithreptus lunatus	White-naped Honeyeater		O				
Phylidonyris melanops	Tawny-crowned						

FAMILY/Scientific Name	Common Name	OFHU	OF	RF	EHW	MOD	RPF
	Honeyeater						
Acanthorhynchus tenuirostris	Eastern Spinebill	O			O		
PETROICIDAE							
Microeca leucophaea	Jacky Winter					O	
Eopsaltria australis	Eastern Yellow Robin			O,W			
PSOPHODIDAE							
Psophodes olivaceus	Eastern Whipbird		W	W			W
NEOSITTIDAE							
Daphoenositta chrysoptera	Varied Sitella		O				
PACHYCEPHALIDAE							
Pachycephala pectoralis	Golden Whistler		O				
Pachycephala rufiventris	Rufous Whistler			O			
Colluricincla harmonica	Grey Shrike-thrush		O				
DICRURIDAE							
Rhipidura leucophrys	Willie Wagtail					O	
Rhipidura rufifrons	Rufous Fantail			O			
Rhipidura fuliginosa	Grey Fantail		O				
Grallina cyanoleuca	Magpie-lark					O,W	
CAMPEPHAGIDAE							
Coracina novaehollandiae	Black-faced Cuckoo-shrike		O			O	
Coracina tenuirostris	Cicadabird		O,W				
ORIOLIDAE							
Oriolus sagittatus	Olive-backed Oriole		O				
Sphecotheres viridis	Figbird			O			
ARTAMIDAE							
Cracticus torquatus	Grey Butcherbird					O	
Gymnorhina tibicen	Australian Magpie		O			O	
Strepera graculina	Pied Currawong					W	
CORVIDAE							
Corvus coronoides	Australian Raven	O			O,W	O	
CORCORACIDAE							
Corcorax melanorhamphos	White-winged Chough						
PTILONORHYNCHIDAE							
Ailuroedus crassirostris	Green Catbird			W			
DICAEIDAE							
Dicaeum hirundinaceum	Mistletoebird		W				
HIRUNDINIDAE							
Hirundo neoxena	Welcome Swallow		O			O	