



Lot 52 in DP 831284 and Lot 84 in DP 792945
Belle O'Connor Street
South West Rocks

Proposed Residential Development

Ecological Issues & Assessment Report

Appendix A
EDAW Landscape Plan and X-Sections

December 2008



Whelans InSites Pty Ltd

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Lot 52 in DP 831284 and Lot 84 in DP 792945
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Ecological Issues & Assessment Report

Appendix B
Cumberland Ecology *Fauna Report* (2008)

December 2008



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SOUTH WEST ROCKS

Fauna Study

For:

MALBEC PROPERTIES

July 2008

Final Report

Cumberland Ecology

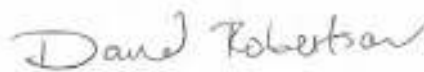
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Report No. 7107RP1

The preparation of this report has been in accordance with the brief provided by the Client and has relied upon the data and results collected at or under the times and conditions specified in the report. All findings, conclusions or recommendations contained within the report are based only on the aforementioned circumstances. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted by Cumberland Ecology

Approved by: David Robertson

Position: Project Director



Signed: _____

Date: 25 July, 2008

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Introduction

1.1 Purpose and Objectives

Cumberland Ecology has been commissioned by Malbec Properties Pty Ltd (Malbec) to conduct a fauna investigation to accompany a Part 3A application for an area of land located between Phillip Drive and Belle O'Connor Street, located near the town of South West Rocks, in the Kempsey Local Government Area (LGA). The proposed development is a "Major Project" to which Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) applies.

This report provides the results of a fauna investigation conducted on the subject land, with a particular emphasis upon threatened fauna listed by the *Threatened Species Conservation Act 1995* (TSC Act) and the *Environment Protection and Biodiversity Conservation Act 1995* (EPBC Act).

1.2 Background

The subject site is located near the town of South West Rocks, in the Kempsey Local Government Area (LGA). The site is bounded to the west by the South West Rocks golf course, to the north by a small creek, and to the south by the new extension of Belle O'Connor Street – beyond which is new residential development. To the east there is rural residential development, beyond which is Saltwater Lagoon. South West Rocks is located within the NSW North Coast Bioregion.

1.3 Terminology

This report uses the following terminology:

- **Proposal** is the development, activity or action proposed;
- **Subject site** means the portions of the land upon which the works are proposed; namely approximately the southern third of Lot 19, DP 882846, (i.e. portion south of Saltwater Creek) and Lot 84 DP 792945 located near Belle O'Connor Street, South West Rocks;

- **Study area** is the subject site and any additional areas that are likely to be affected by the proposal, either directly or indirectly. This includes the surrounding areas of native vegetation and the nearby Saltwater Lake;
- **Locality** is the area within a 5 km radius of the subject site;
- **Threatened species** means those species listed as threatened under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act), the *Threatened Species Conservation Act 1995* (TSC Act) and the *Fisheries Management Act 1994*.

Methods

2.1 Literature Review and Database Analysis

Literature covering flora and fauna of the study area and other relevant literature was reviewed for information that was relevant to the project area.

The study area has been the subject of numerous environmental investigations during recent times, and these were reviewed to obtain background information and reference material. The previous flora and fauna investigations have involved literature reviews, database assessments, vegetation mapping, census of flora and fauna generally and targeted surveys for threatened species. Consequently, the majority of flora and fauna that could be impacted by the project is well known.

Ecological assessments conducted previously in the area include:

- Connell Wagner (2007). South West Rocks LES Investigations, Detailed Wallum Froglet Study, Connell Wagner, Newcastle;
- Connell Wagner (2005). Flora and Fauna Report, South West Rocks LES for Kempsey Shire Council, Connell Wagner, Newcastle;
- Kendall and Kendall Saltwater Creek Catchment Flora and Fauna Study, South West Rocks (2003)
- Peter Parker Environmental Consultants (2002). A Flora and Fauna Survey of Lots 509, DP 850963, 19 DP 882846 and 52 DP 831284 South West Rocks; and
- Umwelt Flora and Fauna Assessment and Bushfire Risk Assessment (2004)

2.2 Fauna Survey

Although previous surveys already undertaken on the subject site (as listed above) provided a valuable database of threatened flora and fauna records within the study area, additional on-ground field survey was completed by Cumberland Ecology in order to provide sufficient survey data on the types and locations of threatened fauna throughout the study area to allow an assessment as part of a Part 3A application to be made. A

summary of the survey effort is found in Table 2.1 and weather conditions during the survey period in Table 2.2.

Vegetation mapping was not conducted as part of this assessment and the descriptions of the community types that occur on the site are based on the assessment by Parker and Parker (2002), as was the Flora and Fauna Study undertaken for the LES by Connell Wagner (2005).

2.2.1 Mammal Trapping

Arboreal trap lines using approximately 10 metre separations were placed in the most suitable trees. Three lines of ten traps were set, totalling 30 traps. Type B Elliott traps were placed onto platforms that were attached to tree trunks approximately 1.5 m above the ground. Traps were baited with a mixture of peanut butter, honey and rolled oats.

Terrestrial trap lines using Elliott Type A and B traps using 10 metre separations were placed in the same locations as the arboreal trap lines as well as in additional areas throughout the site (Figure 2.1). The traps were baited with peanut butter, honey and rolled oats and targeted small mammals. A total of ten traps were placed in each of ten trap lines, totalling 100 traps. Traps were located so as to representatively sample the different vegetation types on the site including heath, riparian woodland and swamp.

One line of ten cage traps was also established along one of the arboreal trap grids to target medium-sized mammals. The cage traps were baited with chicken.

“Faunatech” hair tubes were set in trees approximately 1.5 m above the ground and on the ground and used to survey for mammals. Six trap lines of ten hair tubes were established using 10 metre separations, totalling 60 traps. All hair tubes were left for a minimum of 10 nights and were baited with an alternate mixture of sardines and rolled oats, or peanut butter rolled oats and honey.

2.2.2 Bat Survey

Surveys were undertaken for microchiropteran bats using ZCAIM Anabat bat detector units. Two units were set each night during the trapping surveys, for 12 hours of recording time each night. The two units were placed at different locations each night and sampled each of the major forest types (Figure 2.1). Detector units were sometimes used in a mobile capacity while spotlighting in a vehicle or by foot for periods of between half an hour to an hour.

2.2.3 Diurnal bird survey

Diurnal birds were surveyed by ornithologist Dr Stephen Debus on the 5th and 6th of December 2007. Aural/visual surveys were conducted in each habitat type on the subject site, covering all tracks and fire-breaks on the site. The site was surveyed in the early

morning, middle of the day and afternoon over the survey period to gain a broad species list. All bird species that were positively identified by sight or call were recorded. Searching was curtailed when the species-accumulation rate started to plateau (only 2 species added in the last hour) and survey conditions became adverse (rain, electrical storm). Nocturnal birds were surveyed using call-playback and spotlighting at 2 sites (woodland and swamp forest/heath), with spotlight-driving between sites.

2.2.4 Spotlight Surveys and Call Playback

Spotlighting for nocturnal mammals and birds was conducted using a hand held lamp with a 100W halogen globe. This technique involved driving and walking among forest areas to ensure that the majority of the study area was sampled by spotlighting during the survey period. Spotlighting was conducted for approximately one hour per night for four nights during the survey period. During spotlighting all species of vertebrates seen or heard calling were recorded.

The Masked Owl, Sooty Owl, Powerful Owl, Barking Owl, Squirrel Glider and Yellow-bellied Glider were surveyed using call playback during evening surveys. Taped calls were broadcast through a 15 watt amplifier and played for approximately five minutes followed by listening for 10 minute periods for approximately 30 – 45 minutes at each sampling point. Four call playback surveys were carried out over the survey period.

2.2.5 Incidental Records

Any species observed or heard calling during other surveys, for example while checking traps or setting hair tubes, was recorded.

2.2.6 Limitations of Survey

The survey was undertaken over a period of two weeks in December 2007 and is considered likely to have recorded the majority of the fauna species utilising the site at this time.

Data was retrieved from one Anabat recorder following this survey, and it is likely that the majority of bat species utilising the site have been recorded.

Table 2.1 FAUNA SURVEY EFFORT

Date	Survey Type	Technique	Effort
22.11.07	Hair tubes	60 hair tubes, left out for 10 nights	600 tube nights
03.12.07 to 07.12.07	Type A and B Elliot Traps	100 traps set on the ground for 4 nights	400 trap nights

Table 2.1 FAUNA SURVEY EFFORT

Date	Survey Type	Technique	Effort
		(50 Elliott B traps, 50 Elliott A traps)	
03.12.07 to 07.12.07	Type B Elliot Traps	30 traps set in trees for 4 nights	120 trap nights
03.12.07 to 07.12.07	Cage Traps	10 traps set for 4 nights	40 trap nights
03.12.07 to 06.12.07	Spotlighting	Driving and walking through forested with 100 watt spotlight area to ensure majority of site sampled. 2 people for approximately 1 hour per night.	8 person hours
03.12.07 to 06.12.07	Call Play back Survey	Call played for 5mins followed by 10mins of listening for a total of 30 to 45 minutes per night	4-6 person hours
03.12.07 to 07.12.07	Ultrasonic Call survey	2 Anabat units in separate locations, left for 12 hours for 4 nights*	48 Anabat hours (from which data was recovered)
05.12.07 and 06.12.07	Diurnal Bird survey	Random meander for all diurnal bird species during 1/3 hour intervals for 3 hours on 2 days.	6 persons hours
Total			104 person hours, 560 trap nights, 600 tube nights

* Although two Anabat units were placed on site, data was only recovered from one as the other was stolen during the week before any data was recovered.

Table 2.2 WEATHER CONDITIONS DURING SURVEY PERIOD

Date	Temperature (C)		Precipitation (mm)	Cloud Cover		Wind speed		Wind Direction	
	Min	Max		9am	3pm	9am	3pm	9am	3pm
22.11.07	19.3	25.9	0	5	6	19	33	NNW	N
03.12.07	18.7	25.8	6.8	1	5	6	28	SSE	NE
04.12.07	19.7	25.1	0.8	7	6	28	22	N	NNW
05.12.07	19.5	29.1	0.2	7	3	6	22	W	SSE
06.12.07	20.5	26.1	1.6	7	6	6	6	SW	NE

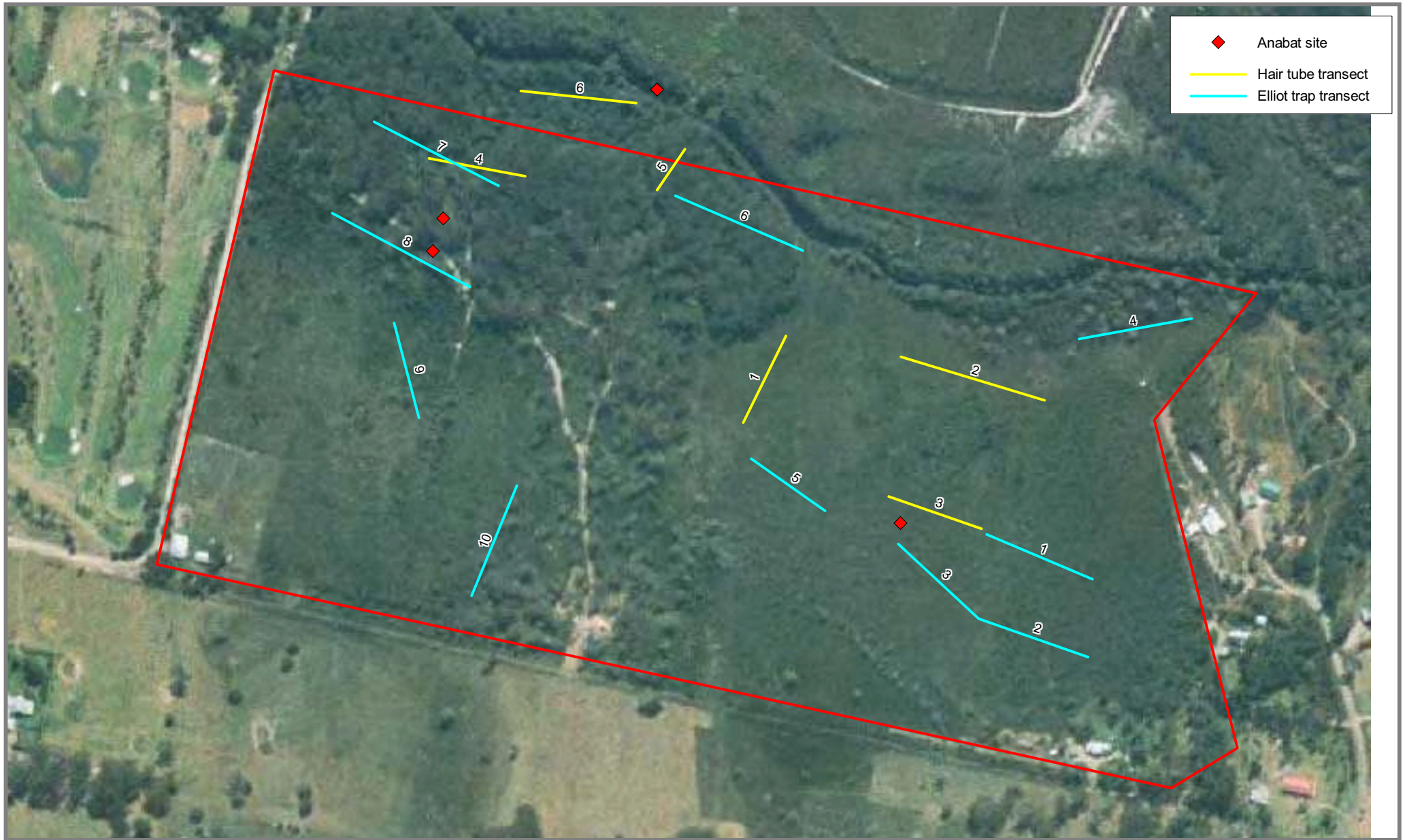


Figure 2.1 Survey Locations

Results

3.1 Birds

A wide diversity of bird life has been recorded from the site and our survey resulted in 76 bird species recorded (Appendix A). The majority of the bird species were recorded in the forested vegetation associated with the riparian corridor where an abundance of resources was present for birds. At the time of the survey the shrubland supported a lower diversity of bird species.

No species listed under the TSC Act were recorded from the site; however feeding signs of the Glossy Black Cockatoo (*Calyptorhynchus lathami*) were recorded. This species is listed as Vulnerable under the TSC Act. The site contains several stands of Black Sheoak (*Allocasuarina littoralis*) and large numbers of chewed cones were observed beneath these trees. Sheoak species are a significant food source for the Glossy Black Cockatoo as they feed almost exclusively on Sheoak cones.

3.2 Mammals

The trapping and hair tube surveys resulted in several mammals being recorded including the Squirrel Glider (*Petaurus norfolkensis*), the Swamp Rat (*Rattus lutreolus*), Northern Brown Bandicoot (*Isodon macroura*), Dusky Antechinus (*Antechinus swainsonii*), Black Rat (*Rattus rattus*) and the Domestic Mouse (*Mus domesticus*). The Black Rat and the Domestic Mouse are introduced species.

The Squirrel Glider is listed as Vulnerable under the TSC Act and was recorded from the arboreal Elliott traps (Figure 3.2) and was also regularly recorded during spotlight surveys at night. Several separate individuals were recorded during spotlighting which indicates that the site is host to a viable population of this species.

Between 10 and 20 Grey Headed Flying Foxes (*Pteropus poliocephalus*) were recorded during spotlighting, foraging in the forested vegetation near the creek. This species is listed as Vulnerable under both the TSC Act and the EPBC Act. No camps of this species are located on the subject site which indicates that the animals recorded would use the site only for foraging and not for roosting.

Several microchiropteran bat species were recorded during the survey, including several that are listed as Vulnerable under the TSC Act (Figure 3.2). These include: Yellow-bellied sheath-tailed bat (*Saccolaimus flaviventris*), Eastern free-tailed bat (*Mormopterus norfolkensis*), Hoary wattled bat (*Chalinolobus nigrogriseus*), Little bent-winged bat (*Miniopterus australis*), Greater broad-nosed bat (*Scoteanax rueppellii*), and the Eastern cave bat (*Vespadelus troughtoni*).

Other common mammal species were recorded opportunistically during the field survey including the Eastern Grey Kangaroo (*Macropus giganteus*), and the Swamp Wallaby (*Wallabia bicolor*). Feral animals recorded from the site included the European Wild Rabbit (*Oryctolagus cuniculus*).

A list of mammal species recorded and indications of trap detection method are provided in Appendix A.

3.3 Amphibians

Several amphibian species were recorded during the field surveys including: The Wallum Froglet (*Crinia tinnula*), Plains Froglet (*Crinia parinsignifera*), Eastern Froglet (*Crinia signifera*), Striped Marsh-Frog (*Limnodynastes peroni*), Bleating Tree-Frog (*Litoria dentata*), Dwarf Tree-Frog (*Litoria fallax*), Broad-palmed Frog (*Litoria latopalmata*), Laughing Tree-Frog (*Litoria tyleri*), and Whistling Tree-Frog (*Litoria verreauxii*).

The Wallum Froglet is listed as Vulnerable under the TSC Act. One specimen was captured and identified (Photograph 3.4, Figure 3.2), and it was also recorded calling.



Photograph 3.1 **Wallum Froglet Captured on the Subject Site**

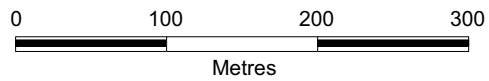
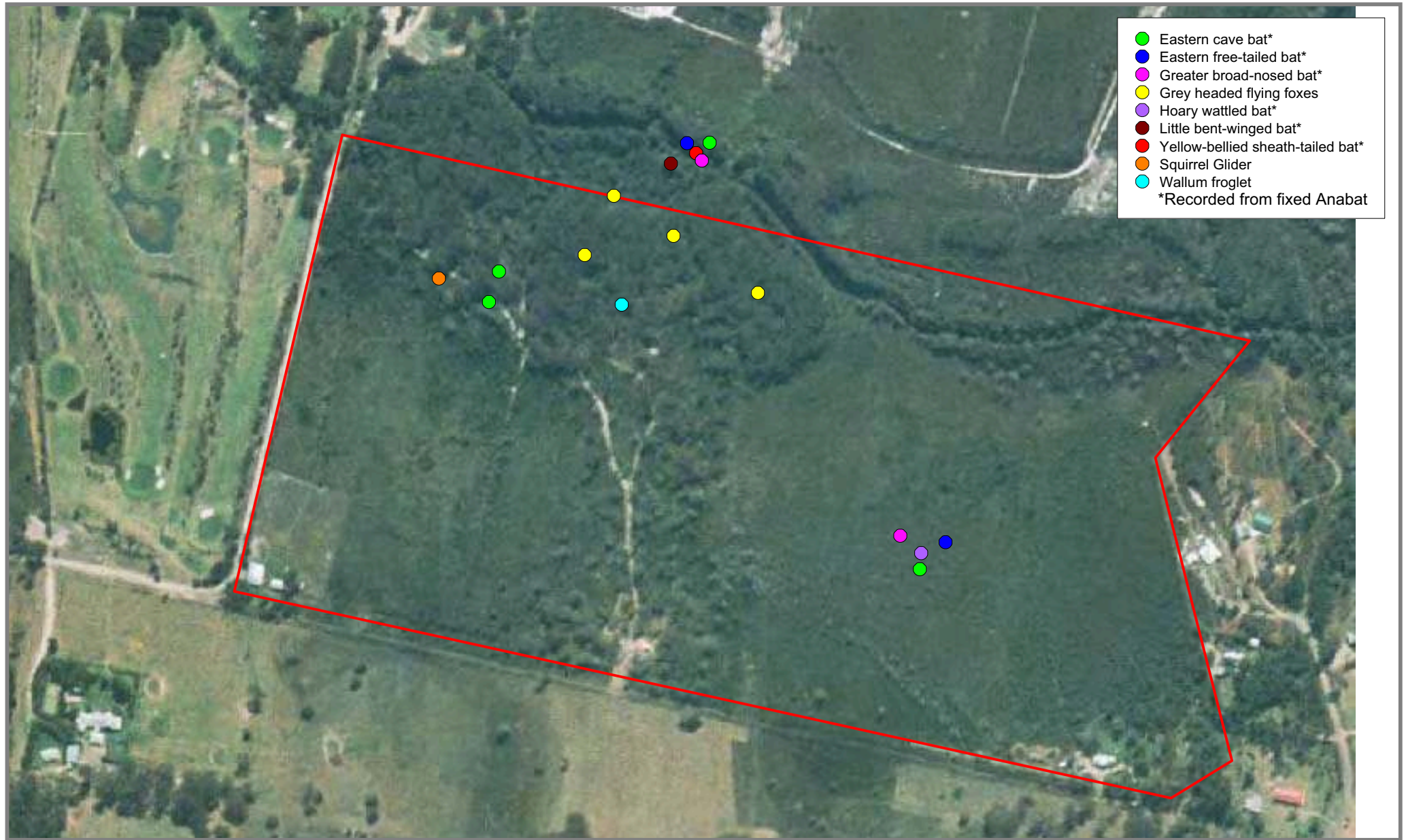


Figure 3.1 Location of threatened fauna species recorded from the subject site

References

Connell Wagner Pty Ltd (2005) **Flora and Fauna Report South West Rocks LES**, Kempsey Shire Council

Kendall and Kendall (2003) **Saltwater Creek Catchment Flora and Fauna Study South West Rocks**, Report to Kempsey Shire Council Coastal and Estuary Management Committee

Peter Parker Environmental Consultants (2002) **Flora and Fauna Survey of Lots 509, DP850963, 19 DP882846 and 52 DP831284 South West Rocks**

Appendix A

Fauna Species Recorded During the Field
Survey

Table A.1 FAUNA SPECIES RECORDED FROM THE SITE

Common Name	Scientific Name
Birds	
Australian Wood Duck	<i>Chenonetta jubata</i>
Brown Quail	<i>Coturnix ypsilophora</i>
Pacific Black Duck	<i>Anas superciliosa</i>
Pied Cormorant	<i>Phalacrocorax varius</i>
Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>
Nankeen Night Heron	<i>Nycticorax caledonicus</i>
Whistling Kite	<i>Haliastur sphenurus</i>
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>
Wedge-tailed Eagle	<i>Aquila audax</i>
Dusky Moorhen	<i>Gallinula tenebrosa</i>
Masked Lapwing	<i>Vanellus miles</i>
Spotted Turtle-Dove	<i>Streptopelia chinensis</i>
Brown Cuckoo-Dove	<i>Macropygia amboinensis</i>
Crested Pigeon	<i>Ocyphaps lophotes</i>
Bar-shouldered Dove	<i>Geopelia humeralis</i>
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>
Galah	<i>Cacatua roseicapilla</i>
Little Corella	<i>Cacatua sanguinea</i>
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>
Scaly-breasted Lorikeet	<i>Trichoglossus chlorolepidotus</i>
Eastern Rosella	<i>Platycercus eximius</i>
Brush Cuckoo	<i>Cacomantis variolosus</i>
Horsfield's Bronze-Cuckoo	<i>Chrysococcyx basalis</i>
Shining Bronze-Cuckoo	<i>Chrysococcyx lucidus</i>
Little Bronze-Cuckoo	<i>Chrysococcyx minutillus</i>
Common Koel	<i>Eudynamys scolopacea</i>
Channel-billed Cuckoo	<i>Scythrops novaehollandiae</i>
Pheasant Coucal	<i>Centropus phasianinus</i>
Southern Boobook	<i>Ninox novaeseelandiae</i>
Tawny Frogmouth	<i>Podargus strigoides</i>
White-throated Needletail	<i>Hirundapus caudacutus</i>
Laughing Kookaburra	<i>Dacelo novaeguineae</i>
Sacred Kingfisher	<i>Todiramphus sanctus</i>

Table A.1 FAUNA SPECIES RECORDED FROM THE SITE

Common Name	Scientific Name
Rainbow Bee-eater	<i>Merops ornatus</i>
Dollarbird	<i>Eurystomus orientalis</i>
Superb Fairy-wren	<i>Malurus cyaneus</i>
Variegated Fairy-wren	<i>Malurus lamberti</i>
Red-backed Fairy-wren	<i>Malurus melanocephalus</i>
Southern Emu-wren	<i>Stipiturus malachurus</i>
Spotted Pardalote	<i>Pardalotus punctatus</i>
Striated Pardalote	<i>Pardalotus striatus</i>
White-browed Scrubwren	<i>Sericornis frontalis</i>
White-throated Gerygone	<i>Gerygone olivacea</i>
Brown Thornbill	<i>Acanthiza pusilla</i>
Yellow Thornbill	<i>Acanthiza nana</i>
Red Wattlebird	<i>Anthochaera carunculata</i>
Little Wattlebird	<i>Anthochaera chrysoptera</i>
Noisy Friarbird	<i>Philemon corniculatus</i>
Lewin's Honeyeater	<i>Meliphaga lewinii</i>
Yellow-faced Honeyeater	<i>Lichenostomus chrysops</i>
Brown Honeyeater	<i>Lichmera indistincta</i>
White-cheeked Honeyeater	<i>Phylidonyris nigra</i>
Scarlet Honeyeater	<i>Myzomela sanguinolenta</i>
Eastern Yellow Robin	<i>Eopsaltria australis</i>
Rufous Whistler	<i>Pachycephala rufiventris</i>
Grey Shrike-thrush	<i>Colluricincla harmonica</i>
Leadend Flycatcher	<i>Myiagra rubecula</i>
Magpie-lark	<i>Grallina cyanoleuca</i>
Rufous Fantail	<i>Rhipidura rufifrons</i>
Grey Fantail	<i>Rhipidura fuliginosa</i>
Willie Wagtail	<i>Rhipidura leucophrys</i>
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>
White-bellied Cuckoo-shrike	<i>Coracina papuensis</i>
Cicadabird	<i>Coracina tenuirostris</i>
Olive-backed Oriole	<i>Oriolus sagittatus</i>
Figbird	<i>Sphecotheres viridis</i>
Grey Butcherbird	<i>Cracticus torquatus</i>
Pied Butcherbird	<i>Cracticus nigrogularis</i>

Table A.1 FAUNA SPECIES RECORDED FROM THE SITE

Common Name	Scientific Name
Australian Magpie	<i>Gymnorhina tibicen</i>
Forest Raven	<i>Corvus tasmanicus</i>
Torresian Crow	<i>Corvus orru</i>
Red-browed Finch	<i>Neochmia temporalis</i>
Mistletoebird	<i>Dicaeum hirundinaceum</i>
Welcome Swallow	<i>Hirundo neoxena</i>
Silvereye	<i>Zosterops lateralis</i>
Amphibians	
Wallum Froglet	<i>Crinia tinnula</i>
Plains Froglet	<i>Crinia parinsignifera</i>
Eastern Froglet	<i>Crinia signifera</i>
Striped Marsh-Frog	<i>Limnodynastes peroni</i>
Bleating Tree-Frog	<i>Litoria dentata</i>
Dwarf Tree-Frog	<i>Litoria fallax</i>
Broad-palmed Frog	<i>Litoria latopalmata</i>
Laughing Tree-Frog	<i>Litoria tyleri</i>
Whistling Tree-Frog	<i>Litoria verreauxii</i>
Microchiropteran Bats	
Yellow-bellied sheath-tailed bat	<i>Saccolaimus flaviventris</i>
Eastern free-tailed bat	<i>Mormopterus species 2</i>
Gould's wattled bat	<i>Chalinolobus gouldii</i>
Chocolate wattled bat	<i>Chalinolobus morio</i>
Hoary wattled bat	<i>Chalinolobus nigrogriseus</i>
Little bent-winged bat	<i>Miniopterus australis</i>
Greater broad-nosed bat	<i>Scoteanax rueppellii</i>
Eastern broad-nosed bat	<i>Scotorepens orion</i>
Central-eastern broad-nosed bat	<i>Scotorepens species</i>
Eastern forest bat	<i>Vespadelus pumilus</i>
Eastern cave bat	<i>Vespadelus troughtoni</i>
Little forest bat	<i>Vespadelus vulturnus</i>
Other Mammals	
Swamp Rat	<i>Rattus lutreolus</i> ¹
Northern Brown Bandicoot	<i>Isodon macroura</i> ¹
Dusky Antechinus	<i>Antechinus swainsonii</i> ²
Squirrel Glider	<i>Petaurus norfolcensis</i> ²

Table A.1 FAUNA SPECIES RECORDED FROM THE SITE

Common Name	Scientific Name
Grey Headed Flying Fox	<i>Pteropus poliocephalus</i>
Eastern Grey Kangaroo	<i>Macropus giganteus</i>
Swamp Wallaby	<i>Wallabia bicolor</i>
European Wild Rabbit*	<i>Oryctolagus cuniculus</i>
Black Rat*	<i>Rattus rattus</i> ^{1,2}
Domestic Mouse*	<i>Mus domesticus</i> ^{1,2}

Key: * denotes introduced species

¹ Record from hair tube

² Record from trap



Lot 52 in DP 831284 and Lot 84 in DP 792945
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Proposed Residential Development

Ecological Issues & Assessment Report

Appendix C
Whelans InSites Field Survey Methods

November 2008



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1 VEGETATION SURVEYS

Botanical surveys were undertaken on the 10th & 11th of April 2008

The surveys were completed in accordance with draft Department of Environment & Climate Change *Guidelines* (DECC 2004). Systematic surveys consisted of seven 20 x 20 metre plots, sampling each vegetation community. Cover abundance for each species recorded within plots surveys was based on a modified Braun-Blanquet scale. Flora transects of 100 metres in length were associated with each community and plot survey. The 'Random Meander' technique was utilised to target threatened species (Cropper 1993).

Botanical nomenclature was applied according to Harden (1990-1993) and cross-referenced against updated and accepted changes per www.plantnet.com.au or the National Herbarium of New South Wales.

Where varieties or subspecies were not able to be accurately determined, specimens were listed at the base species level.

Collected threatened species, rare or threatened taxa or regionally significant species were determined against recognised herbarium specimens and/or sent to the National Herbarium of New South Wales for positive verification, where required.

2 WALLUM FROGLET SURVEYS

2.1 Methods

Field surveys targeting the Wallum Froglet *Crinia tinnula* were conducted over 3 days from the 20th to the 22nd of May 2008. Surveys encompassed the subject site and lands within the local area containing potential habitat for Wallum Froglet.

2.1 Weather Conditions

Field surveys were conducted during mild, calm conditions with an average minimum daily temperature of 13°C and an average maximum daily temperature of 20°C (Bureau of Meteorology 2008) and an average relative humidity of approximately 68%. In the week preceding the surveys, South West Rocks received 10.4mm of rain (BoM 2008).

Survey conditions were considered to be ideal for the target species.

2.2 Call Playback Surveys

Call playback was conducted at 54 locations within the subject site and local area over the 3 day survey period (Figure 5). At each location, calls of the Wallum Froglet were broadcast for 2 minutes followed by a 2 minute period of quiet listening. All amphibian species heard or seen were recorded.

2.3 Limitations

The Wallum Froglet is a poorly known species, and precise information regarding behavioral ecology, population dynamics and habitat requirements in the local area is not available.

As a result, inferences regarding likely periods of peak activity and preferred habitat have been made on the basis of all of the available data, and with reference to results obtained by the survey team in the Wyong and Port Stephens Local Government Areas.

2.4 Consideration of DRAFT DECC Survey Guidelines

The *Draft Biodiversity Survey & Assessment Guidelines* (DECC 2004) identify several techniques for the census of frogs and tadpoles in NSW (Table 1).

Table 1 – Recommended survey methods for amphibians (DECC 2004), and effort applied during surveys conducted for this *Report*.

Method Suggested	Minimum E ffort	Survey Period	Survey E ffort
Systematic diurnal habitat search	One hour per stratification unit	Varies according to the seasonal peak of activity of the target species	2 people for 4 hours within appropriate habitats on 3 separate days
Nocturnal habitat search of damp and watery sites	30 minutes on two separate nights per stratification unit		2 people for 1 hour on 2 separate nights
Nocturnal call playback	At least one playback on each of two separate nights		Nocturnal and diurnal call playback was conducted at 54 locations throughout the subject site and local area over 3 days
Nocturnal watercourse search	Two hours per 200m of water body edge		Not applicable to the Wallum Froglet

As indicated in Table 1, surveys undertaken for this *Report* far exceed the minimum effort recommended by the DECC.



Lot 52 in DP 831284 and Lot 84 in DP 792945
Belle O'Connor Street
South West Rocks

Proposed Residential Development

Ecological Issues & Assessment Report

Appendix D
NPWS Wildlife Atlas

December 2008



Whelans InSites Pty Ltd

Level 12/80 Clarence Street Sydney NSW 2000

ph: 02 - 8234 8300 fax: 02 - 9262 6511

email: dfanning@insites.com.au



Search Results

Your selection: Fauna, threatened species, Selected Area - 152.94260,-30.99060,153.16120,-30.81020 returned a total of 388 records of 43 species.

Report generated on 18/11/2008 - 12:01 (Data valid to 09/11/2008)

[view map](#)
[view map](#)
[search again](#)
[clear selection](#)
[search again](#)
[clear selection](#)

Choose up to 3 species to map.

* *Exotic (non-native) species*

Amphibia	Map	Scientific Name	Common Name	Legal Status	Count	Info
		Myobatrachidae				
	<input type="checkbox"/>	Crinia tinnula	Wallum Froglet	V	12	
Aves		Map	Scientific Name	Common Name	Legal Status	Count Info
		Accipitridae				
	<input type="checkbox"/>	Lophoictinia isura	Square-tailed Kite	V	4	
	<input type="checkbox"/>	Pandion haliaetus	Osprey	V	52	
		Anseranatidae				
	<input type="checkbox"/>	Anseranas semipalmata	Magpie Goose	V	1	
		Ardeidae				
	<input type="checkbox"/>	Ixobrychus flavicollis	Black Bittern	V	1	
		Burhinidae				
	<input type="checkbox"/>	Esacus neglectus	Beach Stone-curlew	E1	1	
		Cacatuidae				
	<input type="checkbox"/>	Calyptorhynchus lathami	Glossy Black-Cockatoo	V	49	
		Campephagidae				
	<input type="checkbox"/>	Coracina lineata	Barred Cuckoo-shrike	V	2	
		Ciconiidae				
	<input type="checkbox"/>	Ephippiorhynchus asiaticus	Black-necked Stork	E1	44	
		Columbidae				
	<input type="checkbox"/>	Ptilinopus magnificus	Wompoo Fruit-Dove	V	4	
	<input type="checkbox"/>	Ptilinopus regina	Rose-crowned Fruit-Dove	V	2	
		Haematopodidae				
	<input type="checkbox"/>	Haematopus fuliginosus	Sooty Oystercatcher	V	12	
	<input type="checkbox"/>	Haematopus longirostris	Pied Oystercatcher	V	7	
		Jacanidae				
	<input type="checkbox"/>	Irediparra gallinacea	Comb-crested Jacana	V	3	
		Laridae				
	<input type="checkbox"/>	Procelsterna cerulea	Grey Ternlet	V	1	
	<input type="checkbox"/>	Sterna albifrons	Little Tern	E1	2	
		Procellariidae				
	<input type="checkbox"/>	Macronectes giganteus	Southern Giant Petrel	E1	1	

	<input type="checkbox"/>	<i>Puffinus carneipes</i>	Flesh-footed Shearwater	V	2	
Psittacidae						
	<input type="checkbox"/>	<i>Lathamus discolor</i>	Swift Parrot	E1	23	
Scolopacidae						
	<input type="checkbox"/>	<i>Limosa limosa</i>	Black-tailed Godwit	V	1	
Strigidae						
	<input type="checkbox"/>	<i>Ninox strenua</i>	Powerful Owl	V	2	
Sulidae						
	<input type="checkbox"/>	<i>Sula dactylatra</i>	Masked Booby	V	2	
Tytonidae						
	<input type="checkbox"/>	<i>Tyto capensis</i>	Grass Owl	V	2	
	<input type="checkbox"/>	<i>Tyto novaehollandiae</i>	Masked Owl	V	1	
Mammalia						
		Map Scientific Name	Common Name	Legal Status	Count	Info
Balaenopteridae						
	<input type="checkbox"/>	<i>Megaptera novaeangliae</i>	Humpback Whale	V	7	
Dasyuridae						
	<input type="checkbox"/>	<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	3	
	<input type="checkbox"/>	<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	V	14	
	<input type="checkbox"/>	<i>Planigale maculata</i>	Common Planigale	V	1	
Emballonuridae						
	<input type="checkbox"/>	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V	3	
Molossidae						
	<input type="checkbox"/>	<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V	8	
Otariidae						
	<input type="checkbox"/>	<i>Arctocephalus pusillus doriferus</i>	Australian Fur-seal	V	1	
Petauridae						
	<input type="checkbox"/>	<i>Petaurus norfolcensis</i>	Squirrel Glider	V	39	
Phascolarctidae						
	<input type="checkbox"/>	<i>Phascolarctos cinereus</i>	Koala	V	9	
Pteropodidae						
	<input type="checkbox"/>	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	35	
	<input type="checkbox"/>	<i>Syconycteris australis</i>	Common Blossom-bat	V	3	
Vespertilionidae						
	<input type="checkbox"/>	<i>Chalinolobus nigrogriseus</i>	Hoary Wattled Bat	V	3	
	<input type="checkbox"/>	<i>Miniopterus australis</i>	Little Bentwing-bat	V	7	
	<input type="checkbox"/>	<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V	2	
	<input type="checkbox"/>	<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	7	
	<input type="checkbox"/>	<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V	1	
Reptilia						
		Map Scientific Name	Common Name	Legal Status	Count	Info
Cheloniidae						
	<input type="checkbox"/>	<i>Caretta caretta</i>	Loggerhead Turtle	E1	7	
	<input type="checkbox"/>	<i>Chelonia mydas</i>	Green Turtle	V	6	

Dermochelyidae

 Dermochelys coriacea Leathery Turtle

V

1



* *Exotic (non-native) species*

Choose up to 3 species to map.

DISCLAIMER: The Atlas of New South Wales Wildlife contains data from a number of sources including government agencies, non-government organisations and private individuals. These data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Find out [more](#) about the Atlas.

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Search Results

Your selection: Flora, threatened species, Selected Area - 152.94260,-30.99060,153.16120,-30.81020 returned a total of 16 records of 6 species.

Report generated on 18/11/2008 - 12:03 (Data valid to 09/11/2008)

Choose up to 3 species to map.

** Exotic (non-native) species*

Plants	Map	Scientific Name	Common Name	Legal Status	Count	Info
Apocynaceae	<input type="checkbox"/>	Cynanchum elegans	White-flowered Wax Plant	E1	4	
Casuarinaceae	<input type="checkbox"/>	Allocasuarina defungens	Dwarf Heath Casuarina	E1	1	
Euphorbiaceae	<input type="checkbox"/>	Chamaesyce psammogeton	Sand Spurge	E1	1	
Juncaginaceae	<input type="checkbox"/>	Maundia triglochinos		V	1	
Orchidaceae	<input type="checkbox"/>	Peristeranthus hillii	Brown Fairy-chain Orchid	V	1	
Rutaceae	<input type="checkbox"/>	Acronychia littoralis	Scented Acronychia	E1	8	

** Exotic (non-native) species*

Choose up to 3 species to map.

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Lot 52 in DP 831284 and Lot 84 in DP 792945
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Appendix E
Flora Species List

December 2008



Whelans InSites Pty Ltd

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APPENDIX E Flora species recorded on the subject site

KEY	
* Exotic Species	
Cover abundance	
Braun-Blanquet	Score
<5% uncommon	1
<5% common	2
5-25%	3
25-50%	4
50-75%	5
75-100%	6

STATUS	SCIENTIFIC NAME	COMMON NAME	Q1	T1	Q2	T2	Q3	T3	Q4	T4	Q5	T5	Q6	T6	Q7	T7
	Anthericaceae															
	<i>Tricoryne elatior</i>	Yellow Autumn-lily	1	X			1	X							1	X
	Apiaceae															
	<i>Actinotus helianthi</i>	Flannel Flower			2	X										
	<i>Centella asiatica</i>	Pennywort														X
	<i>Hydrocotyle peduncularis</i>	-														
	<i>Platysace ericoides</i>	-		X	1	X										
	<i>Platysace lanceolata</i>	Native Parsnip			1	X										
	<i>Trachymene incisa</i> subsp. <i>incisa</i>	-			2	X									1	X
	Apocynaceae															
	<i>Parsonsia straminea</i>	Common Silkpod					1	X								
	Araliaceae															
	<i>Polyscias sambucifolia</i> subsp. <i>sambucifolia</i>	-	1	X	2	X										
	Asteraceae															
*	<i>Ageratum houstonianum</i>	Blue Billygoat Weed														
*	<i>Baccharis halimifolia</i>	Groundsel Bush														
*	<i>Bidens pilosa</i>	Cobbler's Pegs														
	<i>Euchiton sphaericus</i>	-														
*	<i>Gamochoeta spicata</i>	-														
*	<i>Senecio madagascariensis</i>	Fireweed														
*	<i>Taraxacum officinale</i>	Dandelion														

APPENDIX E Flora species recorded on the subject site

STATUS	SCIENTIFIC NAME	COMMON NAME	Q1	T1	Q2	T2	Q3	T3	Q4	T4	Q5	T5	Q6	T6	Q7	T7
	Baueraceae <i>Bauera capitata</i>	-									2	X				
	Bignoniaceae <i>Pandorea pandorana</i>	Wonga Wonga Vine														
	Blechnaceae <i>Blechnum indicum</i>	Swamp Water Fern							2	X			2	X		
	Campanulaceae <i>Wahlenbergia communis</i>	Tufted Bluebell														
*	Caryophyllaceae <i>Stellaria media</i>	Common Chickweed														
	Casuarinaceae <i>Allocasuarina littoralis</i> <i>Casuarina glauca</i>	Black Sheoak Swamp Oak	1	X			1	X								
	Clusiaceae <i>Hypericum japonicum</i>	-				X									1	X
	Colchicaceae <i>Burchardia umbellata</i>	Milkmaids														X
	Convolvulaceae <i>Dichondra repens</i>	Kidney Weed														
	Cyperaceae <i>Baumea articulata</i> <i>Baumea juncea</i> <i>Baumea nuda</i> <i>Baumea rubiginosa</i> <i>Chorizandra cymbaria</i> <i>Cyathochaeta diandra</i> <i>Fimbristylis dichotoma</i> <i>Gahnia aspera</i> <i>Gahnia clarkei</i> <i>Gahnia sieberiana</i> <i>Isolepis inundata</i> <i>Isolepis nodosa</i> <i>Lepidosperma filiforme</i> <i>Lepidosperma laterale</i> <i>Lepidosperma neesii</i> <i>Ptilothrix deusta</i> <i>Schoenus apogon</i>	Jointed Twig-rush Bare-twig Rush - - Heron Bristle Rush - Common Fringe-sedge Rough Saw-sedge Tall Saw-sedge Red-fruit Saw-sedge Swamp Clubrush Knobby Club-rush - Variable Sword-sedge - - Fluke Bogrush					1	X								
							1	X								
							4	X	1	X	2	X			2	X
							1	X	1							
			1	X			1	X	1							
				X												
													3	X		
									2	X					1	
								X					2	X		
							2	X	2	X						
			2	X			2	X	2	X						
							1				1	X			2	X
			2	X			2	X	2	X					3	X
							1	X						X		

APPENDIX E Flora species recorded on the subject site

STATUS	SCIENTIFIC NAME	COMMON NAME	Q1	T1	Q2	T2	Q3	T3	Q4	T4	Q5	T5	Q6	T6	Q7	T7
	Cyperaceae contd.															
	<i>Schoenus brevifolius</i>	A Bog Rush						X								
	<i>Schoenus ericetorum</i>	-					1	X					2	X	1	
	<i>Schoenus paludosus</i>	-														
	Dennstaedtiaceae															
	<i>Pteridium esculentum</i>	Bracken		X	4	X										
	Dicksoniaceae															
	<i>Calochlaena dubia</i>	Dicksoniaceae														
	Dilleniaceae															
	<i>Hibbertia aspera</i>	Rough Guinea Flower	2	X											2	X
	<i>Hibbertia linearis</i>	-			1	X							1			
	<i>Hibbertia obtusifolia</i>	-			2	X										
	<i>Hibbertia scandens</i>	Climbing Guinea Flower														
	<i>Hibbertia vestita</i>	-											1	X		
	<i>Hibbertia virgata</i> subsp. <i>virgata</i>	-														
	Dioscoreaceae															
	<i>Dioscorea transversa</i>	Native Yam														
	Droseraceae															
	<i>Drosera binata</i>	Forked Sundew							1							
	<i>Drosera spatulata</i>	Common Sundew								X			1	X		
	Elaeocarpaceae															
	<i>Tetradlea thymifolia</i>	Black-eyed Susan														
	Epacridaceae															
	<i>Epacris microphylla</i>	-														X
	<i>Epacris obtusifolia</i>	-											1	X		
	<i>Epacris pulchella</i>	NSW Coral Heath	2	X					1	X	2	X			2	X
	<i>Leucopogon ericoides</i>	-			2	X										
	<i>Leucopogon lanceolatus</i>	-		X	1	X										
	<i>Mnnotoca elliptica</i>	Tree Broom-heath														
	<i>Sprengelia incarnata</i>	-											1			
	<i>Sprengelia sprengelioides</i>	-							2	X	2	X	2	X		X
	Euphorbiaceae															
	<i>Glochidion ferdinandi</i> var. <i>ferdinandi</i>	Cheese Tree		X											1	
	<i>Homalanthus populifolius</i>	Bleeding Heart		X												
	<i>Phyllanthus hirtellus</i>	-			2	X										
	<i>Ricinocarpos pinifolius</i>	Wedding Bush			1	X										

APPENDIX E Flora species recorded on the subject site

STATUS	SCIENTIFIC NAME	COMMON NAME	Q1	T1	Q2	T2	Q3	T3	Q4	T4	Q5	T5	Q6	T6	Q7	T7
*	Fabaceae (Caesalpinioideae) <i>Senna pendula</i> var. <i>glabrata</i>	-														
	Fabaceae (Faboideae) <i>Bossiaea heterophylla</i>	Variable Bossiaea			1	X										
	<i>Desmodium rhytidophyllum</i>	-		X												
	<i>Dillwynia retorta</i> species complex	Heathy Parrot Pea			1	X							2	X		
	<i>Glycine clandestina</i>	-														
	<i>Glycine tabacina</i>	-														
	<i>Gompholobium latifolium</i>	Golden Glory Pea			1	X										1
	<i>Gompholobium pinnatum</i>	Pinnate Wedge Pea	2	X						X	2	X			1	X
	<i>Hovea linearis</i>	Narrow-leaved Hovea			1											
	<i>Jacksonia scorparia</i>															1
	<i>Phyllota phylloides</i>	Heath Phyllota							1	X	2	X				
	<i>Pultenaea linophylla</i>	Halo Bush-pea														
	<i>Pultenaea paleacea</i> var. <i>paleacea</i>	-	2	X						X						1
	<i>Pultenaea retusa</i>	-	1	X					2	X			2	X		
*	<i>Vicia sativa</i> subsp. <i>Sativa</i>	Common Vetch														
	Fabaceae (Mmosoideae) <i>Acacia elongata</i>	Swamp Wattle											2	X		
	<i>Acacia implexa</i>	Hickory Wattle		X												
	<i>Acacia longifolia</i> subsp. <i>longifolia</i>	Golden Wattle											2	X	1	
	<i>Acacia longifolia</i> var. <i>sophorae</i>	Coastal Wattle	1	X				X								
	<i>Acacia suaveolens</i>	Sweet Wattle			2	X										
	<i>Acacia terminalis</i> subsp. <i>longiaxialis</i>	Sunshine Wattle														
	<i>Acacia ulicifolia</i>	Prickly Moses		X	2	X										
	Geraniaceae <i>Geranium homeanum</i>	-														
	Gleicheniaceae <i>Gleichenia dicarpa</i>	Pouched Coral Fern					2	X								
	Goodeniaceae <i>Dampiera stricta</i>	Blue Damperia	1	X				X	1	X			2	X	2	X
	<i>Goodenia bellidifolia</i> subsp. <i>bellidifolia</i>	-													1	
	<i>Goodenia paniculata</i>	-							2	X					1	X
	Haemodoraceae <i>Haemodorum planifolium</i>	Blood Root	1	X												

APPENDIX E Flora species recorded on the subject site

STATUS	SCIENTIFIC NAME	COMMON NAME	Q1	T1	Q2	T2	Q3	T3	Q4	T4	Q5	T5	Q6	T6	Q7	T7
	Haloragaceae <i>Gonocarpus micranthus</i> subsp. <i>ramosissimus</i> <i>Gonocarpus teucrioides</i>	- Raspwort				X	2	X	1	X					2	X
	Iridaceae <i>Patersonia glabrata</i> <i>Patersonia sericea</i>	Leafy Purple-flag Silky Purple-Flag			1	X									1	X
*	Juncaceae <i>Juncus cognatus</i> <i>Juncus kraussii</i> <i>Juncus usitatus</i>	- - -														X
*	Lauraceae <i>Cassythia glabella</i> f. <i>glabella</i> <i>Cinnamomum camphora</i>	Slender Devil's Twine Camphor Laurel			1	X	2	X	3	X	2	X	2	X	1	
	Lentibulariaceae <i>Utricularia biloba</i>	Moth Bladderwort														
	Lindsaeaceae <i>Lindsaea linearis</i>	Screw Fern	2	X									2	X	2	X
	Lobeliaceae <i>Lobelia alata</i> <i>Pratia purpurascens</i>	Angled Lobelia Whiteroot	1	X			1	X								
	Loganiaceae <i>Mitracme polymorpha</i>	-								X	2	X				
	Lomandraceae <i>Lomandra filiformis</i> subsp. <i>filiformis</i> <i>Lomandra glauca</i> subsp. <i>glauca</i> <i>Lomandra longifolia</i>	- Pale Mat-rush Spiny-headed Mat-rush	2 2 3	X X X		1 X 2									2 2	X X
*	Malvaceae <i>Sida rhombifolia</i>	Paddy's Lucerne														
	Menyanthaceae <i>Villarsia exaltata</i>	Yellow Marsh Flower														
	Moraceae <i>Ficus coronata</i> <i>Callistemon pachyphyllus</i> <i>Corymbia gummifera</i>	Creek Sandpaper Fig Wallum Bottlebrush Red Bloodwood		X			2	X	2	X						

APPENDIX E Flora species recorded on the subject site

STATUS	SCIENTIFIC NAME	COMMON NAME	Q1	T1	Q2	T2	Q3	T3	Q4	T4	Q5	T5	Q6	T6	Q7	T7
	Mbraceae contd.															
	<i>Corymbia intermedia</i>	Pink Bloodwood	3	X												
	<i>Eucalyptus planchoniana</i>	Needlebark Stringybark			5	X										
	<i>Eucalyptus racemosa</i>	Narrow-leaved Scribbly Gum														
	<i>Eucalyptus resinifera</i> subsp. <i>hemilampra</i>	Red Mahogany											5	X		X
	<i>Eucalyptus signata</i>	Northern Scribbly Gum	5	X												
	<i>Kunzea ambigua</i>	Tick Bush														
	<i>Leptospermum juniperinum</i>	Prickly Tea-tree					2	X	3	X	2	X				
	<i>Leptospermum liversidgei</i>	-					4	X	2	X			2	X		
	<i>Leptospermum polygalifolium</i> subsp. <i>polygalifolium</i>	Yellow Tea-tree														
	<i>Leptospermum trinervium</i>	Slender Tea-tree			2	X					2	X	2	X		
	<i>Melaleuca nodosa</i>	Ball Honeymyrtle							1	X	1	X				
	<i>Melaleuca quinque nervia</i>	Broad-leaved Paperbark	2	X			3	X		X			1	X	4	X
	<i>Melaleuca sieberi</i>	-					1	X	1		1	X	2	X		
	<i>Melaleuca thymifolia</i>	-		X			3	X	2	X						X
	<i>Ochrosperma citriodorum</i>															
	Oleaceae															
	<i>Notelaea ovata</i>	-	1												2	X
	Orchidaceae															
	<i>Cryptostylis</i> Sp. (Leaf only)	A Tongue Orchid														X
	<i>Cryptostylis subulata</i>	Large Tongue Orchid	2	X												
	Passifloraceae															
*	<i>Passiflora edulis</i>	Common Passionfruit														
	Philydraceae															
	<i>Philydrum lanuginosum</i>	Frogsmouth														
	Phormiaceae															
	<i>Dianella caerulea</i> var. <i>caerulea</i>	Blue Flax lily					1								1	
	<i>Dianella caerulea</i> var. <i>producta</i>	Blue Flax lily	2	X	2	X										
	Plantaginaceae															
*	<i>Plantago lanceolata</i>	Lamb's Tongues														
	Poaceae															
*	<i>Andropogon virginicus</i>	Whisky Grass	2	X				X								
	<i>Anisopogon avenaceus</i>	Oat Speargrass		X												
	<i>Aristida warburgii</i>	-													2	X
*	<i>Axonopus fissifolius</i>	Narrow-leaved Carpet Grass														
	<i>Cynodon dactylon</i>	Common Couch		X											1	

APPENDIX E Flora species recorded on the subject site

STATUS	SCIENTIFIC NAME	COMMON NAME	Q1	T1	Q2	T2	Q3	T3	Q4	T4	Q5	T5	Q6	T6	Q7	T7
	Poaceae contd.															
	<i>Dichelachne micrantha</i>	S horthair P lumegrass														
	<i>Entolasia marginata</i>	B ordered P anic	2	X	2	X									2	X
	<i>Entolasia stricta</i>	W iry P anic	4	X		X	3	X		X	2	X	2	X	4	X
	<i>Eragrostis brownii</i>	B rown's L ovegrass								X						
	<i>Eragrostis leptostachya</i>	P addock L ovegrass								X						
	<i>Imperata cylindrica</i> var. <i>major</i>	B lady G rass	3	X	3	X									2	X
	<i>Leersia hexandra</i>	S wamp R icegrass	1				3	X	2	X			2	X	1	
	<i>Microlaena stipoides</i> var. <i>stipoides</i>	-		X												
	<i>Oplismenus aemulus</i>	-														
	<i>Oplismenus imbecillis</i>	-														
	<i>Panicum simile</i>	T wo-colour P anic	2	X	2	X	1	X					2	X	2	X
	<i>Paspalidium distans</i>	-														
*	<i>Paspalum dilatatum</i>	P aspalum		X												
*	<i>Paspalum urvillei</i>	V aseey G rass		X												
*	<i>Paspalum wettseni</i>	B road-leaved P aspalum														
*	<i>Pennisetum clandestinum</i>	K ikuyu G rass														
*	<i>Setaria pumila</i>	P ale P igeon G rass														
	<i>Sporobolus creber</i>	S lender R at's T ail G rass														
*	<i>Stenotaphrum secundatum</i>	B uffalo G rass														
	<i>Themeda australis</i>	K angaroo G rass	2	X	2	X									2	X
	Polygonaceae															
	<i>Persicaria decipiens</i>	S lender K notweed														
	Proteaceae															
	<i>Banksia ericifolia</i> subsp. <i>macrantha</i>	-	1	X			2	X	2	X	4	X	3	X	3	X
	<i>Banksia integrifolia</i> subsp. <i>integrifolia</i>	C oastal B anksia		X												
	<i>Banksia oblongifolia</i>	F em-leaved B anksia							1	X	3	X			3	X
	<i>Banksia robur</i>	S wamp B anksia							4	X			3	X		
	<i>Banksia serrata</i>	O ld-man B anksia			3	X										
	<i>Grevillea linearifolia</i> 'northern form'	-														
	<i>Hakea dactyloides</i>	B road-leaved H akea								X						
	<i>Hakea teretifolia</i>	D agger H akea					2	X	2	X	3	X				
	<i>Lomatia silifolia</i>	C rinkle B ush	1	X											1	
	<i>Persoonia lanceolata</i>	L ance L eaf G eebung					2	X				X	1			
	<i>Persoonia levis</i>	B road-leaved G eebung		X												
	<i>Persoonia virgata</i>	-	1	X	2	X							1	X		
	<i>Petrophile pulchella</i>	C onesticks														

APPENDIX E Flora species recorded on the subject site

STATUS	SCIENTIFIC NAME	COMMON NAME	Q1	T1	Q2	T2	Q3	T3	Q4	T4	Q5	T5	Q6	T6	Q7	T7
	Restionaceae															
	<i>Baloskion tetraphyllum</i> subsp. <i>meiostachyum</i>	-														
	<i>Empodisma minus</i>	Spreading R ope-rush		X			2	X	4	X	4	X	3	X	2	X
	<i>Eurychorda complanata</i>	-										X				
	<i>Hypolaena fastigiata</i>	-			1	X	1				1	X				
	<i>Leptocarpus tenax</i>	-					1	X	2	X						
	<i>Lepyrodia scariosa</i>	Scale R ush	2	X			2	X		X	2	X	1		2	X
	<i>Lepyrodia species A</i>												1	X		
	Rhamnaceae															
	<i>Alphitonia excelsa</i>	Red Ash														
	Rubiaceae															
	<i>Galium propinquum</i>	Maori Bedstraw			1	X										
	<i>Ope rcularia diphylla</i>	-														
	<i>Pomax umbellata</i>	Pomax														
	Rutaceae															
	<i>Boronia falcifolia</i>															
	<i>Boronia pinna ta</i>	-	1	X	2	X					1	X				
	<i>Zieria laxiflora</i>	-			1											
	Santalaceae															
	<i>Leptomeria acida</i>	S our C urrent B ush		X												
	Sapindaceae															
	<i>Dodonaea triquetra</i>	Large-leaf H op-bush	1	X	2	X									2	X
	Scrophulariaceae															
	<i>Euphrasia collina</i> subsp. <i>paludosa</i>	-					1	X								
	Selaginellaceae															
	<i>Selagine lla uliginosa</i>	S wamp S elaginella					1	X						X		
	Smilacaceae															
	<i>Smilax aus tralis</i>	L awyer V ine														
	Solanaceae															
*	<i>Solanum mauritianum</i>	W ild T obacco B ush														
*	<i>Solanum nigrum</i>	B lack-berry N ightshade														
	Stackhousiaceae															
	<i>Stackhousia nuda</i>													X		
	<i>Stackhousia viminea</i>	S lender S tackhousia											1	X		

APPENDIX E Flora species recorded on the subject site

STATUS	SCIENTIFIC NAME	COMMON NAME	Q1	T1	Q2	T2	Q3	T3	Q4	T4	Q5	T5	Q6	T6	Q7	T7
*	Stylidiaceae <i>Stylidium graminifolium</i>	Grass Triggerplant													1	
	Thymelaeaceae <i>Pimelea linifolia</i> subsp. <i>linifolia</i>	Slender Rice-flower	2	X	2	X	2	X							1	X
	Verbenaceae <i>Lantana camara</i>	Lantana														
	Violaceae <i>Viola hederacea</i>	Ivy-leaved Violet														
	Xanthorrhoeaceae <i>Xanthorrhoea fulva</i>	Swamp Grass-tree				X	2	X	3	X	2	X	2	X	2	X
	<i>Xanthorrhoea latifolia</i> subsp. <i>latifolia</i>	-					1	X								
	<i>Xanthorrhoea macroneuma</i>	-			2	X										
	Xyridaceae <i>Xyris complanata</i>	-									1	X	1	X	1	
	<i>Xyris operculata</i>	-														



Lot 52 in DP 831284 and Lot 84 in DP 792945
Belle O'Connor Street
South West Rocks

Proposed Residential Development

Ecological Issues & Assessment Report

Appendix F
Fauna Species List

December 2008



Whelans InSites Pty Ltd

Level 12/80 Clarence Street Sydney NSW 2000

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APPENDIX F Fauna species recorded on the subject site

KEY	
Status	
*	Introduced Species
E	Endangered under the NSW TSC Act
V	Vulnerable under the NSW TSC Act
M	Migratory under the Federal EPBC Act
A	Cumberland Ecology
B	Whelans InSites

STATUS	SCIENTIFIC NAME	COMMON NAME	A	B	Comments
	AMPHIBIANS				
	Hylidae				
	<i>Litoria dentata</i>	Bleating Tree-frog	*		
	<i>Litoria fallax</i>	Dwarf Tree-frog	*		
	<i>Litoria freycineti</i>	Freycinet's Frog		*	
	<i>Litoria latopalmata</i>	Broad-palmed Frog	*		
	<i>Litoria tylei</i>	Laughing Tree-frog	*		
	<i>Litoria verreauxii verreauxii</i>	Whistling Tree Frog	*		
	Myobatrachidae				
	<i>Crinia parvignifera</i>	Plains Froglet	*		
	<i>Crinia signifera</i>	Brown Froglet	*	*	
V	<i>Crinia tinnula</i>	Wallum Froglet	*	*	Heard calling on adjacent property to south and north
	<i>Limnodynastes peroni</i>	Striped Marsh-Frog	*		
	<i>Uperoleia laevigata</i>	Smooth Toadlet		*	
	MAMMALS				
	Emballonuridae				
V	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail Bat	*		
	Molossidae				
	<i>Mormopterus</i> sp. 2	Eastern Free-tail Bat	*		
	Vespertilionidae				
	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	*		

APPENDIX F Fauna species recorded on the subject site

STATUS	SCIENTIFIC NAME	COMMON NAME	A	B	Comments
V	<i>Chalinolobus morio</i>	Chocolate Wattled Bat	*		
V	<i>Chalinolobus nigrogriseus</i>	Hoary Wattled Bat	*		
V	<i>Miniopterus australis</i>	Little Bent-wing Bat	*		
V	<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	*		
	<i>Scotorepens orion</i>	Eastern Broad-nosed Bat	*		
	<i>Scotorepens</i> sp.	Central-eastern Broad-nosed Bat	*		
	<i>Vespadelus pumilus</i>	Eastern Forest Bat	*		
V	<i>Vespadelus trouhtoni</i>	Eastern Cave Bat	*		
	<i>Vespadelus vulturnus</i>	Little Forest Bat	*		
	Pteropodidae				
V (TSC & EPBC)	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	*	*	
	Peramelidae				
	<i>Perameles nasuta nasuta</i>	Long-nosed Bandicoot		*	
	Muridae				
	<i>Rattus lutreolus</i>	Swamp Rat	*		
	Peramelidae				
	<i>Isodon macrourus</i>	Northern Brown Bandicoot	*		
	Dasyuridae				
	<i>Antechinus swainsonii</i>	Dusky Antechinus	*		
	Petauridae				
V	<i>Petaurus breviceps breviceps</i>	Sugar Glider		*	Trial Bay Big 4
	<i>Petaurus norfolcensis</i>	Squirrel Glider	*		
	Macropodidae				
	<i>Macropus giganteus giganteus</i>	Eastern Grey Kangaroo	*	*	
	<i>Wallabia bicolor</i>	Swamp Wallaby	*		
	Leporidae				
*	<i>Oryctolagus cuniculus</i>	Rabbit	*		
	Muridae				
*	<i>Rattus rattus</i>	Back Rat	*		
*	<i>Mus musculus</i>	Domestic Mouse	*		

APPENDIX F Fauna species recorded on the subject site

STATUS	SCIENTIFIC NAME	COMMON NAME	A	B	Comments
	BIRDS				
	Pasianidae				
	<i>Coturnix ypsilophora</i>	Brown Quail (ex Swamp Quail)	*		
	Anatidae				
M	<i>Cygnus atratus</i>	Black Swan		*	Saltwater Lagoon
M	<i>Anas superciliosa</i>	Pacific Black Duck	*	*	Saltwater Lagoon
M	<i>Anas gracilis</i>	Grey Teal		*	Saltwater Lagoon
M	<i>Anas castanea</i>	Chestnut Teal		*	Saltwater Lagoon
M	<i>Chenonetta jubata</i>	Australian Wood Duck	*		
	Phalacrocoracidae				
	<i>Phalacrocorax varius</i>	Pied Cormorant	*	*	
	<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant	*		
	Pelecanidae				
	<i>Pelecanus conspicillatus</i>	Australian Pelican		*	
	Ardeidae				
	<i>Egretta novaehollandiae</i>	White-faced Heron		*	
	<i>Ardea alba</i>	Great Egret		*	
M	<i>Ardea ibis</i>	Cattle Egret		*	
	Threskiornithidae				
	<i>Threskiornis molucca</i>	Australian White Ibis		*	
	<i>Threskiornis spinicollis</i>	Straw-necked Ibis		*	
	Ciconiidae				
E	<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork		*	Male and Female foraging within Saltwater Lagoon. Individual also observed on land to south, assumed to be from same pair
	Accipitridae				
V	<i>Pandion haliaetus</i>	Osprey		*	2 adults and 2 juvenile observed over Trial Bay Big 4. At least 1 individual observed over Saltwater lagoon each day. Also observed flying over subject site on occasions. 2 adults obs over Macleay River at Jerseyville.
M	<i>Haliaeetus leucogaster</i>	Brahminy Kite		*	Frequent obs. over subject site
M	<i>Haliaeetus sphegnus</i>	Whistling Kite	*		
M	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	*	*	2 juvenile observed over saltwater lagoon
	<i>Aquila audax</i>	Wedge-tailed Eagle	*		

APPENDIX F Fauna species recorded on the subject site

STATUS	SCIENTIFIC NAME	COMMON NAME	A	B	Comments
	Rallidae <i>Gallinula tenebrosa</i>	Dusky Moorhen	*		
M	Falconidae <i>Falco berigora</i>	Brown Falcon		*	Frequent obs over subject site Observed adjacent to Macleay River
M	<i>Falco cenchroides</i>	Nankeen Kestrel		*	
M	Charadriidae <i>Vanellus miles</i>	Masked Lapwing	*	*	Heard adjacent to subject site and within Trial Bay Big 4
	Laridae <i>Larus novaehollandiae</i> <i>Sterna bergii</i>	Silver Gull Crested Tern		*	
M	Columbidae <i>Streptopelia chinensis</i> <i>Macropygia amboinensis</i> <i>Ocyphaps lophotes</i> <i>Geopelia humeralis</i> <i>Leucosarcia melanoleuca</i>	Spotted Turtle-Dove Brown Cuckoo-Dove Crested Pigeon Bar-shouldered Dove Wonga Pigeon	*	*	
V	Cacatuidae <i>Calyptorhynchus lathami</i> <i>Calyptorhynchus funereus</i> <i>Cacatua roseicapilla</i> <i>Cacatua sanguinea</i> <i>Cacatua galerita</i>	Glossy Black-Cockatoo Yellow-tailed Black-Cockatoo Galah Little Corella Sulphur-crested Cockatoo	*	*	
	Psittacidae <i>Trichoglossus haematodus</i> <i>Trichoglossus chlorolepidotus</i> <i>Platyceercus eximius</i>	Rainbow Lorikeet Scaly-breasted Lorikeet Eastern Rosella	*	*	
	Cuculidae <i>Cacomantis variolosus</i> <i>Cacomantis flabelliformis</i> <i>Chrysococcyx basalis</i> <i>Chrysococcyx lucidus</i> <i>Chrysococcyx minutillus</i> <i>Eudynamys scolopacea</i> <i>Scythrops novaehollandiae</i>	Brush Cuckoo Fan-tailed Cuckoo Horsfield's Bronze-Cuckoo Shining Bronze-Cuckoo Little Bronze-Cuckoo Common Koel Channel-billed Cuckoo	*	*	

APPENDIX F Fauna species recorded on the subject site

STATUS	SCIENTIFIC NAME	COMMON NAME	A	B	Comments
M	CENTROPODIDAE <i>Centropus phasianinus</i>	Pheasant Coucal	*		
	STRIGIDAE <i>Ninox novaeseelandiae</i>	Southern Boobook	*		
	Podargidae <i>Podargus strigoides</i>	Tawny Frogmouth		*	
	APODIDAE <i>Hirundapus caudacutus</i>	White-throated Needle-tail	*		
	Alcedinidae <i>Alcedo azurea</i>	Azure Kingfisher		*	
M	Halcyonidae <i>Dacelo novaeguinae</i> <i>Todirhamphus sanctus</i>	Laughing Kookaburra Sacred Kingfisher	* *	*	
	MEROPIDAE <i>Merops ornatus</i>	Rainbow Bee-eater	*		
	CORACIIDAE <i>Eurystomus orientalis</i>	Dollarbird	*		
	Maluridae <i>Malurus cyaneus</i> <i>Malurus lamberti</i> <i>Malurus melanocephalus</i> <i>Stipiturus malachurus</i>	Superb Fairy-wren Variegated Fairy-wren Red-backed Fairy-wren Southern Emu-wren	* * * *	* *	
	Pardalotidae <i>Pardalotus punctatus</i> <i>Pardalotus striatus</i> <i>Sericornis frontalis</i> <i>Gerygone olivacea</i> <i>Acanthiza pusilla</i> <i>Acanthiza nana</i>	Spotted Pardalote Striated Pardalote White-browed Scrubwren White-throated Gerygone Brown Thornbill Yellow Thornbill	* * * * * *	* *	
	Meliphagidae <i>Anthochaera carunculata</i>	Red Wattlebird	*	*	

APPENDIX F Fauna species recorded on the subject site

STATUS	SCIENTIFIC NAME	COMMON NAME	A	B	Comments
	<i>Anthochaera chrysoptera</i>	Little Wattlebird	*	*	Heard adjacent to Saltwater Lagoon
	<i>Philemon corniculatus</i>	Noisy Friarbird	*	*	
	<i>Manorina melanocephala</i>	Noisy Mner		*	
	<i>Meliphaga lewinii</i>	Lewin s Honeyeater	*	*	
	<i>Lichenostomus chrysoptera</i>	Yellow-faced Honeyeater	*	*	
	<i>Lichmera indistincta</i>	Brown Honeyeater	*	*	
	<i>Phylidonyris nigra</i>	White-cheeked Honeyeater	*	*	
	<i>Myzomela sanguinolenta</i>	Scarlet Honeyeater	*	*	
	<i>Acanthorhynchus tenuirostris</i>	Eastern Spinebill		*	
	Petroicidae				
	<i>Eopsaltria australis</i>	Eastern Yellow Robin	*		
	<i>Microeca fascians</i>	Jacky Winter		*	
	Pachycephalidae				
	<i>Pachycephala rufiventris</i>	Rufous Whistler	*		
	<i>Colluricincla harmonica</i>	Grey Shrike-thrush	*		
	Dicruridae				
	<i>Myiagra rubecula</i>	Leaden Flycatcher	*		
	<i>Grallina cyanoleuca</i>	Magpie-lark	*	*	
	<i>Rhipidura rufifrons</i>	Rufous Fantail	*		
	<i>Rhipidura albiscapa</i>	Grey Fantail	*	*	
	<i>Rhipidura leucophrys</i>	Willie Wagtail	*	*	
	Campephagidae				
	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	*		
	<i>Coracina papuensis</i>	White-bellied Cuckoo-shrike	*		
	<i>Coracina tenuirostris</i>	Cicadabird	*		
	Oriolidae				
	<i>Oriolus sagittatus</i>	Olive-backed Oriole	*		
	Artamidae				
	<i>Craicticus torquatus</i>	Grey Butcherbird	*		
	<i>Craicticus nigrogularis</i>	Pied Butcherbird	*	*	
	<i>Gymnorhina tibicen</i>	Australian Magpie	*	*	

APPENDIX F Fauna species recorded on the subject site

STATUS	SCIENTIFIC NAME	COMMON NAME	A	B	Comments
	Corvidae <i>Corvus coronoides</i> <i>Corvus tasmanicus</i> <i>Corvus orru</i> Passeridae <i>Taeniopygia bichenovii</i> <i>Neochmia temporalis</i> Dicaeidae <i>Dicaeum hirundinaceum</i> Hirundinidae <i>Hirundo neoxena</i> Zosteropidae <i>Zosterops lateralis</i>	Australian Raven Forest Raven Torresian Crow Double-barred Finch Red-browed Finch Mistletoebird Welcome Swallow Silveryeye	* * * * * *	* * * *	Obs. adjacent to Saltwater Lagoon



Lot 52 in DP 831284 and Lot 84 in DP 792945
Belle O'Connor Street
South West Rocks

Proposed Residential Development

Ecological Issues & Assessment Report

Appendix G
Vegetation Management Principles Plan

March 2009



Whelans InSites Pty Ltd

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**Lot 52 in DP 831284 and Lot 84 in DP 792945
Belle O'Connor Street
South West Rocks**

VEGETATION MANAGEMENT PRINCIPLES PLAN

March 2009

1 INTRODUCTION

- The proposed residential development of the subject site at South West Rocks involves the retention of 14.3 hectares of vegetation for conservation purposes and the creation of two vegetated swales running north east through the site (Figure 1).
- The *Conservation Area* is proposed to be Zoned 7 (b) Environmental Protection (Habitat) and 7(c) Wetlands Protection as part of the rezoning of the site.
- An *Asset Protection Zone* (APZ), to be managed as an *Inner Protection Area* (IPA) is required within the road reserve adjacent to the *Conservation Area*.
- Water quality measures will have minimal encroachment into the *Conservation Area* however will be required to be managed separately.
- Two bike/pedestrian paths are proposed within the *Conservation Area*. One generally follows the northern road of the subdivision whilst the other one is located within the heath vegetation in the eastern portion of the *Conservation Area*.
- The remainder of the vegetation will be retained and managed for biodiversity conservation purposes.
- This *Vegetation Management Principle Plan* outlines the structure and general principles of the final VMP which will be produced following approval of the Part 3A *Project Application*.
- Two '*endangered ecological communities*' (EECs) may be present in the *Conservation Area*,
 - the Sedgeland vegetation community (MU 9) conforms to the EEC Freshwater Wetlands on Coastal Floodplains (FWCF); and
 - the Broad-Leaved Paperbark Open Forest - Sandplain Variant (MU 3) may conform to the EEC Swamp Sclerophyll Forest on Coastal Floodplains (SSCF).
- Both these communities will be retained and managed for conservation purposes within the *Conservation Area*.
- A SEPP 14 Wetland occurs entirely within the *Conservation Area*.
- No threatened flora species have been recorded on the subject site.
- Ten threatened fauna species have been recorded, primarily within the *Conservation Area* of the subject site (the Yellow-bellied Sheath-tail Bat, Eastern Free-tail Bat, Hoary Wattled Bat, Little Bent-wing Bat, Greater Broad-nosed Bat, Eastern Cave Bat, Squirrel Glider, Grey-headed Flying Fox, Wallum Froglet and Glossy Black Cockatoo).
- The area of vegetation to be retained within the *Conservation Area* will involve 3 different management regimes:
 - the active management of the interface between the APZ and *Conservation Area*;
 - the active management of the water quality measures; and

- the passive management of the remainder of vegetation within Conservation Area.
- The aims of this *Vegetation Management Principles Plan* (VMPP) are to provide the basic principles to guide the preparation of a detailed VMPP with respect to:
 - the management and maintenance of the interface between the identified *Asset Protection Zones* and the *Conservation Area*;
 - the management and maintenance of the water quality measures;
 - the implementation of appropriate enhancement measures within areas of retained native vegetation;
 - the maintenance and enhancement of habitat for native fauna; and
 - the monitoring of the Conservation Area, APZs, constructed swales and detention areas.

2 GENERAL PROTECTION MEASURES

- Erection of appropriate protection barriers (to stop vehicles) and signage.
- Clear identification of all hollow-bearing trees within the APZ.
- Provision of sediment fences around earthworks, where relevant, to protect areas of retained vegetation.
- The conduct of an induction program for site workers, and the provision of relevant signage around the site.
- Monitoring of works and the provision of a mechanism for the remedy of any disturbance.

3 VEGETATION WITHIN THE CONSERVATION AREA (Not Water Quality or APZ)

- The overwhelming majority of the Conservation Area will be managed so to maintain the current biodiversity values.
- Three small pockets have been identified for passive recreation. Within these areas no hollow-bearing trees will be removed and only selective clearing of shrub and ground cover. All clearing of vegetation should be undertaken under the supervision of an ecologist
- Specific activities to be undertaken in this area will include:
 - a dedicated weed removal and monitoring program;
 - an ongoing weed management and control program; and
 - the implementation of a monitoring program during and immediately post construction to identify any problems which may arise and to monitor the ongoing condition of vegetation in this area.
- Given the resilient nature of the heath community and the relatively good condition of the forest communities it is considered that any weed management will be minor.
- It is likely that supplementary plantings will not be required throughout the majority of the *Conservation Area*. The only areas where supplementary plantings may be required is potentially along roads and other areas of disturbance.

4 ASSET PROTECTION ZONES

- Management of the *Asset Protection Zones* (APZs) interface with the *Conservation Area* around the northern boundary of the residential subdivision will be undertaken in an environmentally sensitive manner, designed to achieve the requirements of the RFS without compromising the integrity of the vegetation communities or threatened species habitats.
- Any removal of vegetation within the APZs will be the minimum required by the RFS to achieve acceptable bushfire protection outcomes and supervised by an ecologist
- All removal or thinning of midstorey and understorey vegetation will be conducted by hand and/or hand tools to limit potential impacts.
- Vegetation removed from APZs will be re-used in other parts of the site where possible.
- The APZs will be monitored and managed to ensure that no weed infestations occur and that the threatened species are not being affected.
- Wherever possible, no hollow-bearing trees will be moved within the APZ.

5 BIKE/PEDESTRIAN PATHS

- Two bike/pedestrian paths are proposed within the Conservation Area. One path follows the northern road of the subdivision whilst the second path traverses the heath vegetation.
- The current locations of the paths are indicative only. The final location will be developed on site with an ecologist
- The area of disturbance for the construction of the paths will be no greater than 4 metres but preferably less.
- All paths should follow existing lines of disturbance wherever possible.
- Construction of the paths should occur from the two end points only.

6 SWALES/DETENTION AREAS

- The landscaping of the swales have been undertaken in consultation with an ecologist to ensure the swales act as dual function for both water management and fauna linkages. Any changes to the planting schedule must be approved by an ecologist
- Monitoring of these areas should be undertaken as per Chapter 8 (see below)

7 MAINTENANCE REGIME

- The *Conservation Area* and swale/detention areas will be subject to an ongoing regime of:
 - monitoring (see below); and
 - 3-monthly management of weeds during construction works.
- The *Asset Protection Zones* will be managed by:
 - the annual hand removal of excess forest debris (<6mm in diameter) and/or lower stratum vegetation to achieve the fuel loads required by the RFS;
 - monitoring (see below);

APPENDIX G Vegetation Management Principles Plan

- 3-monthly management of weeds during construction works; and
- annual weed removal as deemed necessary by the monitoring program.

8 MONITORING PROGRAM

- Establishment of photo-monitoring points and fixed survey quadrats (where possible) in the Conservation Area, APZ, swale and detention basin areas.
- Monitoring of construction activities and protection fencing.
- Monitoring of the Conservation Area.
- Monitoring of APZs, swales and detention areas (3-monthly during construction).
- *Monitoring Reports* to D o P / C ouncil (annually).