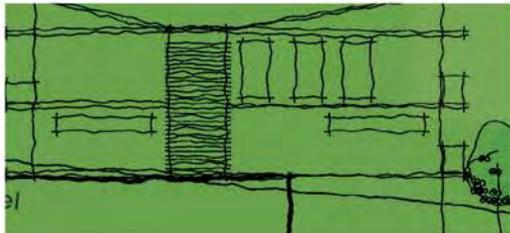
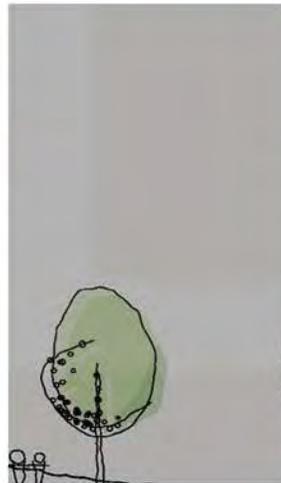




# Terrestrial Flora and Fauna Assessment

Iron Gates Development, Evans Head

Prepared for Gold Coral Pty Ltd



Prepared by Planit Consulting Pty Ltd

August 2014

## 1.0 INTRODUCTION

Planit Consulting has been commissioned by Gold Coral Pty Ltd to prepare terrestrial flora and fauna assessment report relating to the proposed residential development located at Iron Gates, Evans Head as generally depicted in Figure 1.

The Flora and Fauna Assessment documents flora, fauna and habitat studies undertaken over the site, an analysis of ecologically significant areas (and subsequent constraints to development if present) and provides design and management recommendations to be implemented in association with the proposal.

The proposal is for a residential subdivision as depicted in Figure 2 (Attachment 1) within areas zoned for residential development.



**FIGURE 1 – SITE LOCATION**



**FIGURE 2 – SITE PLAN**

## 2.0 SITE DESCRIPTION & LOCATION

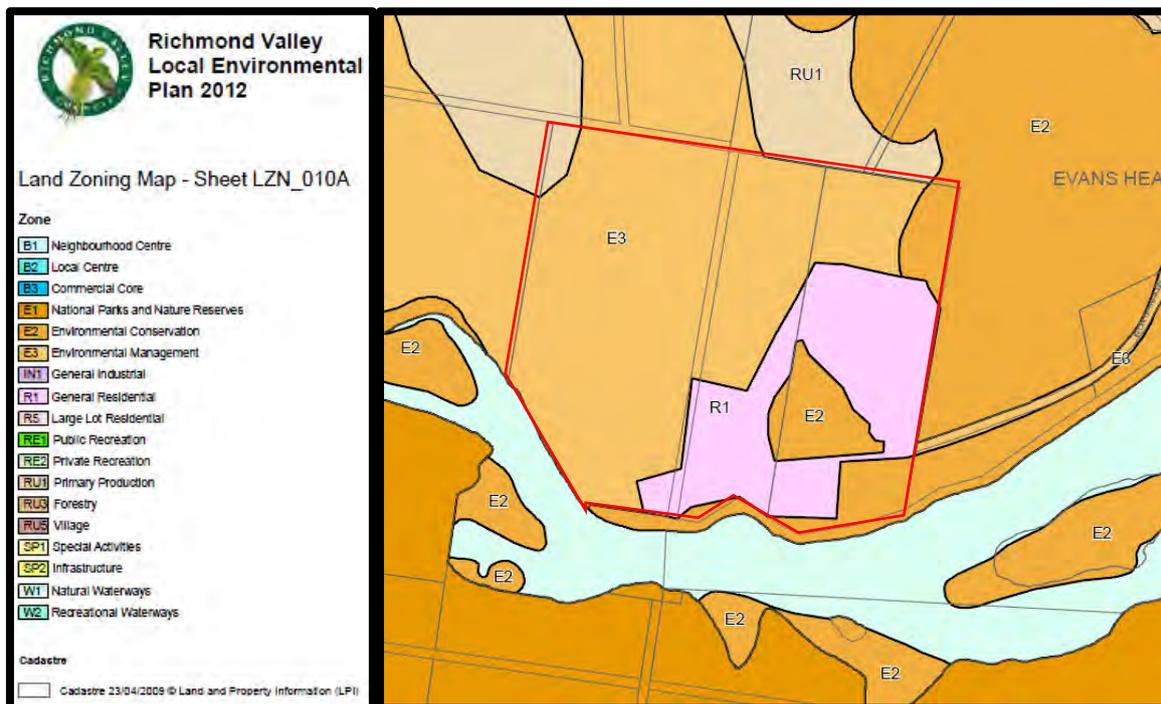
The development is situated within lots Lot 277 DP755624, Lot 276 DP755624 and Lot 163 DP831052 and is accessed from Iron Gates Road within the suburb of Evans Head. These allotments shall be hereafter referred to as '*the site*'.

The site is located within the 'General Residential' precinct of the Richmond Valley Local Environmental Plan 2012 and is surrounded by Environmental Conservation or Management zoning as illustrated in Figure 3. The development footprint areas are largely clear from vegetation as a result of historic landuses and site/bushfire maintenance. A portion of the development footprint is within an area of regrowth acacia.

The Iron Gates development site is situated on the north coast of New South Wales approximately 1km west of the township of Evans Heads.

The Evans River forms the southern portion of the development site. To the south of the site is Bundjalung National Park where Nature Conservation is currently its primary land use. To the north, there is Crown Land supporting local native forest (Anne Clements & Associates, 1996).

In the Crown Land, there has been some quarry extraction in previous years (Tony McAteer, Richmond River Council, pers comm., 17 July 96). The site features two man-made drainage lines which occur along the eastern portions of the site. These drainage lines have a consent order to be filled in.



**FIGURE 3 – LAND USE ZONING (SOURCE: RICHMOND VALLEY LEP 2012)**

### Geology & Topography

Triassic sediments rocks of the Clarence-Morton Basin from the central ridge of the Iron Gates property (Crown Lands Office 1986). Soils of the ridge have a higher clay content than those of surrounding Quaternary sandy soils.

Roy (1982) mapped the Quaternary geology of the area. The central area of the site is mapped as rock and the surrounding soils as Quaternary Deposits. Early Quaternary (Pleistocene age) barrier and beach ridge sand deposits occur in surrounding land with more recent Quaternary deposits (Holocene) back barrier washover tidal delta sands occurring along the Evans River. The Quaternary alluvial deposits along the river form floodplains and terraces. Soils range from clays to uniform silts and sands (Mckenzie 1983).

### **3.0 VEGETATION ASSESSMENT**

To identify and classify vegetation species and communities which occur on site, the following methodology was applied of the 20<sup>th</sup> – 25<sup>th</sup> May 2014:

- Desktop analysis including:
  - i. Review of Council's Planning Scheme Mapping & Associated Reporting (i.e Richmond Valley Local Environmental Plan 2012 Mapping)

- 
- ii. Review of existing vegetation community documentation to confirm dominant elements, forest descriptions and conservation status of mapped forested remnants/ecosystems including:
    - Forestry Commission NSW (1989) *Research Note 17: Forest Types in NSW*.
    - National Parks and Wildlife Service (1999) *Forest ecosystem classification and mapping for the upper and lower north east cra regions*. CRA Unit-Northern Zone.
    - DECC (2008) *BioMetric: Terrestrial Biodiversity Tool for the NSW Property Vegetation Planning System: Definitions of Vegetation Types for CMA Areas* (online @ <http://www.environment.nsw.gov.au/projects/BiometricTool.htm>)
    - Keith, D. (2004) *Ocean Shores to Desert Dunes*. The native vegetation of NSW. DECC, Hurstville.
    - Sheringham, P.R., Dr. Benwell, A., Gilmour, P., Graham, M.S., Westaway, J., Weber, L., Bailey, D., & Price, R. (2008). *Targeted Vegetation Survey of Floodplains and Lower Slopes on the Far North Coast*. A report prepared by the Department of Environment and Climate Change for the Comprehensive Coastal Assessment. Department of Environment and Climate Change (NSW), Coffs Harbour, NSW.
  - iii. Review of search of the Atlas of NSW Wildlife database within a search area 10km surrounding the site to review threatened plant records
  - iv. Review of Environment Australia Protected Matters data within a search area 10km surrounding the site to review threatened plant records
  - v. Review of SEPP Mapping (Coastal Wetlands, Littoral Rainforest) mapping to determine the indicative presence/absence of regional forest ecosystems reflective of wetland (marine, estuarine, riverine, lacustrine and/or palustrine) communities and/or Littoral Rainforests.
  - vi. Review of the following legislation to ensure the latest lists of threatened species and communities were noted as well as investigating the existence of any relevant recovery plans, threat abatement plans, key threatening processes or any preliminary determinations which may be applicable to the site and/or the proposed use/action:
    - *Threatened Species Conservation Act (1995)*
    - *Environment Protection and Biodiversity Conservation Act (1999)*
    - *Site survey including:*
  - i. Random Meander/Diversity Searches: Random searches within each vegetation community were undertaken recording all species observed was undertaken in accordance with Cropper (1993) and DEC (2004). Knowledge of known habitat of protected and uncommon floral species was utilized to target such species. Observation also included recording crown cover, tree heights and DBH estimation, dominant species present and identification of ecologically dominant layer.

The above survey techniques were applied to determine the following:

- Validate or modify existing vegetation mapping;
- Meet minimum Council and State Government vegetation/survey requirements;
- Identify floral species existing within the site;
- Measure and/or estimate Crown Cover (Walker and Hopkins, 1998, Nelder, 2004. EPA, 2005) to determine vegetation structure designations;

- Identify average height of canopy trees;
- Identify the incidence of senescent trees;
- Determine species dominance within ecologically dominant layer;
- Determine incidence of weed invasion and disturbance over the site and within vegetation strata;
- Determine incidence of species listed as endangered, vulnerable or rare under the *Threatened Species Conservation Act*;
- Determine incidence of species listed as endangered or vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999*

In undertaking the site survey works focus was given to the development footprint and immediate surrounding areas (50m) with a more general inspection of areas beyond these limits.

### Structural Analysis

*Canopy tree height* (T1 layer) was determined ocularly from the mean of three experienced observers. Height classes were then selected from classifications provided in Walker & Hopkins (in McDonald et al, 1998).

*Crown cover %* for the T1 layer was estimated using the mean of two experienced observers or measured via crown intercept method (Nelder et al, 2004, EPA, 2005).

*Structural formation classes* were determined via an assessment of growth form and crown cover % information as per Walker & Hopkins (1998).

**Table 1:** Height Classes & Names For Various Growth Forms (Sensu Walker & Hopkins, 1998: Table 15)

Height		Growth Form			
Height Class	Height Range (m)	Trees, vines, palms	shrub, heath shrub, chenopod shrub, mallee (tree or shrub form), cycads	tussock grass, hummock grass, forbs, rushes, sedges, ferns, Xanthorrhoea	Sod grasses, mosses, lichens, liverworts
9	>35.01	Extremely tall	N/A	N/A	N/A
8	20.01-35	Very Tall	N/A	N/A	N/A
7	12.01-20	Tall	N/A	N/A	N/A
6	6.01-12	Mid-high	Extremely tall	N/A	N/A
5	3.01-6	Low	Very tall	Extremely tall	N/A
4	1.01-3	Dwarf	Tall	Very tall	N/A
3	0.51-1	N/A	Mid-high	Tall	Extremely tall
2	0.26-0.5	N/A	Low	Mid-high	Tall
1	<0.25	N/A	Dwarf	Low	Low

**Table 2:** Structural Formation Classes Defined By Growth Form And Crown Separation (Walker & Hopkins, 1998: Tables 14a & 17)



<b>CROWN SEPARATION</b>	<b>D CLOSED OR DENSE</b>	<b>M MID-DENSE</b>	<b>S SPARSE</b>	<b>B VERY SPARSE</b>	<b>I ISOLATED PLANTS</b>	<b>L ISOLATED CLUMPS</b>
<b>FIELD CRITERIA</b>	<b>TOUCHING - OVERLAP</b>	<b>TOUCHING - SLIGHT SEPARATION</b>	<b>CLEARLY SEPARATED</b>	<b>WELL SEPARATED</b>	<b>ISOLATED</b>	<b>ISOLATED</b>
<b>CROWN SEPARATION RATIO</b>	<0	0-0.25	0.25-1	1-20	>20	>20
<b>CROWN COVER %</b>	81-100%	52-81%	20-52%	0.2-20%	<0.2%	<0.2%
<b>GROWTH FORM STRUCTURAL FORMATION CLASSES</b>						
<b>T TREE</b>	CLOSED FOREST	OPEN FOREST	WOODLAND	OPEN WOODLAND	ISOLATED TREES	ISOLATED CLUMP OF TREES
<b>M TREE MALLEE</b>	CLOSED MALLEE FOREST	OPEN MALLEE FOREST	MALLEE WOODLAND	OPEN MALLEE WOODLAND	ISOLATED MALLEE TREES	ISOLATED CLUMP OF MALLEE TREES
<b>S SHRUB</b>	CLOSED SHRUBLAND	SHRUBLAND	OPEN SHRUBLAND	SPARSE SHRUBLAND	ISOLATED SHRUBS	ISOLATED CLUMP OF MALLEE SHRUBS
<b>Y MALLEE SHRUB</b>	CLOSED MALLEE SHRUBLAND	MALLEE SHRUBLAND	OPEN MALLEE SHRUBLAND	SPARSE MALLEE SHRUBLAND	ISOLATED MALLEE SHRUBS	ISOLATED CLUMP OF MALLEE SHRUBS
<b>Z HEATH SHRUB</b>	CLOSED HEATHLAND	HEATHLAND	OPEN HEATH	SPARSE HEATH	ISOLATED HEATH SHRUBS	ISOLATED CLUMP OF HEATH SHRUBS
<b>C CHENOPOD SHRUB</b>	CLOSED CHENOPOD SHRUBLAND	CHENOPOD SHRUBLAND	OPEN CHENOPOD SHRUBLAND	SPARSE CHENOPOD SHRUBLAND	ISOLATED CHENOPOD SHRUBS	ISOLATED CLUMP OF CHENOPOD SHRUBS

**Table 3: Structural Formation Classes For Ground Covers**

<b>Structural formation classes for ground covers (Walker &amp; Hopkins, 1998: Table 14b)</b>						
<b>CROWN CLASS</b>	<b>D CLOSED OR DENSE</b>	<b>M MID-DENSE</b>	<b>S SPARSE</b>	<b>B VERY SPARSE</b>	<b>I ISOLATED PLANTS</b>	<b>L ISOLATED CLUMPS</b>
<b>FOLIAGE COVER</b>	>70	30-70	10-30	<10	<1	<1
<b>GROWTH FORM STRUCTURAL FORMATION CLASSES</b>						
<b>G TUSsock GRASS</b>	CLOSED GRASSLAND	GRASSLAND	OPEN GRASSLAND	SPARSE GRASSLAND	ISOLATED GRASSES	ISOLATED CLUMP OF TUSsock GRASSES
<b>H HUMMOCK GRASS</b>	CLOSED HUMMOCK GRASSLAND	HUMMOCK GRASSLAND	OPEN HUMMOCK GRASSLAND	SPARSE HUMMOCK GRASSLAND	ISOLATED HUMMOCK GRASSES	ISOLATED CLUMP OF HUMMOCK GRASSES
<b>D SOD GRASS</b>	CLOSED SOD GRASSLAND	SOD GRASSLAND	OPEN SOD GRASSLAND	SPARSE SOD GRASSLAND	ISOLATED SOD GRASSES	ISOLATED CLUMP OF SOD GRASSES
<b>V SEDGE</b>	CLOSED SEDGELAND	SEDGELAND	OPEN SEDGELAND	SPARSE SEDGELAND	ISOLATED SEDGES	ISOLATED CLUMP OF SEDGES
<b>R RUSH</b>	CLOSED RUSHLAND	RUSHLAND	OPEN RUSHLAND	SPARSE RUSHLAND	ISOLATED RUSHES	ISOLATED CLUMP OF RUSHES
<b>F FORB</b>	CLOSED FORBLAND	FORBLAND	OPEN FORBLAND	SPARSE FORBLAND	ISOLATED FORBS	ISOLATED CLUMP OF FORBS
<b>E FERN</b>	CLOSED FERNLAND	FERNLAND	OPEN FERNLAND	SPARSE FERNLAND	ISOLATED FERNS	ISOLATED CLUMP OF FERNS
<b>O MOSS</b>	CLOSED MOSSLAND	MOSSLAND	OPEN MOSSLAND	SPARSE MOSSLAND	ISOLATED MOSESSES	ISOLATED CLUMP OF MOSESSES
<b>L VINE</b>	CLOSED VINELAND	VINELAND	OPEN VINELAND	SPARSE VINELAND	ISOLATED VINES	ISOLATED CLUMP OF VINES

It is noted that Qld EPA (2005) and Nelder et al (2004) have provided Structural formation Class Tables which vary slightly from Tables 1 and 2 above. This table is displayed below:

Structural formation classes for woody plant communities qualified by height: (classes defined by growth form, height and cover) [sensu EPA, 2005]				
Foliage projective cover	70-100%	30-70%	10-30%	<10%
Crown separation	closed or dense	mid-dense	sparse	very sparse
Field criteria	touching-overlap	touching - slight separation	clearly separated	well separated
Crown separation ratio	<0	0-0.25	0.25-1	1-20
Crown cover %	81-100%	52-81%	20-52%	0.2-20%
<b>Growth form</b>	<b>Structural Formation Classes (qualified by height)</b>			
trees > 30m	tall closed-forest	tall open-forest	tall woodland	tall open-woodland
trees 10 – 30m	closed-forest	open-forest	woodland	open-woodland
trees < 10m	low closed-forest	low open-forest	low woodland	low open-woodland
shrubs 2 – 8m	closed-scrub	open-scrub	tall shrubland	tall open-shrubland
shrubs 1 – 2m	closed-heath	open-heath	shrubland	open-shrubland
shrubs <1m	-	-	dwarf shrubland	dwarf open-shrubland

The above methodology is considered to be reasonably consistent with the intent of the following documents:

- NSW Department of Infrastructure, Planning and Natural Resources (1997) *Interim Guidelines for Targeted and General Flora and Fauna Surveys under the Native Vegetation Conservation Act 1997*.
- NSWNPWS (2001) *The Community Biodiversity Survey Manual*. New South Wales National Parks & Wildlife Service.
- QLD Department of Environment and Heritage (1999) *Suggested Conservation Criteria for Development Assessment*.
- Gold Coast City Council (2004) *Guidelines for preparing Ecological Site Assessments during the Development Process (v1.1)*. G.C.C.C., Nerang.
- Shire of Maroochy (1997) *Flora and Fauna Assessment Requirements for Developments in Maroochy Shire*. M.S.C
- Brisbane City Council (1999) *Ecological Assessment Guidelines*. B.C.C.
- Walker, J. & Hopkins, M.S. (1998) Chapter 5: Vegetation in McDonald, R. C., Isbell, R.F., Speight, J.G., Walker, J. & Hopkins, M.S. *Australian Soil and Land Survey: Field Handbook Second Edition*. CSIRO Australia, Canberra.
- Nelder, V. J., Wilson, B.A., Thompson, E. J. & Dillewaard, H.A. (2004) *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland*. EPA, Brisbane.
- DEC (2004) *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities Working Draft*. DEC, NSW.

### 3.1 VEGETATION SURVEY RESULTS

As a result of flora surveying of the development footprint and the immediate surroundings the site has 4 broad vegetation categories. These being;



1. Disturbed
2. Heath;
3. Eucalypt Forest; and
4. Littoral Rainforest

The abovementioned broad vegetation categories have been divided into 8 vegetation communities.

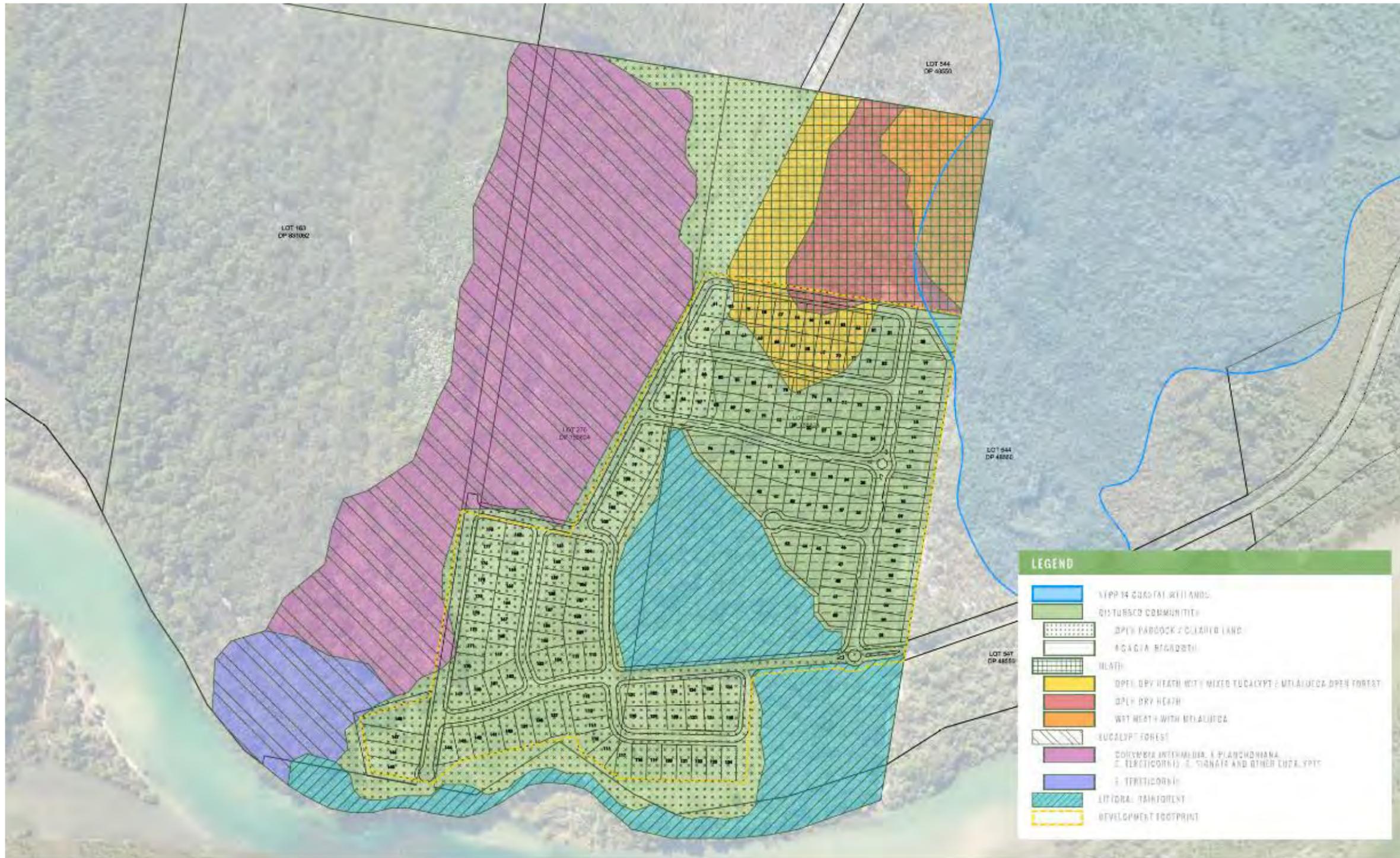
In respect to the Disturbed Community this has 2 distinct forms/characteristics either cleared land / paddocks or previously cleared areas regenerating with acacia.

In regard to the Heath, this differentiation is based upon the presence or absence of a tree canopy layer and composition and results in 3 separable discernible types of heath communities.

The Eucalypt forest displays 2 distinct communities as a result of landform and species composition.

Additionally the SEPP 14 Wetland Mapping is also identified. A discrepancy with the mapping and onsite vegetation is discussed in Section 6.

These vegetation associations/assemblages are described separately below and illustrated in Figure 4 and in Attachment 2.



**IRON GATES, EVANS HEAD**  
 BROAD VEGETATION COMMUNITIES

SCALE: 1:4000 @ A1  
 DATE: 08/14  
 REV: 01

DRAWN: ZP  
 CHECKED: BS  
 DRAWN NO: IRONGATES\_BVC\_00

NORTH

Level 1 207 Third Creek Hwy  
 Hobbey Beach  
 PO Box 55 Hobbey Beach QLD 4218  
 Telephone 07 5564 1880  
 Fax 07 5564 1882  
 www.planitconsulting.com.au

FIGURE 4 – IRON GATES BROAD VEGETATION COMMUNITIES

## 1. DISTURBED COMMUNITIES

### DISTURBED/CLEARED AREAS WITH SCATTERED TREES, OPEN Paddock AND REGROWTH (*ACACIA AULACOCARPA*)



This vegetation community occupies the majority of the site and is approximately 14.5ha in area. The community as mentioned has two distinct characteristics either cleared/pasture or regrowth acacia from previously cleared areas. Each of these have been separately mapped in the disturbed community mapping as Open Paddock/Cleared Land and Acacia Regrowth.

#### Acacia Regrowth

The disturbed acacia regrowth community occupies areas previously cleared with the former residential development of the site. The community is restricted to the previously cleared allotment areas. This regrowth consists almost exclusively of *Acacia disparrima* (Hickory Wattle) with a canopy height of approximately 8-10m and is approximately 7.2ha in area.

Constructed roads and stormwater infrastructure are also a dominant feature of the community.



Other tree species noted within the canopy and sub-canopy layer include Bumpy Ash (*Flindersia schottiana*), Tuckeroo (*Cupaniopsis anacardiodes*), Swamp Box (*Lophostemon suaveolens*), Brushbox (*L. confertus*), Coast Banksia (*Banksia integrifolia*), Candlestick Banksia (*Banksia attenuate*), Willow Bottlebrush (*Callistemon salignus*), Soap Tree (*Alphitonia excelsa*), Coast Wattle (*Acacia longifolia*), Broad-leaved Paperbark (*Melaleuca quinquenervia*), Umbrella Cheese Tree (*Glochidion sumatranum*), Geebung (*Persoonia virgata*) and Scentless Rosewood (*Synoum glandulosum*).



The shrub layer varied in density throughout the community which consisted of Spiny-head Mat-rush (*Lomandra longifolia*), Tall Sawsedge (*Gahnia clarkei*), Wallum Heath (*Epacris pulchella*), Grass Tree (*Xanthorrhoea fulva*), Swamp May (*Leptospermum liversidgei*), Paperbark Tea-tree (*L. trinervium*), Foxtails (*Caustis blakei*), Dodder Laurel (*Cassytha pubescens*), Curly Wig (*Caustis recurvate*), Bracken Fern (*Pteridium* spp.), Homoranthus *virgatus* and Mock Olive (*Notelaea longifolia*).

A variety of native and exotic grass species were present which included Blady Grass (*Imperata cylindrica*), Common Couch (*Cynodon dactylon*), Small-flowered Finger Grass (*Digitaria parviflora*), Winter Grass (*Poa annua*), Wiry Panic (*Entolasia stricta*), Kangaroo Grass (*Themeda triandra*), Whiskey Grass (*Andropogon virginicus*) and Blue Couch (*Digitaria didactyla*). Additional groundcovers are also common throughout (particularly proximate to the drainage lines) which included Knobby Club-rush (*Ficinia nodosa*), Bunchy Sedge (*Baumea articulata*), Didgery Sticks (*Baloskion pallens*), Common Rush (*Juncus effusus*), Grey Sedge (*Lepironia articulata*), Scrambling Lily (*Geitonoplesium cymosum*) and Sweet Sarsaparilla (*Smilax glycyphylla*), Tape Vine (*Stephania japonica*) and Monkey Rope (*Parsonsia straminea*).

This community is bound to the east and west by a drainage channels excavated as part of the prior residential development.



In respect to the drainage line along the eastern boundary of the site, this is tidally influenced south of the access road into the site.

It is noted the north eastern corner of this site is mapped as SEPP wetland, vegetation in this location does not reflect species associated with a wetland. The vegetation of this location is

comprises regrowth Acacia and dry heath immediately to the north. A fire trail exists along the sites eastern boundary and divides the acacia regrowth from the heath.



#### Open Paddock / Cleared land

The open paddock elements of this disturbed community occur adjacent to the existing house and the areas east of this. This area has retained cleared land status due to continuous slashing/maintenance and former agricultural pursuits. Notwithstanding this disturbance a number of occasional trees occur and or are associated with native and ornamental plantings around the dwelling.

This vegetation community occupies the developmental footprint. Within the cleared land adjacent to the house, tree species include Blackwood (*Acacia Melanoxyton*), Tuckeroo (*Cupaniopsis anacardioides*), and Pink Bloodwood (*Corymbia intermedia*).



The groundcover within the cleared area exists as hard stand, exposed earth or is dominated by a mosaic of common pasture/exotic weeds and grasses. Exotic/native grasses include *Setaria sphacelata*, *Cynodon dactylon*, *Digitaria didactyla*, *Digitaria parviflora*, *Themeda triandra*, *Imperata cylindrical* and *Cymbopogon refractus*.

Pasture/environmental weed species present include Wild Tobacco (*Solanum mauritianum*), Blue Billygoat Weed (*Ageratum houstonianum*), Cobbler's Pegs (*Bidens pilosa*), Balloon Vine (*Cardiospermum grandiflorum*), Thickhead (*Crassocephalum crepidioides*), Easter Cassia (*Senna pendula var. glabrata*), Purpletop (*Verbena bonariensis*), Lantana (*Lantana*

*camara*), Inkweed (*Phytolacca octandra*), Wandering Jew (*Commelina cyanea*), Flatweed (*Hypochaeris radicata*), Crofton Weed (*Ageratina adenophora*), White Clover (*Trifolium repens*), Tassel flower (*Emilia sonchifolia*) and Paddy's Lucerne (*Sida rhombifolia*).

Numerous ornamental/garden flora species are present proximate to the existing dwelling within established garden beds, planted in an ad-hoc manner or present as escapees. While not described exhaustively within this report species noted included Silky Oak (*Grevillea robusta*), Cocos Palm (*Syagrus romanzoffiana*), *Hibiscus spp.*, Common Couch (*Cynodon dactylon*) and Blue Couch (*Digitaria didactyla*).

Weed species were also relatively common and are as described within the cleared land section within this community.

The respective comparative nomenclature for this community is presented below.

**Forest Types in NSW 1989: Wattle (214) / Cleared / Partially Cleared (220)**

**CRA Forest Ecosystems 1999: Wattle(151) / NA**

**Keith (2004) Ocean Shores-Desert Dunes: N/A**

## 2 HEATH



Heath dominated communities occur in the north eastern section of the site with only a small portion within the development footprint. This community displays structural and specie variation. The north and northeast portions of the site and has been previously sand mined in several sections and may be a factor in this diversity.

The heath community has been previously described as tall heath, wet heath and heath regenerating after fire and sand mining (Wrigley 1992). Ground truthing of the heath community notes that the community can be divided into three sub-communities.

The three sub-communities on site can be described as Low Closed Wet Heath with Mid-high to Tall *Melaleuca* Closed Forest, Tall – Very Tall Open Dry Heath and Tall – Very Tall Open Dry Heath with *Eucalypt/Melaleuca* Open Forest.



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## LOW CLOSED WET HEATH WITH MID-HIGH TO TALL MELALEUCA CLOSED FOREST.

This community occurs in the northern / north eastern concern of the site and extends into the property to the east. The vegetation community occurs around an overland flow path with ponded tannin stained water.

The canopy layer is 12-14m in height as is of a monospecific nature consisting of Broad-leaved Paperbark (*Melaleuca quinquenervia*).

The wet heath layer is 1 -3m in height and dominated by of Coast Banksia (*Banksia integrifolia*), Wallum Banksia (*B. aemula*), Heath-leaved Banksia (*B. ericifolia*), Candlestick Banksia (*B. attenuate*), Coastal Wattle (*Acacia longifolia*), Hickory Wattle (*A. aulacocarpa*), Sweet Wattle (*A. suaveolens*), Sieber's Paperbark (*Melaleuca sieberi*), Willow Bottlebrush (*Callistemon salignus*), Coast Beard-heath (*Leucopogon parviflorus*), Pink Beard-heath (*L. ericoides*), Pink Blunt-leaf heath (*Epacris obtusifolia*), Wallum Heath (*E. pulchella*), Blue Tongue (*Melastoma affine*), Midgen Berry (*Austromyrtus dulcis*), Weeping Baeckea (*Baeckea frutescens*), Zieria (*Zieria spp.*), Wallum Boronia (*Boronia falcifolia*), Wide Bay Boronia (*Boronia rivularis*), Swamp May (*Leptospermum liversidgei*), White's Tea Tree (*L. whitei*), Yellow Tea Tree (*L. polygalifolium*), Paperbark Tea Tree (*L. trinervium*), Wallum Hakea (*Hakea actites*), Whitebeard (*Agiortia pedicellata*), Sporadanthus interruptus, Ground Berry (*Acrotriche aggregata*), Green Five Corners (*Styphelia viridis*), Golden Candlesticks (*Aotus lanigera*), Healthy Parrot Pea (*Dillwynia retorta*), Dogwood (*Jacksonia scoparia*) and Grass Tree (*Xanthorrhoea fulva*).

Various grasses, sedges and ferns i.e *Gahnia clarkei*, *Baumea rubignosa*, *B. articulate*, *Lepironia articulate*, *Histiopteris incise*, *Caustis blakei*, *Caustis recurvate*, *Lepidosperma laterale* and *Lomandra longifolia*.





#### TALL – VERY TALL OPEN DRY HEATH

This community is located between the two other heath communities in the north-eastern portions of the site.

The shrub and small tree layer is 1-4m in height and dominated by Swamp May (*Leptospermum liversidgei*), White's Tea Tree (*L. whitei*), Yellow Tea Tree (*L. polygalifolium*), Paperbark Tea Tree (*L. trinervium*), Candlestick Banksia (*B. attenuate*) and Sieber's Paperbark (*Melaleuca sieberi*).

Additional species recorded included Coast Banksia (*Banksia integrifolia*), Wallum Banksia (*B. aemula*), Whitebeard (*Agiortia pedicellata*), *Sporadanthus interruptus*, Ground Berry (*Acrotriche aggregata*), Green Five Corners (*Styphelia viridis*), Golden Candlesticks (*Aotus lanigera*), Healthy Parrot Pea (*Dillwynia retorta*), Dogwood (*Jacksonia scoparia*), Willow Bottlebrush (*Callistemon salignus*), Coast Beard-heath (*Leucopogon parviflorus*), Pink Beard-heath (*L. ericoides*), Pink Blunt-leaf heath (*Epacris obtusifolia*), Wallum Heath (*E. pulchella*), Blue Tongue (*Melastoma affine*), Weeping Baeckea (*Baeckea frutescens*), Zieria (*Zieria spp.*), *Caustis blakei* (Foxtails) and Wide Bay Boronia (*Boronia rivularis*),



#### TALL – VERY TALL OPEN DRY HEATH WITH EUCALYPT/MELALEUCA OPEN FOREST

This community is similar to the Tall –very Tall Open Dry Heath in composition, however this community also contains a tree layer. The canopy layer height varies considerable within this community, however is generally 12-16m in height consisting of multiple species. Canopy species representing this community includes Broad-leaved Paperbark (*Melaleuca quinquenervia*), Rough Barked Apple (*Angophora floribunda*), Swamp Box (*Lophostemon suaveolens*) and Pink Bloodwood (*Corymbia intermedia*), and Needle-barked Stringybark.

The small tree and shrub layer generally consists of the same species noted within the Tall – very Tall Open Dry Heath community with only several additions which includes Coastal Wattle (*Acacia longifolia*), Hickory Wattle (*A. aulacocarpa*), Sweet Wattle (*A. suaveolens*), Midgen Berry (*Austromyrtus dulcis*) and Heath-leaved Banksia (*Banksia ericifolia*)

The groundcover consisted of species already mentioned within the previous two heath communities, however weed species were more frequent.

Although not in abundance, environmental weed species were present and consisted of Scotch Thistle (*Onopordum acanthium*), Slash Pine (*Pinus elliottii*) and several other common species as previously stated within the Disturbed communities.





Additional strappy grass-like plants, small herbaceous groundcovers, vines and twining species included Tall Saw-sedge (*Gahnia clarkei*), Foxtails (*Caustis blakei*), Curly Wig (*C. recurvate*) Bunchy Sedge (*Cyperus polystachyos*), Sedges (*Schoenus spp.*), Dodder Laurel (*Cassytha pubescens*), Sweet Sarsaparilla (*Smilax glycyphylla*), Variable Sword-sedge (*Lepidosperma laterale*), Coral Fern (*Gleichenia dicarpa*), Tassel Cord-rush (*Baloskion tetraphyllum*) and Bracken (*Pteridium spp.*).

Although uncommon, environmental weed species were present and consisted of Scotch Thistle (*Onopordum acanthium*), Slash Pine (*Pinus elliotii*) and several other common species a previously stated.

Comparative nomenclature for this community is presented below.

**Forest Types in NSW 1989: Heath (223)**

**CRA Forest Ecosystems 1999: Heath (65)**

**Keith (2004) Ocean Shores-Desert Dunes: Coastal Headland Heaths/Coastal Heath Swamps**

### 3. EUCALYPT FOREST

Eucalypt forest communities occur in the western section of the site with only a small portion within the development footprint (~0.09ha).

The Eucalypt Forest community has been previously described as Eucalypt Woodland, Eucalypt Woodland with Reduced Understorey, Eucalypt Woodland Mainly Bloodwood, and Forest Red Gum with Disturbed Understorey (Wrigley 1992). Ground truthing of the eucalypt community notes that the community can be divided into two sub-communities as a result of landform and dominant specie.

The two sub-communities on site can be described as Tall to Very Tall Eucalypt Open Forest to Woodland: *Corymbia intermedia*, *Eucalyptus planchoniana*, *E. tereticornis*, *E. signata* and *Other Eucalypts* [T8M] and Tall to Very Tall Eucalypt Open Forest to Woodland: *Eucalyptus tereticornis* [T8M].

TALL TO VERY TALL EUCALYPT OPEN FOREST TO WOODLAND: *CORYMBIA INTERMEDIA*, *EUCALYPTUS PLANCHONIANA*, *E. TERETICORNIS*, *E. SIGNATA* AND *OTHER EUCALYPTS* [T8M]



This community occupies the western slope on the site. The canopy generally ranges from 20-25m in height although several trees exceed this height. For the most part canopy crowns are arranged in an open forest structure (per Walker & Hopkins) although several portions of the site contain less cover (due to lower mature tree stem density) and are more reflective of woodland cover.

Hollow-bearing trees are present in moderate densities and are generally abundant within the locality (Bundjalung National Park and Broadwater National Park).



Canopy trees are dominated by Pink Bloodwood (*Corymbia intermedia*), Needle-barked Stringybark (*Eucalyptus planchoniana*), Blue Gum (*E. tereticornis*) and Scribbly Gum (*E. signata*). Less commonly occurring trees are Tallowood (*Eucalyptus microcorys*), Thick-leaved Mahogany (*E. carnea*), Rough-barked Apple (*Angophora floribunda*) and Swamp Box (*Lophostemon suaveolens*).



The small tree/shrub layer is mostly sparse and occupied by juvenile eucalypts/corymbias and Soap Tree (*Alphitonia excelsa*), Corkwood (*Duboisia myoporoides*), Coast Banksia (*Banksia integrifolia*), Wallum Banksia (*Banksia aemula*), Willow Bottlebrush (*Callistemon salignus*), Climbing Guinea Flower (*Hibbertia scandens*), Tangled Guinea Flower (*Hibbertia empetrifolia*), Hairy Bush Pea (*Pultenaea villosa*), Umbrella Cheese Tree (*Glochidion sumatranum*), Coastal Wattle (*Acacia longifolia*), Hickory Wattle (*A. aulacocarpa*), Grass Tree (*Xanthorrhoea spp.*), Coffee Bush (*Breynia oblongifolia*), Blueberry Ash (*Elaeocarpus reticulatus*), Rose Marara (*Pseudoweinmannia lachnocarpa*), and Bumpy Ash (*Flindersia schottiana*).



The ground layer varies throughout the community and ranges from a dense grassy ground layer to a deep leaf litter layer with minimal ground vegetation. Areas where the ground layer is typically grassy are dominated by common species (*Imperata cylindrical*, *Themeda triandra*, *Andropogon virginicus*, *Entolasia stricta*, *Cymbopogon refractus* and *Microlaena stipoides*). Additional strappy grass-like plants, small herbaceous groundcovers, vines and twining species were also noted including Tall Sawsedge (*Gahnia clarkei*) Wattle Matrush (*Lomandra filiformis*), Matrush (*Lomandra confertifolia*), Bracken Fern (*Pteridium spp.*),

Variable Sword-sedge (*Lepidosperma laterale*), Feather Sedge (*Ptilothrix deusta*), Mock Olive (*Notelaea longifolia*) and Sweet Sarsaparilla (*Smilax glycyphylla*).

Environmental weed species were relatively scarce throughout this community and consisted of Lantana (*Lantana camara*), Wood Sorrel (*Oxalis corniculata*), Crofton Weed (*Ageratina adenophora*), Cobbler's Pegs (*Bidens pilosa*), Corky Passionfruit (*Passiflora suberosa*) and Brazilian Nightshade (*Solanum seaforthianum*).

#### TALL TO VERY TALL EUCALYPT OPEN FOREST TO WOODLAND: *EUCALYPTUS TERETICORNIS* [T8M]

The southern portions of the eucalypt forest community near the house and close to the river changes from a mixed eucalypt dominant community to almost entirely of *Eucalyptus tereticornis*

Additional canopy species recorded included Scribbly Gum (*Eucalyptus Signata*), Swamp Box (*Lophostemon suaveolens*), Brush Box (*L. confertus*), Pink Blood Wood (*Corymbia intermedia*) and Rough-barked Apple (*Angophora floribunda*).

The understorey and groundcover of this community is generally sparse due to on-going slashing/mowing, however several species mentioned in the previous eucalypt forest community were present. Areas unmaintained area was vastly dominated by exotic species such as Lantana (*Lantana camara*), Cobbler's Pegs (*Bidens pilosa*), Brazilian Nightshade (*Solanum seaforthianum*) and Corky Passionflower (*Passiflora suberosa*).

Respective nomenclature for these communities is presented below.

#### **Forest Types in NSW 1989: Needlebark Stringybark (97) / Brushbox (53)**

#### **CRA Forest Ecosystems 1999: Heathy Scibbly Gum (65) / Northern Wet Tallow – Blue Gum(104)**

#### **Keith (2004) Ocean Shores-Desert Dunes: Coastal Dune Dry Sclerophyll Forests/ North Coast Dry Sclerophyll Forests**

## **4 LITTORAL RAINFOREST**

TALL TO VERY TALL CLOSED FOREST (LITTORAL RAINFOREST) CONTAINING A WIDE VARIETY OF RAINFOREST SPECIES



This vegetation community occupies the central portion of the development footprint as well as the southeast portion of the site. It is also found within the unconstructed road reserve along the sites southern boundary and adjacent to the Evans River. The approximate area of this community occurring on site and inclusive of the road reserve is 8.1ha.

The canopy generally ranges from 15-20m in height although a number of emergent exceed this canopy height. For the most part canopy crowns are arranged in an closed forest structure (per Walker & Hopkins) although several portions of the site contain less cover (mainly associated with the southeast and southern section) and are more reflective of open forest cover.

Tree species noted within this community include Brushbox (*Lophostemon confertus*), Bumpy Ash (*Flindersia schottiana*), Bennet's Ash (*F. bennettiana*), Kerosene Wood (*Halfordia kendack*), Quinine Bush (*Petalostigma pubescens*), Brown Kurrajong (*Commersenia bartramia*), Beach Acronychia (*Acranychia Imperforata*), Jackwood (*Cryptocarya glaucescens*), Ribbonwood (*Euroschinus falcatus* var. *falcatus*), Celery Wood (*Polyscias elegans*), Coogara (*Arytera divaricata*), Tuckeroo (*Cupaniopsis anacardiodes*), Yellow Pear-fruit (*Mischocarpus pyriformis*), Swamp Box (*Lophostemon suaveolens*), Hard Corkwood (*Endiandra sieber*), Wild Quince (*Alectryon subcinereus*), Swamp Oak (*Casuarina glauca*), Broad-leaved Paperbark (*Meleleuca quinquenervia*), Blueberry Ash (*Elaeocarpus reticulatus*), Grey Walnut (*Beilschmiedia elliptica*), Corkwood (*Duboisia myoporoides*) and Blue Lilly Pilly (*Syzygium oleosum*).





The smaller tree and shrub layer consisted of species such as Satinwood (*Nematolepis squamea*), Native Gardenia (*Atractocarpus benthamianus*), Cabbage Palm (*Livistona australis*), Narrow-leaved Palm Lily (*Cordyline stricta*), Peanut Tree (*Sterculia quadrifida*), Bollywood (*Litsea fawcettiana*), Beach Alectryon (*Alectryon Loriaceus*), Pink Evodia (*Melicope Elleryana*), Red Olive Plum (*Elaeodendron australe*), Scrub Cherry (*Exocarpos latifolius*), Soap Tree (*Alphitonia excelsa*), Blunt-leaved Coondoo (*Pouteria myrsinifolia*), Umbrella Cheese Tree (*Glochidion sumatranum*), Scentless Rosewood (*Synoum glandulosum*), Veiny Wilkiea (*Wilkiea huegeliana*), Bangalow Palm (*Archontophoenix cunninghamiana*), Brown Laurel (*Cryptocarya Triplinervis*), Coffee Bush (*Breynia oblongifolia*), Muttonwood (*Myrsine variabilis*), Hickory Wattle (*Acacia aulacocarpa*), Native Guava (*Rhodomyrtus psidioides*), Bolwarra (*Eupomatia laurina*), Orange Boxwood (*Maytenus disperma*) and Coastal Geebung (*Persoonia adenantha*)



The groundlayer throughout this vegetation community was nearly entirely covered in a dense leaf litter layer with ground layer species relatively scarce.

Grass species were limited and consisted of common species such as *Imperata cylindrical* and *Themeda triandra*. Additional strappy grass-like plants, small herbaceous groundcovers, vines and twining species noted include Spiny-head Mat-rush (*Lomandra longifolia*), Large Mock-olive (*Notelaea Longifolia*), Tall Saw-sedge (*Gahnia clarkei*), Wandering Jew (*Commelina cyanea*), Stag Horn Fern (*Platynerium superbum*), Bird's Nest Fern (*Asplenium australasicum*), Elk Horn Fern (*Platynerium bifurcatum*), Whip Vine (*Flagellaria indica*), Long-leaf Water Vine (*Cissus sterculiifolia*), Five-leaf Water Vine (*C. hypoglauca*), Kangaroo Vine

(*C. antarctica*), Monkey Rope (*Parsonsia straminea*), Lawyer Vine (*Smilax australis*), Sweet Sarsaparilla (*S. glycyphylla*) and Whip Vine (*Flagellaria indica*).



Environmental weed species were scarce and mainly occurred along the edges of the community and in particular the road reserve. Species included Lantana (*Lantana camara*), Crofton Weed (*Ageratina adenophora*), Cobbler's Pegs (*Bidens pilosa*), Easter Cassia (*Senna pendula* var. *glabrata*), Umbrella Tree (*Schefflera actinophylla*) and Cocos Palm (*Syagrus romanzoffiana*).

During the survey works, a population (159 stems recorded) of swamp orchids were discovered within the Littoral Rainforest Community on site.

At the time of surveying the orchid was not flowering challenging to specific identification. It was concluded that the orchids were either the Lesser Swamp Orchid (*Phaius australis*) or the Greater Swamp Orchid (*Phaius tancarvilleae*).



The EPBCA survey guidelines states that surveys should be conducted in the spring so this species can be distinguished from other swamp orchids by characteristics of its flowers (Benwell 1994b). As the survey period was conducted outside the flowering period for the swamp orchids, the species is not identifiable.

Due to the uncertainty, both species of swamp orchids (Lesser Swamp Orchid and Greater Swamp Orchid) will be discussed within this report. Both species are listed as endangered pursuant to both the *Threatened Species Conservation Act 1995* and the *Environment Protection and Biodiversity Conservation Act 1999*. Both species are discussed in detail later in the report.

Equivalent Vegetation Mapping Descriptions are as follows

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## Forest Types in NSW 1989: Tuckeroo (24)

## CRA Forest Ecosystems 1999: Rainforest (168)

## Keith (2004) Ocean Shores-Desert Dunes: Littoral Rainforests

### 3.2 REGIONAL SIGNIFICANCE & CONSERVATION STATUS

#### 3.2.1 ENDANGERED ECOLOGICAL COMMUNITIES

A discussion of potentially applicable endangered ecological communities (EECs) is provided below in the context of vegetation surveys undertaken within the study area and the relevant scientific determinations for EECs.

Endangered ecological communities are listed under Schedule 1, Part 3 of the Threatened Species Conservation Act 1995, while threatened ecological communities are listed under the Environment Protection and Biodiversity Conservation Act 1999 as critically endangered, endangered and vulnerable.

A review of the community would indicate that Vegetation Community 4 is an endangered ecological community (EEC). This vegetation community will be retained for the future development. No removal of this community is proposed minor pruning of vegetation may be required for the delivery of the extension of Iron Gates Road.

The following is an extract from the DEH NSW Scientific Committee - final determination report. This outlines conservation status and significance of the community.

#### *Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions*

This EEC is described by the scientific committee (online @ <http://www.environment.nsw.gov.au/determinations/littorallrainforest36a.htm>) as follows:

1. Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions is generally a closed forest, the structure and composition of which is strongly influenced by proximity to the ocean. The plant species in this ecological community are predominantly rainforest species with evergreen mesic or coriaceous leaves. Several species have compound leaves, and vines may be a major component of the canopy. These features differentiate littoral rainforest from sclerophyll forest or scrub, but while the canopy is dominated by rainforest species, scattered emergent individuals of sclerophyll species, such as *Angophora costata*, *Banksia integrifolia*, *Eucalyptus botryoides* and *E. tereticornis* occur in many stands. Littoral Rainforest in NSW is found at locations along the entire NSW Coast in the NSW North Coast Bioregion, Sydney Basin Bioregion and South East Corner Bioregion. Bioregions are defined in Thackway and Cresswell (1995). The areas mapped for inclusion in State Environmental Planning Policy 26 Littoral Rainforest are examples of the Littoral Rainforest ecological communities, but the mapping for SEPP 26 is not exhaustive and stands of the Littoral Rainforest ecological community occur at locations not mapped under SEPP 26. Some stands may be regrowth or in the process of regenerating. The Sutherland Shire Littoral Rainforest Endangered Ecological Community which was previously listed as an endangered ecological community is included within this Community.

2. Littoral rainforest occurs on both sand dunes and on soils derived from underlying rocks (McKinley *et al.* 1999). Stands on headlands exposed to strong wind action may take the form of dense windpruned thickets (for example the Bunga Head Rainforest illustrated by Keith & Bedward 1999, or MU5 Littoral Windshear Thicket in NPWS 2002). In more sheltered sites, and in hind dunes, the community is generally taller, although still with wind pruning on the windward side of stands. Floristically there is a high degree of similarity between stands on different substrates. Most stands of Littoral Rainforest occur within 2 km of the sea, but may occasionally be found further inland, but within reach of maritime influence.

6. Littoral Rainforest occurs in numerous, small stands and in total comprises less than 1% of the total area of rainforest in NSW. The largest known stand occurs in Iluka Nature Reserve, which is approximately 136 ha. Many, but not all, stands of Littoral Rainforest have been included in mapping for State Environmental Planning Policy 26 Littoral Rainforest, but degradation of the ecological community is still occurring.

8. Other threats include loss of canopy integrity arising from salt and wind damage as a result of clearing or damage to stand margins; clearing of understorey (including for firewood collection); grazing and physical disturbance of understorey including by feral deer; inappropriate collection of a range of plant species (including, but not restricted to, epiphytes); fire, particularly fire incursion along boundaries: visitor disturbance including soil compaction, soil disturbance, erosion from foot, cycle, trail bike and 4 wheel drive tracks, introduction of pathogens, and disturbance from creation of new planned and unplanned tracks; increased visitation and resulting increased demand for and use of, visitor facilities such as walking tracks, viewing platforms, toilet blocks, picnic areas etc; dumping of garden waste causing weed infestation; car and other rubbish dumping. Loss of fauna due to predation by feral animals, road kill, loss of habitat and feeding resources, disturbance from human visitation (faunal elements are essential to the ecological functioning of littoral rainforest and loss, or reduction, in pollinators and seed dispersal agents will adversely affect long term vegetation health); fragmentation resulting in loss of connectivity and possibly reduced genetic exchange between populations. For stands not protected by State Environmental Planning Policy 26, clearing and development remains a possibility. (Adam 1987, 1992; Floyd 1990; Mills 1996)

9. In view of the above the Scientific Committee is of the opinion that Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions is likely to become extinct in nature in New South Wales unless the circumstances and factors threatening its survival or evolutionary development cease to operate.

### 3.2.2 REGIONAL SIGNIFICANCE

Eight separate communities have been described as occurring within the development footprint. As illustrated in Figure 2 the development is largely contained to disturbed communities. The status of the various CRA communities as identified in the Richmond Valley biodiversity report indicates the following;

Wattle (151) is highly inadequately reserved and the CRA target has not been met;  
Heath (64) is a Vulnerable community but the CRA target has been met;  
Heathy Scribbly Gum (65) has had its conservation target met;  
Northern Wet Tallwood – Blue Gum has had its conservation target met;

Rainforest (168) is an Endangered Community which has not achieved its conservation target.

As indicated the Wattle community is a disturbed / modified community the result of past clearing / seeding. It is not proposed to be retained and the proposal will remove all Wattle from within the development footprint. The area to be removed is 7.23ha.

The development will remove approximately 2000m<sup>2</sup> of Open Dry Heath and 1.18ha of Open Dry Heath with mixed Eucalypt. We note this community is vulnerable but locally well conserved in the surrounding conservation network.

The development will require the removal of approximately 1200m<sup>2</sup> of Heathy Scribbly Gum for roads and an additional 400m<sup>2</sup> is proposed for removal with bushfire requirements and lots.

The proposal does not remove any Littoral rainforest. As noted the road extension will necessitate minor pruning of limbs within the road reserve.

#### 4.0 FAUNA ASSESSMENT

This section describes the study areas' fauna and associated habitat as identified through surveying. The methodology applied to arrive at the species list is outlined and significant species have been identified where relevant.

#### 4.1 METHODOLOGY

- Desktop analysis including:
  - i. Review of Council's Planning Scheme Mapping & Associated Reporting (i.e. Richmond Valley Local Environmental Plan 2012 Mapping)
  - ii. Review of search of the Atlas of NSW Wildlife database within a search area 10km surrounding the site to review threatened plant records
  - iii. Review of the following legislation to ensure the latest lists of threatened species were noted as well as investigating the existence of any relevant recovery plans, threat abatement plans, key threatening processes or any preliminary determinations which may be applicable to the site and/or the proposed use/action:
    - *Threatened Species Conservation Act (1995)*
    - *Environment Protection and Biodiversity Conservation Act (1999)*
    - *Fisheries Management Act (1994)*
- Field survey of the flora communities located within and immediately adjacent to the study area (in accordance with Section 3 above) to review habitat values;
- The following fauna field survey methods were implemented during May 2014 in general accordance with the following:

- DEC (2004) *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities Working Draft*. DEC, NSW.
- NSWNPWS (2001) *The Community Biodiversity Survey Manual*. New South Wales National Parks & Wildlife Service.
- Gold Coast City Council (2006) Planning Scheme Policy 8: *Guidelines for Ecological Assessments*. G.C.C.C., Nerang.
- Shire of Maroochy (1997) *Flora and Fauna Assessment Requirements for Developments in Maroochy Shire*. M.S.C
- Department of Land and Water Conservation (1997) *Interim Guidelines for Targeted and General Flora and Fauna Surveys under the Native Vegetation Conservation Act 1997*. NSWDLWC, Parramatta.
- Brisbane City Council (1999) *Ecological Assessment Guidelines*. B.C.C
- Redland Shire's *Planning Scheme Policy 4-Ecological Impacts*

Weather conditions were warm during the day and becoming cool at night (max of 26.4°C and min of 13.2°C as measured at the Evans Head RAAF Bombing Range AWS). Only 2mm of rain fell (Saturday 24th) during the entire duration of the survey works.

#### 4.2.1 DIURNAL SURVEY

- Active searches were conducted for key habitat components and potential macro- and micro- habitat components for rare and threatened species
- Binocular search and identification of all fauna heard or sighted
- Opportunistic sightings/audible identifications were conducted and recorded whilst all survey works were being undertaken
- Bird identification surveys were conducted in association with dawn and dusk activity and comprised a combination of walked transects through each vegetation community and stationary observations within selected locations
- Detailed ground track/trace survey was performed including:
  - Scat/pellet examination
  - Scratch/trace examination of trees
  - Diggings, burrow, trace and track examination
  - Humus/crevice examination
  - Examination and assessment of tree hollows, hanging bark, termite mounds, flowering and nesting trees
- Oxleyan Pygmy Perch Survey (See Section 5.3)
- Diurnal frog-call recognition and identification during rainfall events and opportunistically performed during other survey works
- Trapping for fauna was performed in accordance with NSW DPI permits issued to Planit Consulting. Type 'A' & 'B' Elliot traps and open wire traps (hook baited and foot paddle spring-loaded) of various sizes were utilised. Traps were set at offset intervals of approximately 10 meters within the linear remnant.
- Trapping for fauna was performed in accordance with NSW DPI and NPWS permits issued to Planit Consulting. Type 'A' & 'B' Elliot traps of various sizes were utilised. Traps were set at offset intervals of approximately 10 metres.

Trapping was undertaken over a 96 hour period, checked and emptied (where necessary) every morning. Baits utilized within the traps included rolled oats & golden syrup, rolled oats & peanut butter, dog biscuits, tuna and chicken.

Leaf litter and/or grass was placed within all traps to protect captured fauna from potential hypothermia and to provide nesting refuge during the period between trapping and release. All animals were released at the point of capture following positive species identification. In association with this survey no animals were needed to be taken as voucher specimens.

**Table 4:** Review Of Trapping Program

	Elliot Traps	Cage Traps	Camera Traps	Hair Funnels	Pitfall Traps
No. of trap lines	6	6	6	6	2
No. of nights per trap line	5	5	5	5	5
No. of traps per line	7	1	1	1	1
Total No. of trap nights	210	30	30	30	10



**Image 1:** Elliot and Cage Traps Deployed

- Ground strata searches and rock timber/leaf rolls and examination for reptiles and frogs;  
Duration 3 x 30minutes during the middle of the day 21st & 23rd May 2014.
- Two pitfall traps were constructed to randomly capture small fauna moving throughout the site
- Hair funnels (Faunatech) were deployed in general accordance with DSEWPC (2011) 'Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999*.' This included installing hair funnels (Faunatech large opening reducing to small) at least 40m apart. The bait utilized included a mixture of sardines

and tuna oil with flour utilized as a binding agent or a generic mixture of oats, peanut butter and golden syrup. In addition tuna oil or aniseed was sprayed in an approximate 2m radius around each funnel to act as an attractant. Each hair funnel was marked in the field with a piece of flagging tape on a proximate tree (except where visible from nearby residences/roadways i.e. to avoid potential theft/vandalism) and the location recorded via hand-held GPS (to enable retrieval and mapping).

Following deployment, hair funnel wafers with positive results were sent to a private laboratory (Scats About P/L) for analysis.



**Image 2:** Deployed Hair Funnel

- Six motion triggered trail cameras (ScoutGuard SG550PV-31B) were placed within site between 20<sup>th</sup> – 25<sup>th</sup> May 2014 to digitally capture fauna activity. Passive camera traps were deployed in accordance with DSEWPC (2011) ‘Survey guidelines for Australia’s threatened mammals: Guidelines for detecting mammals listed as threatened under the *Environment Protection and Biodiversity Conservation Act* 1999. “Passive systems are single units that use heat and motion detectors to trigger the camera (Kelly & Holub 2008). Infrared sensors work better at cooler ambient temperatures and are less consistent in warm environments (Swann et al. 2004). Camera trapping has been found to be the most effective method of detecting species at low or moderate densities (Vine et al. 2009 in DSEWPC, 2011: 32).”

DSEWPC (2011) note that “recent surveys have found remote cameras to be the most cost-effective technique and allow concurrent data to be collected on other carnivores, particularly cats and foxes.” Cameras were fixed to trees (or a driven metal stake where no trees were available) approximately 75-100cm from ground level and aimed at a bait station. Cameras were programmed to operate 24 hours and take 3-image bursts triggered by motion. A 60 second delay was programmed between bursts.

Each bait station consisted of either fresh chicken pieces, a tuna/sardine mixture using flour as a binding agent (carnivore) or a mixture of oats, peanut butter and golden syrup (generalist). To reduce the bait was placed within a 50mm PVC vent cowl which was secured via a tent peg (per Paull et al, 2011).

In addition either tuna oil (carnivore) or golden syrup/aniseed mixture (generalist) was sprayed in an approximate 5m radius around each bait station to act as an

attractant. All fauna images were identified to genus or species level by experienced ecologists/environmental planners.



#### 4.2.2 NOCTERNAL SURVEY

Nocturnal survey included the following survey techniques:

- Audible survey for calls, scratching and landings;
- Spotlighting utilising:
  - Short duration-long distance white light, and
  - Long duration-short distance red light
 Duration on foot: three researchers on three nights for 120 minutes
- Naked eye observation utilising dawn/dusk/moon light for bats and fauna returning to potential nest/shelter areas.

Duration: three researchers on two nights for 120 minutes per night 20<sup>th</sup> and 21<sup>st</sup> May 2014 (4 hours)

- Passive digital recording (for nocturnal birds, mammals and amphibians) was undertaken utilising Songmeter TM. The recorder was programmed to 'wake up' and record continuously for 10 minutes, 'sleep' for 20 minutes and begin recording again

for 10 minutes over a period of three hours (commencing at 6:00am). Recordings were analyzed audibly by experienced ecologists and with Songscope Bioacoustics software. All avifauna reference calls were sourced from reputable organizations such as Naturesound and BOCA.

Duration: Five nights staggered recording for 70 minutes per night.

- Anabat detection system was utilized to record echolocation of microchirpteran bats at fixed points and along spotlighting transects. Recordings were undertaken in areas most likely to attract bat species including standing water, drainage lines, remnant edges, areas of flowering vegetation and sites of high insect activity. Calls were analyzed utilizing Analook 49j and accepted reference keys.



Duration: Five night's continuous recording between 1800 and 0600 hrs (60 recording hours).

- Six motion triggered trail cameras (ScoutGuard SG550PV-31B) were deployed as discussed in 'diurnal' above



- Amplified call recording/playback for avifauna, mammals and amphibians. Playback of pre-recorded calls included the following threatened species:
  - Wallum Froglet
  - Olongburra Frog
  - Wompoo Fruit-dove

- Black-necked Stork
- Red Goshawk
- Pale-vented Bush-hen
- Bush Stone-curlew
- Glossy Black-Cockatoo
- Powerful Owl
- Eastern Grass Owl
- Masked Owl
- Regent Honeyeater
- White-eared Monarch
- Spotted-tailed Quoll
- Koala
- Squirrel Glider

Each call playback session comprised of the following:

- A 15min listening period for unelicited fauna calls
- 5min call playback for relevant species on a 25W Toa Megaphone
- 10min search/spotlight for fauna at the playback site

Depending on the targeted species playback was undertaken at dawn, dusk and/or after dark. All call files were obtained from BOCA or NATURESOUND.

The approximate locations of fauna survey plots (for defined methods such as trapping, call playback, spotlighting etc) across the site are depicted in Attachment 3.

#### **4.3.1 SURVEY LIMITATIONS**

Whilst the duration of flora surveys and inspections of the study area are considered appropriate, additional undetected threatened or other native flora species may be present on the property (particularly weed species within the pasture). Seasonal surveys would also be necessary to detect flora species that are dormant or inconspicuous for part of the year (i.e. from the Asteraceae, Orchidaceae, Cyperaceae, Poaceae etc). Some of these species (dormant or non-flowering) may have been undetected or under-represented within the survey period. Further ungerminated seed of various species may have been present within the soil seed bank.

Whilst the duration and sampling methodology of the fauna survey is considered appropriate, it is acknowledged that the entire seasonal fauna assemblage is unlikely to be recorded. It is also accepted that although assessments of habitat and species ecology does provide an additional measure to anticipate the presence of species (as a surrogate for its actual observation), there is no absolute certainty to the absence of a species from marginal or potential habitat.

Additionally, there may be some species that may utilise the habitats within the site but have remained undetected due to their rarity, elusive nature or the sporadic utilisation of the habitats (i.e. the Long-nosed Potoroo, Common Planigale and Dunnart are elusive species that are difficult to trap or observe directly; the Black-necked Stork, Powerful Owl, Spotted-tail Quoll and Red Goshawk may only visit an area occasionally within a much larger home-range; the Swift Parrot and Regent Honeyeater may only visit an area during peak flowering periods etc).

The conclusions of this report are therefore based upon data available at the time and the results of field works undertaken and are therefore indicative of the environmental condition



of the site at the time of sampling, including the presence or otherwise of species. It should be acknowledged that site conditions, including the presence of threatened species, can change over time.

The above limitations have been taken into account and the likelihood of threatened such species occurring within the site assessed through habitat assessment, records of the species within the locality and aspects of species ecology (refer Section 5).

#### 4.3.2 LICENCING

The following issued licences were held by the surveyors at the time of surveying:

**Table 5:** Relevant Licences

Authority	Licence/Permit	Title	Expiration	Permit No.
NSW DPI Animal Care & Ethics Committee	Animal Research Approval	Fauna Surveying, Trapping & Release	30 June 2014	08/6865
NSW DPI Animal Care & Ethics Committee	Animal Research Authority	Fauna Surveying, Trapping & Release	30 June 2014	08/6865
NSW National Parks & Wildlife Service	Scientific Licence	Ecological Survey	31 May 2014	S100142
QLD EPA/DEHP	Scientific Purposes Permit	Wildlife Research	11 June 2014	WISP06002009
QLD DEEDI Animal Ethics	Scientific Use Registration	Scientific Use Registration	14 February 2015	Reg No. 241
QLD DAAF Animal Ethics	Community Access AEC	Fauna Surveying	31 May 2014	CA 2012/06/615
QLD DEHP	Rehabilitation Permit NC(Administration)R 2006	Observe or relocate protected animals	16 May 2016	WIRP12736113

#### 4.4 HABITAT ASSESSMENT

Prior to the commencement of the abovementioned survey works on site a broad habitat assessment was conducted in association with vegetation survey works. The purpose of this overview was to determine which species were likely to be present based on available habitat components and to target areas for detailed surveying of protected fauna species.

The site incorporated the following broad habitat types as a result of previous land use, vegetation types (refer Section 3), surrounding uses and hydraulic regime:



**Table 6:** Habitat Elements

<b>HABITAT ELEMENTS</b>	
<b>Habitat Element/Feature</b>	<b>Comment</b>
Hollow bearing trees	Present. Hollow-bearing trees were present within the Eucalypt Forest (Vegetation Community 3)
Presence of koala habitat and/or favoured koala trees	Favoured koala trees present (Blue Gum, Tallowood, Scribbly Gum, Bastard Tallowood)
Presence of caves, culverts or disused buildings suitable for roosting of microchiropteran bat species	Sheds and dwelling present. No caves or culverts encountered.
Presence of scratches or feeding scars on tree trunks	Koala and Possum scratches were observed on several smooth barked eucalypts within eucalypt forest on the western portion of the site.
Presence of megabat roosting sites	Not recorded. A large roost does occur within the locality in association with the littoral rainforest near the Silver Sands Holiday Park.
Presence of creeklines, estuaries, mudflats, mangroves and/or riparian vegetation	Although not recorded on site, Evans River is immediately external to the site to the south.
Presence of dams, ponds, lakes and/or other natural or constructed permanent water sources	Two drainage lines occurs within the eastern portion of the site. The Heath community features several small drainage lines.
Presence of dense understory and ground cover vegetation	Abundant in association with the eucalypt forest and littoral rainforest.
Presence of deep leaf litter layer and/or debris (fallen logs etc)	Abundant in association with the eucalypt forest and littoral rainforest.
Presence of fruiting flora species	Present in association with the littoral rainforest. Species includes typical species such as Tuckeroo, Glochidion, Elaeocarpus ect.
Presence of flowering species	Typically prolific flowing species such as melaleuca, eucalypt, acacia, banksia ect. are found throughout the entire site (with the exception of cleared areas)
Presence of large stick nests indicative of raptor presence	Known within the locality however not observed on site
Presence of rocky outcrops and/or extensive exposed rocky areas favouring reptile populations	Absent, although reptiles were noted basking on the abandoned roadways within the site.



## 4.5 SITE SURVEY RESULTS

The following section(s) list the fauna species recorded on the subject site during detailed surveying and lists the methods by which each species was identified. Results are grouped by the Class of species recorded. Those techniques utilized to record fauna are listed below and correlate with the acronyms included within the Survey Methods column of the grouped Survey Results tables. An element has also been incorporated into the table which quantifies the abundance of each species recorded on site.

### Survey Method Codes:

O	Direct Observation
SL	Direct Observation with Spotlight
Sc	Scat
C	Call (Audible) Detection, Recording and/or response to playback
CAM	Passive Camera Trap
HT	Hair tube/funnel
Scr	Scrape
Scrt	Scratch
Sh	Shell/Shell Fragment/Skeleton
Trk	Track/Trace
T	Trapped/hand captured
Ana	ANABAT Detection
Rk	Road-kill
*	All birds were either directly observed through diurnal survey, spotlighting or call identification.
**	Introduced/feral species
***	Recorded in adjacent areas or circling overhead

### **BIRDS\***

CLASS	FAMILY	SPECIES NAME	COMMON NAME
Birds	Acanthizidae	<i>Acanthiza pusilla</i>	Brown Thornbill
Birds	Acanthizidae	<i>Sericornis frontalis</i>	White-browed Scrubwren
Birds	Accipitridae	<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk
Birds	Accipitridae	<i>Accipiter fasciatus</i>	Brown Goshawk
Birds	Accipitridae	<i>Circus approximans</i>	Swamp Harrier
Birds	Accipitridae	<i>Elanus axillaris</i>	***Black-shouldered Kite
Birds	Accipitridae	<i>Haliastur indus</i>	Brahminy Kite
Birds	Accipitridae	<i>Haliastur sphenurus</i>	***Whistling Kite
Birds	Alcedinidae	<i>Ceyx azureus</i>	Azure Kingfisher
Birds	Alcedinidae	<i>Dacelo novaeguineae</i>	Laughing Kookaburra
Birds	Alcedinidae	<i>Todiramphus sanctus</i>	Sacred Kingfisher
Birds	Anatidae	<i>Anas superciliosa</i>	Pacific Black Duck
Birds	Anatidae	<i>Chenonetta jubata</i>	Australian Wood Duck
Birds	Ardeidae	<i>Ardea modesta</i>	***Eastern Great Egret
Birds	Ardeidae	<i>Egretta garzetta</i>	Little Egret
Birds	Ardeidae	<i>Egretta novaehollandiae</i>	White-faced Heron
Birds	Artamidae	<i>Artamus leucorhynchus</i>	White-breasted Woodswallow
Birds	Artamidae	<i>Cracticus nigrogularis</i>	Pied Butcherbird
Birds	Artamidae	<i>Cracticus tibicen</i>	Australian Magpie
Birds	Artamidae	<i>Cracticus torquatus</i>	Grey Butcherbird
Birds	Artamidae	<i>Strepera graculina</i>	Pied Currawong
Birds	Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike
Birds	Campephagidae	<i>Coracina tenuirostris</i>	Cicadabird



Birds	Campephagidae	<i>Lalage leucomela</i>	Varied Triller
Birds	Caprimulgidae	<i>Eurostopodus mystacalis</i>	White-throated Nightjar
Birds	Centropodidae	<i>Centropus phasianinus</i>	Pheasant Coucal
Birds	Charadriidae	<i>Vanellus miles</i>	Masked Lapwing
Birds	Climacteridae	<i>Cormobates leucophaea</i>	White-throated Treecreeper
Birds	Columbidae	<i>Geopelia humeralis</i>	Bar-shouldered Dove
Birds	Columbidae	<i>Geopelia striata</i>	Peaceful Dove
Birds	Columbidae	<i>Leucosarcia picata</i>	Wonga Pigeon
Birds	Columbidae	<i>Ocyphaps lophotes</i>	Crested Pigeon
Birds	Coraciidae	<i>Eurystomus orientalis</i>	Dollarbird
Birds	Corvidae	<i>Corvus orru</i>	Torresian Crow
Birds	Cuculidae	<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo
Birds	Cuculidae	<i>Eudynamis orientalis</i>	Eastern Koel
Birds	Dicruridae	<i>Dicrurus bracteatus</i>	Spangled Drongo
Birds	Falconidae	<i>Falco cenchroides</i>	Nankeen Kestrel
Birds	Hirundinidae	<i>Hirundo neoxena</i>	Welcome Swallow
Birds	Laridae	<i>Chroicocephalus novaehollandiae</i>	Silver Gull
Birds	Maluridae	<i>Malurus cyaneus</i>	Superb Fairy-wren
Birds	Maluridae	<i>Stipiturus malachurus</i>	Southern Emu-wren
Birds	Megaluridae	<i>Megalurus timoriensis</i>	Tawny Grassbird
Birds	Meliphagidae	<i>Anthochaera carunculata</i>	Red Wattlebird
Birds	Meliphagidae	<i>Anthochaera chrysoptera</i>	Little Wattlebird
Birds	Meliphagidae	<i>Entomyzon cyanotis</i>	Blue-faced Honeyeater
Birds	Meliphagidae	<i>Lichenostomus chrysops</i>	Yellow-faced Honeyeater
Birds	Meliphagidae	<i>Lichmera indistincta</i>	Brown Honeyeater
Birds	Meliphagidae	<i>Manorina melanocephala</i>	Noisy Miner
Birds	Meliphagidae	<i>Meliphaga lewinii</i>	Lewin's Honeyeater
Birds	Meliphagidae	<i>Melithreptus albogularis</i>	White-throated Honeyeater
Birds	Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark
Birds	Nectariniidae	<i>Dicaeum hirundinaceum</i>	Mistletoebird
Birds	Oriolidae	<i>Oriolus sagittatus</i>	Olive-backed Oriole
Birds	Pachycephalidae	<i>Colluricincla harmonica</i>	Grey Shrike-thrush
Birds	Pachycephalidae	<i>Pachycephala rufiventris</i>	Rufous Whistler
Birds	Pardalotidae	<i>Pardalotus striatus</i>	Striated Pardalote
Birds	Pelecanidae	<i>Pelecanus conspicillatus</i>	***Australian Pelican
Birds	Petroicidae	<i>Eopsaltria australis</i>	Eastern Yellow Robin
Birds	Phalacrocoracidae	<i>Microcarbo melanoleucos</i>	***Little Pied Cormorant
Birds	Phalacrocoracidae	<i>Phalacrocorax carbo</i>	***Great Cormorant
Birds	Phasianidae	<i>Coturnix ypsilophora</i>	Brown Quail
Birds	Podargidae	<i>Podargus strigoides</i>	Tawny Frogmouth
Birds	Psittacidae	<i>Trichoglossus chlorolepidotus</i>	Scaly-breasted Lorikeet
Birds	Psittacidae	<i>Trichoglossus haematodus</i>	Rainbow Lorikeet
Birds	Psophodidae	<i>Psophodes olivaceus</i>	Eastern Whipbird
Birds	Rallidae	<i>Fulica atra</i>	***Eurasian Coot
Birds	Rallidae	<i>Gallinula tenebrosa</i>	***Dusky Moorhen
Birds	Rallidae	<i>Porphyrio porphyrio</i>	Purple Swamphen
Birds	Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail
Birds	Threskiornithidae	<i>Threskiornis molucca</i>	Australian White Ibis
Birds	Threskiornithidae	<i>Threskiornis spinicollis</i>	Straw-necked Ibis
Birds	Timaliidae	<i>Zosterops lateralis</i>	Silvereye
Birds	Tytonidae	<i>Tyto javanica</i>	Eastern Barn Owl



## MAMMALS

CLASS	FAMILY	SCIENTIFIC NAME	COMMON NAME	METHOD
Mammals	Canidae	** <i>Canis lupus familiaris</i>	Dog	CAM
Mammals	Dasyuridae	<i>Antechinus flavipes</i>	Yellow-footed Antechinus	T, HT
Mammals	Felidae	** <i>Felis catus</i>	Cat	SL, O
Mammals	Leporidae	** <i>Lepus capensis</i>	Brown Hare	SL
Mammals	Macropodidae	<i>Macropus giganteus</i>	Eastern Grey Kangaroo	SL, O
Mammals	Macropodidae	<i>Wallabia bicolor</i>	Swamp Wallaby	O, CAM
Mammals	Molossidae	<i>Mormopterus sp.2</i>	A Free-tailed Bat	Ana
Mammals	Muridae	<i>Melomys burtoni</i>	Grassland Melomys	T
Mammals	Muridae	** <i>Mus musculus</i>	House Mouse	T
Mammals	Muridae	<i>Rattus fuscipes</i>	Bush Rat	T, HT
Mammals	Peramelidae	<i>Perameles nasuta</i>	Long-nosed Bandicoot	CAM
Mammals	Peramelidae	<i>Isoodon macrourus</i>	Northern Brown Bandicoot	CAM
Mammals	Petauridae	<i>Petaurus norfolcensis</i>	Squirrel Glider	SL
Mammals	Phalangeridae	<i>Trichosurus vulpecula</i>	Brushtail Possum	SL
Mammals	Phascolarctidae	<i>Phascolarctos cinereus</i>	Koala	Scrt
Mammals	Pseudocheiridae	<i>Pseudocheirus peregrinus</i>	Common Ringtail Possum	SL
Mammals	Pteropodidae	<i>Pteropus poliocephalus</i>	Grey-headed Flying Fox	SL
Mammals	Pteropodidae	<i>Pteropus alecto</i>	Black Flying Fox	SL
Mammals	Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	Ana
Mammals	Vespertilionidae	<i>Chalinolobus nigrogriseus</i>	Hoary Wattled Bat	Ana
Mammals	Vespertilionidae	<i>Miniopterus australis</i>	Little Bent-wing Bat	Ana
Mammals	Vespertilionidae	<i>Myotis macropus</i>	Southern Myotis	Ana
Mammals	Vespertilionidae	<i>Vespadelus pumilus</i>	Eastern Forest Bat	Ana
Mammals	Vespertilionidae	<i>Scotorepens spp.</i>	A Broad-nosed Bat	Ana
Mammals	Molossidae	<i>Mormopterus sp2</i>	Eastern Freetail	Ana
Mammals	Rhinolophidae	<i>Rhinolophus megaphyllus</i>	Smaller Horseshoe Bat	Ana

## REPTILES

CLASS	FAMILY	SCIENTIFIC NAME	COMMON NAME	METHOD
Reptiles	Agamidae	<i>Physiganthus lesueurii</i>	Eastern Water Dragon	O
Reptiles	Agamidae	<i>Pogona barbata</i>	Bearded Dragon	O
Reptiles	Boidae	<i>Morelia spilota</i>	Carpet Python	O
Reptiles	Colubridae	<i>Dendrelaphis punctulatus</i>	Common Tree Snake	SL
Reptiles	Elapidae	<i>Notechis scutatus</i>	Tiger Snake	O
Reptiles	Elapidae	<i>Pseudonaja textilis</i>	Eastern Brown Snake	O
Reptiles	Scindae	<i>Cryptoblepharus pulcher</i>	Wall Skink	O
Reptiles	Scincidae	<i>Lampropholis delicata</i>	Grass Skink	O, T

## AMPHIBIANS

CLASS	FAMILY	SCIENTIFIC NAME	COMMON NAME	METHOD
Amphibians	Bufoidea	<i>Rhinella marina</i>	Cane Toad	O, SL, C
Amphibians	Hylidae	<i>Litoria fallax</i>	Eastern Sedgefrog	C
Amphibians	Myobatrachidae	<i>Limnodynastes terraereginae</i>	Northern Banjo Frog	SL
Amphibians	Myobatrachidae	<i>Crinia signifera</i>	Clicking Froglet	C
Amphibians	Myobatrachidae	<i>Crinia tinnula</i>	Wallum Froglet	C

## 4.4 DISCUSSION OF SURVEY RESULTS

### 4.4.1 BIRDS

Seventy-four (74) species of bird were recorded during surveys of the subject site. No species scheduled as endangered or vulnerable under the *Threatened Species Conservation Act 1995* or *Environment Protection and Biodiversity Conservation Act 1999* were recorded on the site during fauna survey works

The majority of bird species recorded from within and adjacent the site are diurnal species including:

- Insectivores which forage for invertebrates in the leaves, branches and bark of trees, in the air spaces provided by canopy gaps, and amongst litter, woody debris and groundcovers (i.e. fairy wrens, fantails, scrubwren etc)
- Nectar feeders (i.e. lorikeets, honeyeaters, miners etc)
- Large omnivores (i.e. butcherbirds, magpies, crows etc)
- Waterbirds (pelicans, gulls, egrets etc)
- Granivores (Doves, Pigeons)

A significant review of literature relating to the habitats and niche requirements of avifauna utilising eucalypt woodlands and forests was undertaken by McElhinny (2000) in association with NSW NPWS. This review notes that “the bird species occurring in eucalypt woodlands and forests belong to a variety of foraging groups, reflecting the diversity of resources which these vertebrates can utilise. A large proportion of birds are insectivorous, foraging for invertebrates in the leaves, branches and bark of eucalypts, in the air spaces provided by

canopy gaps, and amongst litter and woody debris (Woinarski *et al.* 1997). There is also a diversity of bird species which feed on nectar and exudates such as manna, honeydew and sap (Recher *et al.* 1985). A small proportion of birds feed on eucalypt seeds, and only a very few species are capable of digesting pollen. Frugivorous birds are rare and there are no leaf eating birds (Landsberg and Cork 1997). In addition to food resources, birds utilise sites for nesting and shelter, either in the form of suitable tree hollows, or appropriate foliage or ground cover arrangements (Recher *et al.* 1991).

The most productive habitats for birds appear to be those providing a range of resources which can support a variety of different foraging groups (Bauer *et al.* 2000). This is most likely to occur where there is a diversity of vegetation strata available as foraging substrates (Gilmore 1985, Loyn 1985, Recher 1969, MacArthur and MacArthur 1961). In Australian temperate forests and woodlands different strata tend to reflect differences at the levels of plant life form (forb, shrub or tree) and plant genus. This provides different kinds of food (nectar, fruit, seeds) and foliage thereby increasing the diversity of foraging opportunities for bird species (Recher 1985).

Six habitat components have been consistently identified as important resource bases for birds (Recher *et al.* 1998, Woinarski *et al.* 1997, Traill 1993, Recher 1991, Gilmore 1985):

- Foliage; a source of exudates and invertebrates;
- Flowers; a source of nectar and invertebrates
- Bark; a source of exudates and invertebrates
- The ground layer, including ground vegetation, litter, logs and coarse woody debris; - a source of invertebrates and small vertebrates;
- Air spaces; within and between canopy strata - a source of invertebrates;
- Hollow bearing trees; for nesting and shelter" (McElhinny, 2000: 20).

It is considered that the site exhibits habitat suitable for a wide variety of native bird species due to the different variety of vegetation communities and site characteristics.

The nectarivorous guild was well represented and is generally well established within local eucalypt, paperbark and coastal forests (incorporating heath species) favouring this avifauna group. Meliphagids were regularly encountered during survey works, in particularly within the heath community which featured flowering *Melaleucas*.

The expansive tracts of eucalypt forest and rainforest present within the locality incorporating moderate densities of hollow bearing trees provides potential habitat for a variety of nocturnal avifauna, although only the Barn Owl were encountered. Large forest owls (Masked, Eastern Grass, Powerful) are also known from the locality and must be considered potential occurrences within the areas given the abundance of suitable habitat for known prey species.

Suitable habitat for species associated with dense ground strata was abundant in association with the eucalypt forest and the littoral rainforest which contained a deep leaf litter layer, and groundcovers containing rushes, sedges and grasses and thick shrub layer in areas. A reasonable diversity of ground, low and shrub level foliage gleaners/pouncers and sallyers were recorded from these areas including Silvereyes, Fantails, Fairy-wrens, and Grassbird.

The nearby Evans River has resulted in the recording of common waterfowl such as Pelicans, Ducks, Egrets and Herons. Diurnal coastal raptors were also noted to be common in the locality and were regularly recorded circling over the site although no nests were observed.

The open grassland/modified areas adjacent to the existing house provides suitable habitat for common territorial species (Crow, Magpie, Minor) and edge-specialist species (Kookaburra, Butcherbird, Magpie) which were frequently recorded on site.

#### 4.5.2 MAMMALS

A total of twenty-six (26) mammal species were recorded on the subject site during surveying works. Two species scheduled as Vulnerable under the *Threatened Species Conservation Act 1995* or *Environmental Protection and Biodiversity Conservation Act 1999* were recorded on the site during survey works. These species are discussed individually within the later sections of the report.

##### *Ground-dwellings Mammals*

All terrestrial mammals require vegetated cover for shelter and to facilitate movement. Small terrestrial mammals prefer areas within a complex vegetation structure which is dense within the lower strata and subsequently provides shelter/nesting sites and refuge from predators. Larger terrestrial mammals (larger wallabies, kangaroos) also generally require dense cover for refuge but tend to favour more open areas for grazing/feeding.

Suitable structural forest variation and dense understory components were generally present over the entire site (excluding the cleared areas and vehicles tracks) and are abundant within the locality including the Bundjalung National Park and Broadwater National Park. Common native and introduced ground dwelling mammals such as Bandicoots, Rats, Antechinus a mice were regularly trapped or recorded and a considered to occur in abundance within the locality. The Eastern Grey Kangaroo was regularly recorded within the cleared grassland/paddock areas adjacent to the existing house. Swamp wallabies were also encountered regularly on site. Several cats, a dog (uncollared) and hares were also recorded on site. A very small area of potential habitat for terrestrial mammals will be modified in association with the proposed development.

##### *Arboreal Mammals*

Arboreal mammals previously noted to occur within the vicinity of the site are all noted to be hollow dependent with the exception of the Koala and the Ringtail Possum (which does utilize hollows but will also construct leaf dreys) (Strahan eds, 2002; Gibbons and Lindenmayer, 2002). It is widely accepted that a reduction in senescent trees is a limiting factor in hollow dependent arboreal mammal populations (Smith and Lindenmayer, 1998; Gibbons and Lindenmayer, 2002; Lindenmayer, 2002; Lunney, 1987).

Within the study area and surrounding locality exists an abundance of hollow bearing trees (HBT) with associated Eucalypt forest also prevalent. The habitat value for hollow-dependent arboreal mammals is accordingly considered to be high within the locality. The following species were encountered during nocturnal survey:

- Squirrel Glider (2 individuals recorded)
- Brush-tailed Possum (4 individuals recorded)

Koala foraging resources and associated eucalypt forest/woodland is present on site in association with the eucalypt forest (Vegetation Community 3). Koala scratches were observed on numerous Blue Gums and Scribbly Gums within this community. Koalas are addressed in Section 5.3 below.

### Flying Mammals

Two species of flying fox (Grey-headed and Black) was recorded flying over the site. An individual Grey-headed Flying-fox was noted foraging on a Melaleuca within the Heath community during spotlighting events. No evidence of roosting colonies or camps were encountered on site, however, is present within the locality Since 2002 grey-headed and black flying-foxes have been roosting on a seasonal basis in the littoral rainforest remnant located near the village centre just 250 metres north east of the main street (Hallinan and Richmond Valley Council, 2008). Anabat detection survey also recorded the following bat species within the study area:

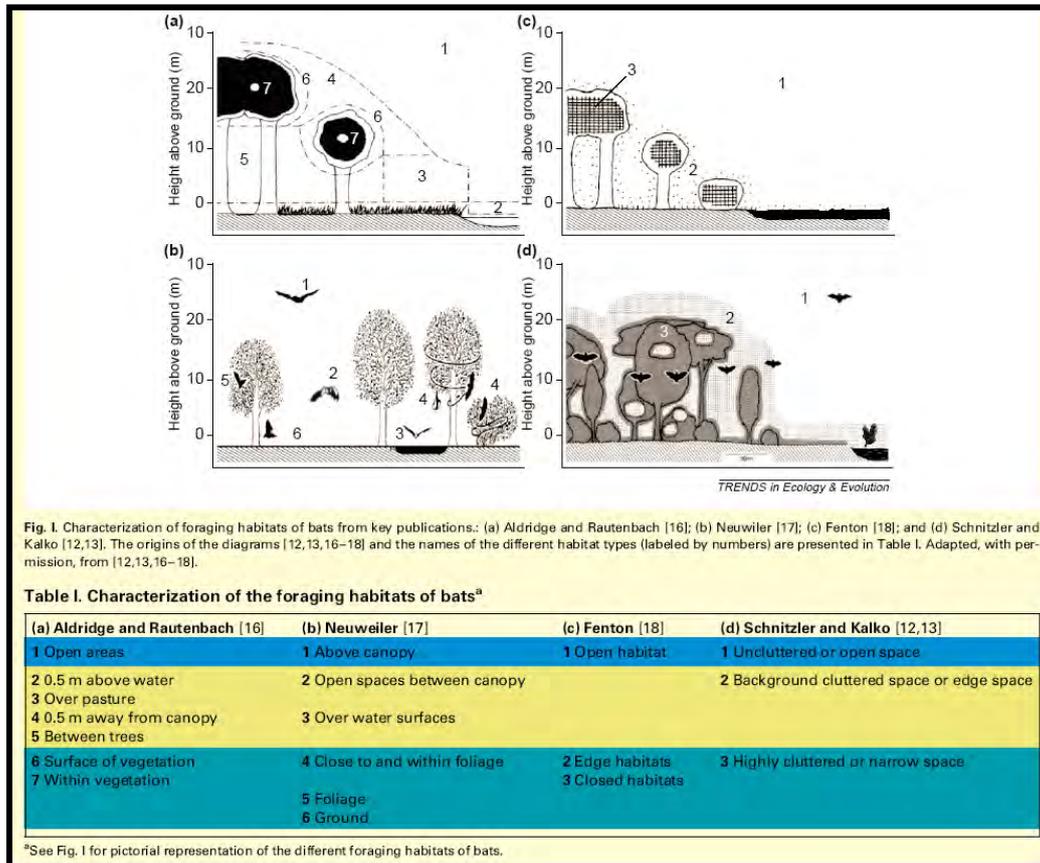
- Smaller Horseshoe Bat
- Gould's Wattled Bat
- Hoary Wattled Bat
- Little Bent-wing Bat
- Southern Myotis
- Eastern Forest Bat
- A Broad Nosed Bat (*Scotorepens spp.*)
- Freetail Bat (*Mormopterus sp2*)

The presence of extensive eucalypt forest and heathland habitats on site indicates that microchiropteran bats are likely to forage on site. The existing drainage lines on site also provides potential habitat for species which favour foraging over waterbodies for insects (eg. Southern Myotis ect.), although more suitable habitats occur within the locality in association with Evans River and wetlands.

<b>SPECIES NAME</b>	<b>COMMON NAME</b>	<b>ROOST TYPE</b>
<i>Rhinolophus megaphyllus</i>	Smaller Horseshoe Bat	Though characteristically cave-dwelling, substitute roosts have been provided by humans in the form of old railway tunnels, abandoned mines, stormwater drainpipes and culverts (Hall, Young & Spate 1974). Occasionally, rhinolophids are found in houses or a shed, and Eastern Horseshoe-bats have been found roosting amongst tree roots in undercut creek banks. Many roosts have a small, restricted entrance with access via narrow vertical drops (Dwyer 1966d). A variety of surfaces such as sloping walls, flat roofs, or indentations can be used for roosting. Flat vertical walls causing ventral body contact are never used, but deep ceiling domes are frequently occupied by single animals, groups of unclustered individuals, and, occasionally, by small clusters. Roost sites are typified by small dimensions, high temperatures and humidities, and frequently have a dirt floor (Hall et al. 1974).
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	Mostly within tree cavities although occasionally within other areas [tree stump, disused birds nests, building roofs, canvas roll, tractor exhaust] (Chruszcz and Barclay, 2002).  Victoria studies conducted by Lumsden and Bennett (1995) and later by Lumsden (2004) found roost switching was common in individuals faithful to a roost area. Roosts used on successive days were usually within 300m of each other. Lumsden (2004) showed a strong bias for roost trees within floodplain forests and preference toward large Blue Gum/River Red Gums.  Colonies are generally small (up to 30) within individuals (primarily males) also roosting individually (Dixon and Lumsden in Van Dyck and Strahan, 2008).
<i>Chalinolobus</i>	Hoary	Tree cavities and occasionally buildings and rock crevices.



<i>nigrogriseus</i>	Wattled Bat	
<i>Miniopterus australis</i>	Little Bent-wing Bat	<p>Caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day (DECC 2005). DECC (2005) note the following additional particulars with regard to roosting of little bentwing bat:</p> <ul style="list-style-type: none"> <li>• Maternity colonies form in spring. Males and juveniles disperse in summer.</li> <li>• Only five nursery sites /maternity colonies are known in Australia.</li> <li>• They often share roosting sites with the Common Bentwing-bat and, in winter, the two species may form mixed clusters.</li> <li>• In NSW the largest maternity colony is in close association with a large maternity colony of Common Bentwing-bats (<i>M. schreibersii</i>) and appears to depend on the large colony to provide the high temperatures needed to rear its young.</li> </ul>
<i>Myotis macropus</i>	Southern Myotis	<p>The <i>Myotis</i> roosts within caves, tunnels, hollow-bearing trees, bridges, buildings and dense tree foliage always in close proximity to permanent water (NPWS, 2002; Richards, 2002). Breeding colonies may consist of 10-15 individuals or occasionally up to several hundred. Within breeding colonies small clusters are made where a male establishes a territory from which other males are actively excluded and breeding females are protected. Outside of breeding males roost solitarily within a defended zone or established a small group of up to 20 males.</p>
<i>Vespadelus pumilis</i>	Eastern Forest Bat	<p>Tree hollows, favouring large hollow bearing trees, with maternity colonies up to 50 adult females (Law et al in Van Dyck &amp; Strahan, 2008). Large hollow bearing trees proximate to riparian zones are particularly favoured (Land and Anderson, 2000). Males may also roost within understorey species such as Blackwood (Turbill et al, 2003)</p>
<i>Scotorepens spp.</i>	A Broad Nosed Bat	<p>Broad Nosed bats have been recorded roosting in tree hollows and roofs (Tidemann and Parnaby 2008,</p>
<i>Mormopterus sp2</i> (syn. <i>M. ridei</i> per Churchill, 20085).	Eastern Freetail	<p>Eastern Freetail bats roost mainly in tree hollows but will also roost under bark, in buildings and cracks in posts. Colonies of several hundred have been recorded. They have been reported to share roost with Gould's wattled bats, <i>Chalinolobus gouldii</i>, and the eastern broad-nosed bat, <i>Scotorepens orion</i></p>



**Figure 5: Review Of Micro-bat Foraging Habitats – Source: Schnitzler *et al.* 2003)**

A review of the bats recorded within the study area indicates that tree cavities and caves/crevices are necessary for roosting/breeding. In addition to providing shelter, maternity places and retreats for hibernation, roosts are also important places for social interactions among bats. The availability of suitable roosts is therefore critical for the survival of forest bats (Herr, 1998). Within the site it is considered that cave/mine potential breeding sites are absent, however hollow-bearing trees were present in association with the eucalypt community.

In addition to the above, it is noted that several bat species (i.e. Large-eared Pied Bat, Eastern Bentwing, Little Bentwing, Southern Myotis etc) may regularly roost in man-made structures such as bridges (Hoye, 2009; Bat Advisory Recovery Team, 2001; TSC, 2010). Such structures too are absent from this site.

#### 4.5.3 REPTILES

A total of eight (8) reptile species were recorded on the subject site. No species listed as endangered or vulnerable under the *Threatened Species Conservation Act 1995* or *Environment Protection and Biodiversity Conservation Act 1999* were recorded on the site during fauna survey works.

Within the site, a variety of lizards were recorded all of which are considered to be common species. Several individuals were encountered within the ground layer of the eucalypt forest and the acacia regrowth area which incorporates abundant fallen timber, logs and general organic debris. A bearded dragon was encountered utilising the abandoned roads for



basking within the acacia regrowth section of the site. Additionally, a grass skink was trapped within the constructed pitfall traps located within the heathland community.

Several (4) snake species were encountered during surveying periods of the site. A large Carpet Python was found within the eucalypt forest adjacent to the existing house, while a Common Tree Snake was found within the Littoral Rainforest during spotlighting events. The cleared area/grassland in close proximity to the house recorded an Eastern Brown Snake and a Tiger Snake.

The presence of abundant eucalypt woodlands in the locality would indicate that common species such as the spotted python, whip snakes and red-bellied black snake may also occur.

Those encountered are considered to be common occurrences within the locality and will be minimally affected by the proposal via modification of the existing ground refuge within the small area occupied by the development envelope.

#### 4.5.4 AMPHIBIANS

Four (4) species of native frog and one (1) introduced toad were recorded on the subject site. One species listed as vulnerable under the *Threatened Species Conservation Act 1995* was recorded on the site during fauna survey works.

The Eastern Sedge Frog, Wallum Froglet and Clicking Frog were recorded vocalising within the eastern drainage line along the property boundary and within the adjacent SEPP designated land. The Northern Banjo Frog was regularly observed during spotlight events throughout the site along with the introduced Cane Toad.

Amphibians typically require a series of permanently wet or damp habitats (streams, moist understorey, dams, depressions etc) to disperse (it is noted however that they will disperse across additional areas during prolonged wet weather) and require access to various breeding sites on a seasonal basis.

Negative impacts to continued amphibian survival within local and regional areas can occur when appropriate breeding sites and habitats are isolated, thus separating breeding individuals and access to alternate food resources. This is particularly relevant for rare and threatened species, which are usually already geographically isolated from similar populations. In this regard it is noted that the drainage lines of the site are connected to melaleuca dominated wetlands occurring to the northeast of the site.

Although the proposal will see the two drainage lines filled, more suitable habitat occurs directly to the northeast of the site in association with the melaleuca dominated wetlands. It is considered unlikely that potential significant amphibian sites will be impacted or isolated from existing connected breeding areas.

<b>Species</b>	<b>Common Name</b>	<b>Adult Habitat</b>	<b>Breeding Habitat</b>
<i>Litoria fallax</i>	Eastern Sedgefrog	tree frog & ground	Permanent-temporary pools/lentic. Dams, ponds and swamps especially those with emergent reeds. Breeding: Spring-Summer



<i>Crinia signifera</i>	Clicking Frog	ground	Ephemeral pool/lentic. Temporary to permanent flooded ditches, streams, or permanent pools and dams. Highly adaptable.
<i>Crinia tinnula</i>	Wallum Froglet	ground	Breeding occurs in low nutrient, acidic (pH < 6), tannin-stained ephemeral ponds and swamps associated with coastal banksia, melaleuca, wet heath and/or adjacent eucalypt forest/woodland (Meyer et al., 2005).
<i>Limnodynastes terraereginae</i>	Northern Banjo Frog	ground	The species occurs in a variety of habitats along the edges of permanent streams, dams, swamps and other areas of static water including roadside depressions. There must be cover in the form of grass and other dense vegetation. Breeding commences about October and continues until May.

## 5.0 SCHEDULED COMMUNITIES, POPULATIONS AND SPECIES OF CONSERVATION SIGNIFICANCE

Following a review of the flora and fauna assessments, the following further discussions of ecological significance have been prepared:

### 5.1 ENDANGERED ECOLOGICAL COMMUNITIES

Endangered ecological communities are listed under Schedule 1, Part 3 of the *Threatened Species Conservation Act 1995*, while threatened ecological communities are listed under the *Environment Protection and Biodiversity Conservation Act 1999* as critically endangered, endangered and vulnerable.

One potential endangered ecological community has been recorded on the subject site:

**Table 9** - Recorded Endangered Ecological Communities

EEC	SITE VEGETATION COMMUNITY
LITTORAL RAINFOREST IN THE NSW NORTH COAST, SYDNEY BASIN AND SOUTH EAST CORNER BIOREGIONS	VEGETATION COMMUNITY 4: TALL TO VERY TALL MIXED CLOSED FOREST CONTAINING A WIDE VARIETY OF RAINFOREST SPECIES

Endangered populations are listed under Schedule 1, Part 2 of the *Threatened Species Conservation Act 1995*. Although the region occurs within the 'Emu population in the New South Wales North coast Bioregion and Port Stephens local government area', no emus were recorded during surveying works.

### 5.2 THREATENED FLORA SPECIES

One flora species listed as (either *Phaius australis* or *Phaius tancarvilleae*) Endangered under both Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* and NSW's *Threatened Species Conservation Act 1999* was observed. This species was recorded within the Littoral Rainforest Community and is unaffected by the proposal.



A search of the NPWS *'Atlas of NSW Wildlife' [2014]* has determined that eleven (11) species of threatened flora have been previously recorded within the locality (search area North: -29.07 West: 153.3599 East: 153.4599 South: -29.17). Active searches throughout the occurring vegetation communities throughout the site were undertaken to locate the presence or absence of these species which are tabulated below.

Based on habitat assessment and the known distribution of these species within the NENSW bioregion, a number of these are considered unlikely to be present within the site. It is considered suitable habitat for these may be present but given the site conditions they do not occur and were not detected during field survey.



Table 10: Potentially Occurring Threatened Flora Species				
Family	Species Name	Preferred Habitat	TSCA Status	Expected Impact
Asteraceae	<i>Rutidosis heterogama</i>	Recorded from near Cessnock to Kurri Kurri with an outlying occurrence at Howes Valley. On the Central Coast it is located north from Wyong to Newcastle. There are north coast populations between Wooli and Evans Head in Yuraygir and Bundjalung National Parks. It also occurs on the New England Tablelands from Torrington and Ashford south to Wandsworth south-west of Glen Innes (OEH 2014).  Grows in heath on sandy soils and moist areas in open forest, and has been recorded along disturbed roadsides (OEH 2014).	V	Not recorded within the development site. No impact expected on the species.
Cyperaceae	<i>Cyperus aquatilis</i>	In NSW, known only from a few sites north from Grafton (OEH 2012)  Grows in ephemerally wet sites, such as roadside ditches and seepage areas from small cliffs, in sandstone areas (OEH 2012)	E	Not recorded within the development site. No impact expected on the species.
Droseraceae	<i>Aldrovanda vesiculosa</i>	The species is more commonly found in northern Australia and tropical regions of Asia and Africa. Known in NSW only from lagoons in the Moruya area on the south coast, from the Evans Head area on the north coast and from north of Guyra on the New England Tablelands (OEH 2012).  Found free-floating in near-coastal shallow freshwater lagoons that are rich in organic matter (OEH 2012)	E	Not recorded within the development site preferred habitat not present on site. No impact expected on the species.
Fabaceae (Caesalpinioideae)	<i>Senna acclinis</i>	<i>Senna acclinis</i> occurs in coastal districts and adjacent tablelands of NSW from the Illawarra in NSW to Queensland (OEH 2012).  Grows in or on the edges of subtropical and dry rainforest (OEH 2012).	E	Not recorded within the development site. No impact expected on the species.
Fabaceae (Faboideae)	<i>Pultenaea maritima</i>	Within NSW, the species has been recorded from Newcastle north to Byron Bay on 16 headlands. Populations vary from a few plants to larger populations of many hundreds of individuals where the species is a major component of the Kangaroo Grass Headland community (OEH 2013).	V	Not recorded within the development site. No impact expected on the species.
Orchidaceae	<i>Dendrobium melaleucaphilum</i>	Grows frequently on <i>Melaleuca styphelioides</i> , less commonly on rainforest trees or on rocks in coastal districts; north from the lower Blue Mountains (OEH 2012).	E	Not recorded within the development site. No impact



				expected on the species.
Orchidaceae	<i>Oberonia complanata</i>	This species grows on trees and rocks in littoral rainforest, subtropical rainforest, dry rainforest, wet or dry eucalypt forests, dunes (including stabilised sands), stream-side areas, swampy forests and mangroves (OEH 2012), as well as coastal scrub and gorges in sclerophyll forest; north of Coffs Harbour (OEH 2012).	E	Not recorded within the development site. No impact expected on the species. Preferred habitat not affected by development
Orchidaceae	<i>Oberonia titania</i>	Red-flowered King of the Fairies occurs in littoral and subtropical rainforest and paperbark swamps, but it can also occur in eucalypt-forested gorges and in mangroves (OEH 2012).	V	Not recorded within the development site. No impact expected on the species. Preferred habitat not affected by development
Orchidaceae	<i>Peristeranthus hillii</i>	In NSW this orchid is restricted to coastal and near-coastal environments, particularly Littoral and Lowland Rainforest north from Port Macquarie (DEC, 2005)	V	Not recorded within the development site. No impact expected on the species. Preferred habitat not affected by development
Orchidaceae	* <i>Phaius australis</i>	'The Lesser Swamp-orchid is commonly associated with coastal wet heath/sedgeland wetlands (Barry 2005), swampy grassland or swampy forest (NSW DECCW 2005iw) and often where Broad-leaved Paperbark or Swamp Mahogany are found (NH NSW 2006; Sparshott & Bostock 1993). Typically, the Lesser Swamp-orchid is restricted to the swamp-forest margins, where it occurs in swamp sclerophyll forest (Broad-leaved Paperbark/Swamp Mahogany/Swamp Box ( <i>Lophostemon suaveolens</i> )), swampy rainforest (often with sclerophyll emergents), or fringing open forest. It is often associated with rainforest elements such as Bangalow Palm ( <i>Archontophoenix cunninghamiana</i> ) or Cabbage Tree Palm ( <i>Livistona australis</i> ) (Benwell 1994b; Bishop 1996; Weston in Harden 1993)' [DoE, 2013 online @ <a href="http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=5872">http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=5872</a> ]	E	Potentially, approximately 159 stems were recorded within Vegetation Community 1 (Littoral Rainforest)  This vegetation community is external to the development footprint and will be retained Preferred habitat not affected by development  Nevertheless, a 7-part test was performed for the species.
Orchidaceae	* <i>Phaius tancavilleae</i>	Swamp Lily occurs in north-east and south-east Queensland and north east NSW as well as globally from Papua New Guinea to China and Asia (Threatened Species Scientific Committee, 2008).	E	Potentially, approximately 159 stems were recorded within Vegetation



		<p>Swamp Lily tends to occur in sunny positions in swamp forest ecotones. Associated vegetation includes swamp sclerophyll forest (<i>Melaleuca quinquenervia-Eucalyptus robusta-Lophostemon suaveolens</i>), swampy rainforest (often with sclerophyll emergents), or fringing open forest. It is often associated with rainforest elements <i>Archontophoenix cunninghamiana</i> or <i>Livistona australis</i> (Harden 1993; Benwell 1994; Bishop, 1996). Soil parent materials include marine Aeolian sand, alluvium, granite, metasediments and sandstone. On sand, soils range from shallow peat to humus or podzols (Harden 1993; Benwell 1994; Bishop 1996).</p>		<p>Community 1 (Littoral Rainforest)</p> <p>This vegetation community is external to the development footprint and will be retained Preferred habitat not affected by development</p> <p>Nevertheless, a 7-part test was performed for the species.</p>
Polypodiaceae	<i>Belvisia mucronata</i>	<p>In NSW, it is known from only five locations on the far north coast, north from Evans Head (OEH 2012)</p> <p>Forms small clumps on trees or rocks in dry rainforest or along creeks in moist open forest (OEH 2012)</p>	E	Not recorded within the development site. No impact expected on the species.

\* A population (159 stems recorded) of swamp orchids was discovered within the Littoral Rainforest (Vegetation Community 1) during survey works of the site. The species was identified as either being the Lesser Swamp Orchid (*Phaius australis*) or the Greater Swamp Orchid (*Phaius tancavilleae*). It is stated that the species can only be identified from each other via the characteristics of their flowers (Benwell 1994). As the survey period was conducted outside the flowering periods for these species (September-November), both species will be described as being recorded on site. Future analysis will be conducted on the swamp orchid located on site during flowering periods to identify the species.

### 5.3 THREATENED FAUNA SPECIES

A search of the NPWS 'Atlas of NSW Wildlife' [2014] has determined that fifty-three (53) species of threatened flora have been previously recorded within the locality (search area North: -29.07 West: 153.3599 East: 153.4599 South: -29.17). During surveys of the subject site seven (7) of these species were recorded:

**Table 11:** Recorded Threatened Fauna Species

Species	Location Recorded
Grey-headed Flying-fox	Recorded flying over the site via spotlight
Hoary Wattled Bat	Recorded via anabat survey
Little Bentwing-bat	Recorded via anabat survey
Southern Myotis	Recorded via anabat survey
Koala	Trace recorded within the eucalypt forest on the western portion of the site (scratches on Blue Gum and Scribbly Gum).
Squirrel Glider	Recorded via spotlight survey (two individuals recorded within the eucalypt forest on the western portion of the site).
Wallum Froglet	Recorded vocalising within the man-made drainage line along the eastern boundary line.

A review of available habitats and the ecology of the database listed species (i.e. range, preferred habitat, home range etc) indicate that it is unlikely that all of these previously recorded species in the region would rely on the habitats of the subject site or be significantly affected by the proposal.

Subsequently several such threatened species are considered unlikely to be significantly affected by the proposal for one or more of the following reasons:

- core habitats were not recorded in the study area
- resources used by the species are unlikely to be adversely affected or only likely to be minimally affected by the proposal.

Details of such species requirements and reasons for not considering impacts to these species further are contained within the below Table. A number of threatened species have been excluded from discussion in the below table where they are considered reasonably unlikely occurrences due to the following:

- Being a marine reptile or mammal (i.e. whale, turtle, seal)
- Being a pelagic seabird, wader bird or intertidal zone coastal bird (i.e. tern, godwit, oystercatcher)

For species considered a potential occurrence (based upon distribution, database recording, suitable habitat present etc) or which were recorded within or directly adjacent the site during either survey period and for which it is considered that the species may be significantly affected by the proposal (i.e. impact on feeding, roosting, nesting, behaviour and associated habitat), the seven-part test of significance has been performed in Section 6 of this report.



Notwithstanding, all the species tabled below were targeted during the fauna survey or were reviewed in the context of documented ecology and available habitats.



**Table 12: Potentially Occurring Threatened Fauna Species**

Species	Potential occurrence based upon known habitat and range	Notes	Potential for the species or associated habitat to be impacted upon by proposal
Wallum Froglet ( <i>Crinia tinnula</i> )	Possible	<p>This species of wallum frog is found along drainage lines in sub-coastal wet heath, in acid paperbark (<i>Melaleuca</i>) swamps, and sedge swamps associated with sandy coastal plains (but rarely from around coastal lakes) and low slopes below 40m altitude and above areas of tidal influence (Ehmann, 1997; Meyer et al, 2006). The habitats in which the wallum froglet species breed are typically oligotrophic (i.e. nutrient poor), tannin-stained and acidic (pH 4.3-5.2) [QPWS 2001; Meyer et al. 2006; McDonald et al, 2009; Hines et al, 2004]. These attributes may render wallum frog breeding habitat unsuitable for related species (i.e. the common sedgefrog <i>Litoria fallax</i>, striped rocketfrog <i>L. nasuta</i>, clicking froglet <i>C. signifera</i> and beeping froglet <i>C. parinsignifera</i>). This could explain why wallum frog species and related species seldom occur together" (Ingram and Corben, 1975; Straughan, 1966 in Myer et al, 2006: 16).</p> <p>The coastal distribution occurs as far north as Litabella National Park on the southeast coast of Queensland south to Kurnell in mid-eastern New South and also upon a number of offshore islands including Fraser Island, Bribie Island, Moreton Island and North Stradbroke Island (BCC, 2010). Breeding usually occurs in autumn or early winter, but has been recorded in all seasons following rain with males vocalising from the base of sedges near water or atop matted sedges (McDonald et al, 2009; Meyer et al, 2006).</p> <p>A regionally significant population of the species is noted to occur within a wide variety of habitats investigated in association with the Tugun Bypass SIS (PB, 2004; Hero et al, 2001). Known habitat broadly encompasses the following vegetation communities: Slashed Heathland, Wet Heathland, Swamp Mahogany Forest, Swamp Mahogany-Brushbox Forest, Littoral Rainforest, Swamp Paperbark Forest and other moist forest types. Breeding is confined to slow-moving water less than 1.5 metres deep within the pH range of 3.0 to 5.2 (PB 2004; 4.23). Significant areas of Melaleuca Forest are present within the adjacent Cudgen Reserve with the species known to occur there (NPWS, 1998). The species is known from swamp sclerophyll habitats to the north which were investigated as 'Block F' in association with the Tugun Bypass Compensatory Habitat Package (SMEC, 2009).</p> <p>Wallum Froglet habitat occurs on site in association with the two man-made drainage lines occurring in the eastern portions of the site, dense vegetation cover is scarce in comparison to the</p>	Recorded  7-part test performed



		<p>neighbouring melaleuca swamplands to the east.</p> <p>Wallum Froglet habitat occurs on site in association with the natural drainage line within the wet heath community in the north east of the site and mapped as SEPP 14 wetland. Dense vegetation cover is associated with this feature</p> <p>Marginal habitat also occurs within the Littoral Rainforest community and Eucalypt forest, however permanent standing water is absent.</p> <p>The specie was recorded in the eastern boundary constructed drainage line, the drainage line within the wet heath community and from the adjoining property o the east.</p> <p>Similar habitat is known to occur in abundance within the locality, in particularly the melaleuca wetland occurring directly to the northeast of the site.</p> <p>The proposal will remove the artificially constructed drainage line along the sites eastern boundary within the disturbed Acacia community. The proposal retains the drainage feature in the wet Heath community and is significantly buffered from the proposed development and will unlikely be significantly impact by the proposal.</p> <p>No Wallum Froglets were directly observed. A 7-part test was performed for the species.</p>	
<p>Wallum Sedge-frog (<i>Litoria olongburensis</i>)</p>	<p>Possible</p>	<p>This species is known from a variety of coastal sandy vegetation communities associated with wallam (banksia) including heathland, sedgeland, melaleuca forest/woodland and ephemeral wetlands with a preference for acidic (low pH) seasonally inundated sedge swamps for breeding. The known distribution includes such lowland coastal zones from Fraser Island (southeast QLD) to Yuraygir National Park (north-east NSW) including several offshore islands such as Fraser Island, Bribie Island, Moreton Island and North Stradbroke Island (DSEWPC, 2011; Meyer et al, 2006; BSC, 2010). A review of the modeled distribution of <i>Litoria olongburensis</i> (DSEWPC, 2011) notes that the species is neither mapped as 'known/likely to occur' nor 'may occur' on the mainland between approximately Tugun and Beerwah.</p> <p>At swamp sites, the Wallum Sedge Frog can be found sheltering amongst sedges, reeds and ferns all year round (Anstis 2002; Ehmann 1997; Ingram &amp; Corben, 1975; James, 1996; Lewis &amp; Goldingay, 2005; Liem &amp; Ingram, 1977; Neilson, 2000 in DSEWPC, 2012). During wet periods the frog can be found on emergent vegetation (rushes, sedges, ferns) whilst during drier periods it may be found at the base of such vegetation (BSC, 2010). Breeding occurs after rain in spring, summer and autumn within acidic, permanent to ephemeral freshwater wetlands with emergent vegetation, most notably sedges, reeds or ferns in still water 0.5-1.5m deep (Hines et al, 2004). These wetlands (wallum swamps, bogs, lakes or creeks), which are considered habitats critical to the survival of the species, typically overlie deep, low-nutrient, sandy soils where groundwater levels are characteristically high (Wallum Sedge Frog Workshop 2010 in DSEWPC, 2012; Meyer et al, 2006).</p>	<p>Modification of an insignificant area of potential habitat will occur.</p> <p>This species is considered unlikely to be significantly affected by the proposed development.</p>



		<p>Consequently, numerous survey guidelines indicate that searches for the species are best undertaken during the warmer months as activity may be increased. It is noted, however, that studies undertaken over a four year period in northeastern NSW (Lewis and Goldingay, 2005) resulted in counts of individuals of <i>Litoria olongburensis</i> being higher in winter than in summer. Additional activity information obtained noted that counts of adults were negatively influenced by rain during the previous day, but positively influenced by rain the previous week. Counts of juveniles were influenced by rain during the previous three months (Lewis and Goldingay, 2005).</p> <p>A significant population of the species is noted to occur within restricted wallum habitats on Gold Coast airport lands investigated in association with the Tugun Bypass SIS (PB, 2004; Hero et al, 2001; BAAM, 2005). Breeding habitat is characterised by low pH and relatively deep pools with some capacity to retain water for longer periods with six ponds of breeding importance located proximate to the Gold Coast Airport (Hero et al, 2001). It is noted that purpose built frog ponds established adjacent the airport site have been re-colonised by the wallum sedgefrog post construction of the Tugun Bypass (QDTMR, 2007). "The context of the Tugun population with respect to other populations of the frog is as follows:</p> <ul style="list-style-type: none"><li>• It is an isolated population that is 30-40km to the north of the nearest known population in the Pottsville Area, New South Wales and 45 km to the nearest known population in the north, North Stradbroke Island, Queensland.</li><li>• It also most likely occurs on South Stradbroke Island, which is about 16km north of Tugun.</li><li>• The nearest known mainland population in Queensland is at Beerwah about 100km to the north. However, it is known from in between on the major Moreton Bay Islands of Bribie, Moreton and North Stradbroke. The Stradbroke Islands were apparently connected to each other and the mainland at Southport during European memory.</li></ul> <p>Wallum Sedge-frog habitat occurs on site in association with the two man-made drainage lines occurring in the eastern portions of the site, however dense vegetation cover is scarce in comparison to the neighbouring melaleuca swamplands and drainage line in the weet heath community.</p> <p>Marginal habitat also occurs within the Littoral Rainforest community, however permanent standing water is absent. More suitable habitat occurs within the heath community which contains smaller drainage lines. Similar habitat is known to occur in abundance within the locality, in particularly the melaleuca wetland occurring directly to the northeast of the site. The drainage lines within the heath community will be significantly buffered from the proposed development and will unlikely be significantly impact by the proposal. Wallum Sedge-frog was not observed or recorded vocalising during survey works.</p>	
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<p>Wompoo Fruit-dove (<i>Ptilinopus magnificus</i>)</p>	<p>Possible</p>	<p>This species is confined to mature rainforest and adjacent wet sclerophyll environments in eastern Australia from Cape York to around Coffs Harbour. As an obligate frugivore it requires a high availability of fruiting materials which it generally feeds on in the high canopy (Recher et al, 1995).</p> <p>Potential habitat occurs in association with the Littoral Rainforest (Vegetation Community 1) which contains large rainforest trees. The fruit dove was not, however, observed or recorded vocalising on the site during survey works.</p>	<p>All areas of potential habitat will be retained in association with the proposal.</p> <p>This species is considered unlikely to be significantly affected by the proposed development as no clearing of preferred habitat is proposed..</p>
<p>Black-necked Stork (<i>Ephippiorhynchus asiaticus</i>)</p>	<p>Possible</p>	<p>The species is generally associated with wetlands, mudflats, mangroves, swamps and floodplains while it may also sometimes be found in open woodland environs where a grassy understorey is present (NPWS, 2002, Readers Digest, 2002; DEC, 2005). Irrigated lands are also occasionally a foraging resource and it has also been recorded foraging in artificial wetlands of sewerage treatment plants (ERM, 2001). The species has also been recorded foraging within grassed paddocks and pasture areas in Cedar Creek, Mudgeeraba and Coomera (pers. obs.).</p> <p>The breeding behaviour is poorly understood within information available for NSW (DEC, 2005) noting that breeding activity (from nest construction to fledging of young) occurs from May to January. Most activity, however, takes place between June and December, and clutches present May to September. In NSW, Jabirus usually nest in a tall, live and isolated paddock tree, but also in other trees, including paperbarks, or even lower shrubs within wetlands. The nest is a large platform, 1-2 m in diameter, made in a live or dead tree, in or near a freshwater swamp (DEC, 2005).</p> <p>The stork has been previously observed within Hastings Point foraging within a dredge pond by Planit (2006).</p> <p>Marginal habitat is considered to occur in the eastern portions of the site in association with the drainage lines, as well as the cleared paddock/grassland (Vegetation Community 2). The stork was not, however, observed on the site during survey works. The modification of potential stork habitat is only a small proportion in comparison to the existing habitat in the locality which is more preferable for the species.</p>	<p>Modification of an insignificant area of potential habitat will occur.</p> <p>This species is considered unlikely to be significantly affected by the proposed development.</p>
<p>Spotted Harrier (<i>Circus assimilis</i>)</p>	<p>Possible</p>	<p>The Spotted Harrier occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania (Barrett et al. 2003). Individuals disperse widely in NSW and comprise a single population. The Spotted Harrier occurs in grassy open woodland including acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe (e.g. chenopods) (Marchant and Higgins 1993; Aumann 2001a). It is found mostly</p>	<p>Modification of an insignificant area of potential habitat will occur.</p>



		<p>commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. The species builds a stick nest in a tree and lays eggs in spring (or sometimes autumn), with young remaining in the nest for several months.</p> <p>The diet of the Spotted Harrier includes terrestrial mammals, birds and reptiles, occasionally large insects and rarely carrion (Marchant and Higgins 1993; Aumann 2001b). It was formerly heavily dependent on rabbits, but following the spread of rabbit calicivirus disease, and consequent decline in rabbit numbers by 65-85% in the arid and semi-arid zones (e.g. Falkenberg <i>et al.</i> 2000; Sharp <i>et al.</i> 2002), this harrier is increasingly dependent on native prey. Most of its former native mammalian prey species in inland NSW are extinct (e.g. bandicoots, bettongs and rodents: Van Dyck and Strahan 2008). Many of the remaining key prey species (e.g. terrestrial grassland birds such as quail, button-quail, pipits, larks and songlarks) require ground cover and are sensitive to habitat degradation from grazing (Marchant and Higgins 1993). [DECC online @ <a href="http://npws.nsw.gov.au/determinations/spottedharrierpd.htm">http://npws.nsw.gov.au/determinations/spottedharrierpd.htm</a>]</p> <p>Potential habitat occurs on the eastern portions of the site which contains drainage lines, as well as the cleared paddock/grassland (Vegetation Community 2). The harrier was not, however, observed or recorded vocalizing on the site during survey works. The modification of potential Spotted Harrier habitat is only a small proportion in comparison to the existing habitat in the locality which is more preferable for the species.</p>	<p>This species is considered unlikely to be significantly affected by the proposed development.</p>
<p>Red Goshawk (<i>Erythroriorchis radiatus</i>)</p>	<p>Possible</p>	<p>This raptor utilises coastal-subcoastal tall forests/woodlands, savanna traversed by forested rivers and rainforest fringes (Marchant &amp; Higgins, 1993; NPWS, 2002; NPWS, 1999). In south-east Qld, <i>Araucaria</i> vine forests and open forests are a significant component of the vegetation mosaics frequented by Red Goshawks (Czechura 1997). In north-east NSW and south-east Qld, Red Goshawks are mainly found in rugged terrain (Debus 1993; Czechura 1996) as most suitable lowland forest has been cleared or modified. In northern Australia they nest in both rugged terrain and lowland sites (Aumann &amp; Baker-Gabb 1991 in NPWS, 2002).</p> <p>The population size is difficult to estimate because the red goshawk has a very sparse and discontinuous distribution over a wide area — from the Kimberley in Western Australia across northern Australia, and down the east coast of Queensland to northern New South Wales. It is estimated there are between 100 and 200 breeding pairs in Queensland. Some researchers have suggested that the species is extinct in New South Wales, although there is evidence that some pairs do remain along the Queensland-New South Wales border (Ryan, 2006). Based on analysis during 2001, the distribution of the Red Goshawk in south-east Qld has been recorded from areas of different land tenure. Six pairs are centred in National Park lands and four pairs are recorded from either private land or other crown land (e.g. State Forests) (Stewart &amp; Hobson 2002 in NPWS, 2002).</p> <p>Nesting is restricted to tall trees within proximity of a creek, river or wetland (NPWS, 1999; NT Parks &amp; Wildlife Commission, 2002). Nests are usually built towards the outer edge of the canopy on a substantial live horizontal limb and braced against a vertical branch on the limb. Favoured nest trees are taller than 20m and species in the genera <i>Eucalyptus</i>, <i>Melaleuca</i>, <i>Corymbia</i> and, less frequently,</p>	<p>Modification of an insignificant area of potential habitat will occur.</p> <p>This species is considered unlikely to be significantly affected by the proposed development.</p>



		<p><i>Angophora</i>. Red goshawks commonly nest in the tallest and largest tree in a stand of tall trees, often directly beside but always within 1km of a permanent waterway or wetland (Ryan, 2006).</p> <p>Potential Red Goshawk habitat occurs on site in association with the eucalypt forest and the fringes of the Littoral Rainforest. As the site is less than 1km from permanent waterways and features favoured nesting trees (eucalypts, melaleucas and corymbias), potential nesting habitat is present on site (although no Red Goshawk nests were observed). It is noted that the surrounding vegetation communities and conservation networks contains similar habitat to the site's, however at a much larger scale. No Red Goshawks were observed or recorded vocalizing on site.</p>	
Little Eagle ( <i>Hieraaetus morphnoides</i> )	Possible	<p>The Little Eagle occupies habitats rich in prey within open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used (Marchant and Higgins 1993; Aumann 2001a).</p> <p>For nest sites it requires a tall living tree within a remnant patch, where pairs build a large stick nest in winter and lay in early spring. Young fledge in early summer. It eats birds, reptiles and mammals, occasionally adding large insects and carrion (Marchant and Higgins 1993; Aumann 2001b; Debus <i>et al.</i> 2007). It was formerly heavily dependent on rabbits, but following the spread of rabbit calicivirus disease, and consequent decline in rabbit numbers by 65-85% in the arid and semi-arid zones (Sharp <i>et al.</i> 2002), the eagle is increasingly dependent on native prey. Most of its former native mammalian prey species in inland NSW are extinct (terrestrial mammals of rabbit size or smaller, e.g. large rodents, bandicoots, bettongs, juvenile hare-wallabies and nailtail wallabies: Van Dyck and Strahan 2008).</p> <p>The Little Eagle is distributed throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment (Marchant and Higgins 1993). It occurs as a single population throughout NSW. The population in New Guinea is now classified as a separate species, the Papuan Booted Eagle <i>Hieraaetus weiskei</i> (Lerner and Mindell 2005).</p> <p>As the species utilises a wide variety of habitats, it is considered that the site potentially provides Little Eagle habitat. The proposal will remove only a small fraction of potential Little Eagle habitat in comparison to the locality and the surrounding conservation networks. The Little Eagle was not recorded during survey works.</p>	This species is considered unlikely to be significantly affected by the proposed development
Eastern Osprey ( <i>Pandion cristatus</i> )	Possible	<p>This species is associated with waterbased habitats including estuaries, coastal wetlands, rivers and streams. The Osprey is predominately a coastal raptor frequenting estuaries, bays, inlets, islands and rocky cliffs within all Australian states except for Tasmania and sporadically within Victoria (DEC, 2005; NPWS, 2002). It is noted however, that the species sometimes inhabits inland islands (Pizzey and Knight, 1997; Readers Digest, 2002). Within suitable environment it usually constructs a nest in an overhanging large tree or upon elevated man-made structures such as platforms or telegraph poles.</p> <p>The species preys almost exclusively on fish by usually hunting alone and traversing the water's surface for prey which it secures by swooping over the waters surface or plunging below (Readers</p>	This species is considered unlikely to be significantly affected by the proposed development.



		<p>Digest, 2002; Clancy, 2005). Studies of prey middens on Lizard Island within the Great Barrier Reef also noted that occasional Terns and crustaceans are sourced for food (Smith, 1985).</p> <p>Whilst expansive favoured habitat for the Osprey occurs in the locality (in association with the foreshore and Evans River), the species is unlikely to frequent the habitats of the site given the absence of habitat for prey species. Potential nesting habitat occurs in association with the eucalypt forest (Vegetation Community 3) which features large trees. No Ospreys or their nests were recorded on site.</p>	
Brolga ( <i>Grus rubicund</i> )	Unlikely	<p>The Brolga inhabits the large open swamplands/wetlands of coastal and subtropical coastal Australia where it may form flocks of several hundred individuals during the breeding season (Readers Digest, 2002). Studies conducted in southern NSW and Northern Victoria (Charles Sturt University, 2000) indicates that most Brolga breeding sites were large (&gt;50 ha) remnant wetlands with extensive areas of water around 30 cm deep. More than 90% of breeding sites were dominated by Canegrass (<i>Eragrostis australasica</i>, <i>E. infecunda</i>) or Spike-rushes (<i>Eleocharis</i> species), with emergent vegetation cover usually around 25% and 90 cm in height. DEC (2005) notes that the species may also forage within grassed paddocks or ploughed fields.</p> <p>While it is noted that the site contains marginal habitat for the Brolga in association with the drainage lines, the species is considered an unlikely occurrence due to its small size. More preferable habitat is known to occur in the locality in association with the conservation networks to the south and north of the site. The species was not recorded during surveying periods.</p>	This species is considered unlikely to be significantly affected by the proposed development
Pale-vented Bush-hen ( <i>Amauornis moluccana</i> )	Unlikely	<p>This species favors coastal rivers and inlets from the Clarence River, north. It prefers densely overgrown margins of permanent terrestrial freshwater wetlands such as creeks and rivers, billabongs, ponds, swamps, waterholes, dams, lakes and roadside ditches (Muranyi and Baverstock, 1996). Three Bush-hens were recorded from Swamp Mahogany Forest in areas NE of the Cobaki Broadwater in association with fauna survey works undertaken in association with the Tugan Bypass SIS (Ecopro, 2004). PB (2008) has also recorded the bush hen at Banora Point within early regrowth rainforest west of Martinelli Avenue.</p> <p>Whilst expansive favoured habitat for the Pale-vented Bush-hen occurs in the locality (in association with Evans River and wetlands associated with the surrounding conservation networks), the species is unlikely to frequent the site given the scarcity of wetland type habitat. The bush hen was not observed or recorded vocalising on the site during survey works.</p>	This species is considered unlikely to be significantly affected by the proposed development
Bush Stone-curlew ( <i>Burhinus gallarius</i> )	Possible	<p>In NSW, Bush Stone-curlews occur in lowland grassy woodland and open forest. Habitat is described by broad ground and understorey structural features and is not necessarily associated with any particular vegetation communities. In general, habitat occurs in open woodlands with few, if any, shrubs, and short, sparse grasses of less than 15cm in height, with scattered fallen timber, leaf litter and bare ground present. In coastal areas, structurally similar elements of tidal and estuarine communities provide suitable habitat, for example Bush Stone curlews are recorded within Casuarina woodlands, saltmarsh and mangroves (Price 2004). The important structural elements of Bush</p>	<p>Modification of an insignificant area of potential habitat will occur.</p> <p>This species is considered unlikely to be significantly affected by</p>



		<p>Stone-curlew habitat appear to be:</p> <ul style="list-style-type: none"> <li>○ a low sparse ground cover</li> <li>○ some fallen timber and leaf litter</li> <li>○ a general lack of a shrubby understorey</li> <li>○ open woodlands (DECC, 2006: 8)</li> </ul> <p>Foraging however, has been noted to occur over a broader spectrum of habitats including paddocks, grasslands, domestic areas (gardens, sports fields, [golf courses, residential areas pers. obs] etc), estuarine areas (mudflats, saltmarsh, mangrove forest, swamp oak, melaleuca forest) (NPWS, 1999; 2006).</p> <p>The Bush Stone-curlew nests on the ground, near dead timber, usually under trees within open woodlands that have an understorey of short grass or among brushwood (Wilson 1989 in NPWS, 1999). The nest site is typically in or near the edge of open grassy woodland or within a cleared paddock where there is good visibility across the surrounding lands (Johnson and Baker-Gabb 1994 in DECC, 2006). In modified environments the species is also noted to nest within various areas where they are protected from dogs and cats (i.e. golf courses, garden beds, shade houses etc pers. obs.).</p> <p>As the species utilises a wide variety of habitats (including modified residential areas) it is considered that the site potentially provides Bush Stone-curlew habitat. The proposal will remove only a small fraction of potential Bush Stone-curlew habitat in comparison to the locality and the surrounding conservation networks. The Bush Stone-curlew was not recorded during survey works.</p>	the proposed development
Beach Stone-curlew ( <i>Esacus magnirostris</i> )	Unlikely	<p>This species is distributed throughout coastal western, northern and eastern Australia from Norwest Cape to the Manning River (Readers Digest, 2002). Within this area it utilised open beaches, islands, reefs and sand/mudflats (NPWS, 2005; 1999; 2002) where it forages on crabs and other hard shelled marine invertebrates (Readers Digest, 2002).</p> <p>Suitable habitat for the Beach Stone-curlew is considered to be absent from the site. The species was not recorded during survey events.</p>	This species is considered unlikely to be significantly affected by the proposed development
Comb-crested Jacana ( <i>Irediparra gallinacean</i> )	Unlikely	<p>This species inhabits permanent wetlands with a good surface cover of floating vegetation, especially water-lilies It occurs throughout coastal Australia and well inland in the north from the Kimberley to Sydney (DEC, 2005).</p> <p>While it is noted that the site contains marginal habitat for the Comb-crested Jacana in association with the drainage lines, the species is considered an unlikely occurrence due to its small size and lack of dense floating vegetation. More preferable habitat is known to occur in the locality in association with the conservation networks to the south and north of the site. The species was not recorded during surveying periods.</p>	This species is considered unlikely to be significantly affected by the proposed development



<p>Glossy Black-Cockatoo (<i>Calyptorhynchus latham</i>)</p>	<p>Possible</p>	<p>Glossy Black Cockatoos are uncommon parrots found in scattered localities in the forests and woodlands of eastern Australia and Kangaroo Island (Forshaw, 1981). The eastern subspecies of Glossy Black Cockatoos seems thinly distributed through its range with the highest densities occurring in south-eastern Queensland and north-eastern New South Wales (Forshaw, 1989). The main habitat of the eastern subspecies is <i>Eucalyptus</i> woodlands and forest with moderate-high densities of <i>Allocasuarina</i> which are required for feeding (Clout, 1989; Park &amp; Borsboom, 1996; Forshaw &amp; Cooper, 1989; Crome &amp; Shields, 1992; Cleland &amp; Sims, 1968; Garnett, 1992b; Blakers <i>et al</i>, 1984). Suitable senescent trees (large hollow within a live or dead Eucalypt: 10-20m, Depth: 40-120cm, Entry: ~21cm; Inside Dia: ~23cm (Forshaw, 1981; Gibbons &amp; Lindenmayer, 2002)) are also required for nesting.</p> <p>No Glossy Black-Cockatoo feed trees were noted to occur on site. Potential nesting trees are present in association with the eucalypt forest (Vegetation Community 3) which contains numerous hollow-bearing trees. No hollow-bearing trees are expected to be removed for the development proposal. The species was not observed or recorded vocalising during site surveying.</p>	<p>All areas of potential habitat will be retained in association with the proposal.</p> <p>This species is considered unlikely to be significantly affected by the proposed development.</p>
<p>Little Lorikeet (<i>Glossopsitta pusilla</i>)</p>	<p>Possible</p>	<p>“The distribution of the Little Lorikeet extends from just north of Cairns, around the east coast of Australia, to Adelaide. In New South Wales Little Lorikeets are distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri (Barrett <i>et al</i>. 2003). There is no evidence of regular migration, but Little Lorikeets are generally considered to be nomadic (Higgins 1999), with irregular large or small influxes of individuals occurring at any time of year, apparently related to food availability. However, long term investigation of the breeding population on the north-western slopes indicates, that breeding birds are resident from April to December, and even during their non-resident period, they may return to the nest area for short periods if there is some tree-flowering in the vicinity (Courtney &amp; Debus 2006).</p> <p>Potential habitat occurs on site in association with the eucalypt forest (Vegetation Community 3). This vegetation community will not be impacted and will be retained for the future development. The Little Lorikeet was not recorded during fauna survey works.</p>	<p>This species is considered unlikely to be significantly affected by the proposed development</p>
<p>Eastern Ground Parrot (<i>Pezoporus wallicus wallicus</i>)</p>	<p>Possible</p>	<p>In NSW, it is widespread at several sites in the southeast, from Barren Grounds Nature Reserve through to Nadgee Nature Reserve at the Victorian border. There is also a small population in north-eastern NSW between Broadwater National Park and Yuraygir National Park (Higgins 1999).</p> <p>It occurs mostly in heathlands or sedgeland with very dense cover (projective foliage cover usually greater than 60%) (McFarland 2005, pers. comm.; Meredith 1984a), and a high density of the parrot's food plants, such as one or more seeding sedges of families <i>Cyperaceae</i> or <i>Restionaceae</i>, or a diverse array of many seeding heath-plants.</p> <p>In some parts of northern NSW it also occurs in more open heathlands. Four major habitat types are used: (1) temperate shrub heathland with high diversity of heath-plant species but structurally</p>	<p>This species is considered unlikely to be significantly affected by the proposed development</p>



		<p>dominated by a number of shrubs such as <i>Banksia</i> and <i>Casuarina</i>; (2) temperate graminoid heathland, or grass-tree plains as they're known in NSW and Victoria, containing only a few plant species and dominated by graminoid plants such as sedges and grass-trees <i>Xanthorrhoea</i> with a few shrubs; (3) subtropical graminoid heathland typically dominated by <i>X. resinosa</i> over a ground layer of sedges and some shrubs; and (4) sedgeland consisting of swampy areas supporting a few shrubs and a very high abundance of one or a few sedges (Meredith 1984a, 1984b).</p> <p>It nests on the ground, usually in a dry, well-drained site such as a low ridge, slope or slight rise and sheltered by low, dense vegetation such as sedges, rushes, ferns and shrubs including <i>Xanthorrhoea</i>, <i>Banksia</i>, <i>Empodisma</i> and <i>Leptospermum</i> (Higgins 1999; McFarland 1991b; McFarland 2005, pers. comm.).</p> <p>Potential habitat occurs for the species in association with the heath community on site (Vegetation Community 4) which contains a high diversity of heath-plant species. This vegetation community is proposed to be retained for the future development and as a result, will not be impacted. The Eastern Ground Parrot was not recorded during surveying works.</p>	
Powerful Owl ( <i>Ninox strenua</i> )	Possible	<p>This species of Owl occupies a very large (800-1000ha) permanent range within mostly wet sclerophyll forests and woodlands in southeastern Australia (NPWS, 2002; NPWS, 2005). Within this range its favoured prey include large arboreal mammals (greater glider, brushtail possum) although additional smaller prey (flying fox, sugar glider, ringtail possum, rabbit, birds) are also taken (NPWS, 1997; 2005). Kavanagh &amp; Stanton (2002) note that small (&lt;200 ha) fragments do not provide a significant reservoir for populations of large forest owl (Sooty, Powerful, Masked) species. Roosting occurs within 'groves of dense mid-canopy trees or tall shrubs in sheltered gullies, typically on wide creek flats and at the heads of minor drainage lines, but also adjacent to cliff faces and below dry waterfalls. Roosting sites are commonly among small groves of up to 2 ha of similar-sized trees with dense foliage in the height range 3-15 m. (Data from Kavanagh 1997, Kavanagh 2002b in DEC, 2005; 8).</p> <p>Nesting has been recorded in over-mature eucalypts within 100m of streams/drainage lines in large hollows (&gt;45cm dia; 100cm deep) surrounded by canopy trees and subcanopy or understory trees or tall shrubs The owl is faithful to traditional nesting hollows, but also sometimes uses alternative hollows in the nesting gully (Data from Schodde and Mason 1980, McNabb 1996, Kavanagh 1997, Kavanagh 2002b, Higgins 1999 in DEC, 2005: 8).</p> <p>Potential habitat is considered to occur in association with the eucalypt forest (Vegetation Community 3) due to its dense understory where prey species may occur and potential nesting trees (hollow-bearing trees). Due to the size of the site in comparison to neighbouring vegetation networks, it is considered that the proposal's impact will be insignificant for the species. The species was not recorded during survey works.</p>	This species is considered unlikely to be significantly affected by the proposed development
Eastern Grass Owl ( <i>Tyto longimembris</i> )	Possible	<p>This species is generally recorded within tussock-grasslands but has also been noted to occur</p>	This species is considered unlikely to be



		<p>within heathland, swamps, coastal dunes, tree-lined creeks, treeless plains, mangrove fringes, grassy gaps between trees and crops and sugar cane plantation (Garnett and Crowley 2000; Pizzey and Knight, 1997). Within these habitats it sources a wide range of prey including birds, insects and terrestrial mammals. However, it feeds predominately on rodents and its population numbers can fluctuate wildly with the rise and fall of prey populations (Olsend and Doran, 2002). The fall of primary prey species following plague events (during which owl breeding increases) can result in widespread dispersal by the Owls with starvation also noted as the forage base reduces (Debus et al, 1998).</p> <p>Potential habitat is considered to occur in association with the heath community (Vegetation Community 4) and the eucalypt forest (Vegetation Community 3) due to its dense understory where prey species may occur. Due to the size of the site in comparison to neighbouring vegetation networks, it is considered that the proposal's impact will be insignificant for the species. The species was not recorded during survey works.</p>	significantly affected by the proposed development
Masked Owl ( <i>Tyto novaehollandiae</i> )	Possible	<p>The Masked Owl lives in eucalypt forests and woodlands from the coast, where it is most abundant, to the western plains (Kavanagh 2002b in NPWS, 2005). Within suitable habitat that species occupies a range of 5-10km<sup>2</sup> where it forages mostly upon rodents and marsupials although this may be supplemented by bandicoots, arboreal mammals (Sugar Glider, Common Ringtail Possum) and some birds with introduced rodents and rabbits becoming important in disturbed environments (Debus, 1993, Kavanagh, 1996; NPWS, 2005). Habitats containing stands of large, hollow bearing eucalypts are also critical to roosting and nesting (NPWS, 2005; Kavanagh and Murray, 1996).</p> <p>Potential habitat is considered to occur in association with the eucalypt forest (Vegetation Community 3) due to its dense understory where prey species may occur and potential nesting trees (hollow-bearing trees). Due to the size of the site in comparison to neighbouring vegetation networks, it is considered that the proposal's impact will be insignificant for the species. The species was not recorded during survey works.</p>	This species is considered unlikely to be significantly affected by the proposed development
Regent Honeyeater ( <i>Anthochaera Phrygia</i> )	Possible	<p>The Regent Honeyeater is mostly recorded within box-ironbark eucalypt and riparian associations incorporating River She-oak on the inland slopes of the Great Dividing Range (Menkhorst et al, 1999; NPWS, 1999). Only three key breeding regions are known [north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region] although non-breeding flocks have been recorded in flowering coastal Swamp Mahogany and Spotted Gum forests particularly on the central coast and occasionally on the upper north coast (DEC. 2005; Menkhorst et al, 1999).</p> <p>“Since the beginning of the current recovery effort several large aggregations have been found. During May 1994, 151 birds were present at Howes Valley, NSW (Menkhorst 1997, Oliver 1998a). At the same time there were 47 at Warrumbungle National Park, giving a total known population of about 200 birds. During spring 1997 at least 400 Regent Honeyeaters were present in the Capertee Valley, NSW and, based on the proportion of colour-banded birds present, the actual population</p>	This species is considered unlikely to be significantly affected by the proposed development



		<p>may have been closer to 800 (D. Geering unpublished data). During the same breeding season population estimates for the Bundarra-Barraba region, based on the number of breeding pairs found, extrapolated across the available habitat, suggest a maximum of 520 birds (Oliver 1998b). Therefore, the total population may be close to or greater than the upper limit of 1500 suggested by Webster and Menkhorst (1992)" (online @ <a href="http://www.environment.gov.au/biodiversity/threatened/publications/recovery/regent-h-eater/index.html#section12">http://www.environment.gov.au/biodiversity/threatened/publications/recovery/regent-h-eater/index.html#section12</a>).</p> <p>Diet is mostly reliant on nectar from 16 species of Eucalypt and two species of Mistletoe although the preferred sources are three species of eucalypt; Red Ironbark, White Box and Yellow box (Webster &amp; Menkhorst 1992; NPWS, 1999; Menkhorst et al, 1999). At times of food shortage (e.g. when flowering fails in preferred habitats), Honeyeaters also use other woodland types and wet lowland coastal forest dominated by <i>Eucalyptus robusta</i> (Swamp Mahogany) or <i>E. maculata</i> (Spotted Gum) (Franklin et al. 1989b; Geering &amp; French 1998; Ley &amp; Williams 1992; Oliver et al. 1999; Webster &amp; Menkhorst 1992). They sometimes use native pine <i>Callitris</i> woodlands, usually where mixed with eucalypts. They regularly occur in remnant trees or patches of woodland in farmland, partly cleared agricultural land and riverine forest of River Sheoak, usually infested by mistletoe, and sometimes mixed with eucalypts (Franklin et al. 1989; D. Geering 2005, pers. comm.; Geering 1997; Geering &amp; French 1998; Ley et al. 1996; Ley &amp; Williams 1994; Oliver et al. 1999).</p> <p>Regent Honeyeaters usually build their nests in rough-barked trees, mostly eucalypts such as ironbarks, stringybarks or River Sheoak, or sometimes in smooth or box-barked species (e.g. Blakely's Red Gum, White Box, Yellow Box) if rough-barked trees are not available (D. Geering 2005, pers. comm.; Geering 1997; Geering &amp; French 1998; Geering &amp; Herman 1999; Ley &amp; Williams 1992, 1994; Oliver et al. 1998). Nests are often also built amongst mistletoes in trees (D. Geering 2005, pers. comm.; Geering &amp; Herman 1999; Oliver et al. 1998; Webster &amp; Menkhorst 1992).</p> <p>The site is considered to contain marginal habitat for the species (eucalypt forest species present although favoured eucalypt types are absent) which will be retained for the future development. Additionally, the surrounding conservation networks in the locality is known to feature similar eucalypt forest habitat types. Avifauna survey failed to generate any recordings of the Regent Honeyeater.</p>	
<p>Grey-crowned Babbler [eastern] (<i>Pomatostomus temporalis temporalis</i>)</p>	<p>Possible</p>	<p>'Grey-crowned Babblers occupy open woodlands dominated by mature eucalypts, with regenerating trees, tall shrubs, and an intact ground cover of grass and forbs. The species builds conspicuous dome-shaped nests and breeds co-operatively in sedentary family groups of 2-13 birds (Davidson and Robinson 1992). Grey-crowned Babblers are insectivorous and forage in leaf litter and on bark of trees. In NSW, the Grey-crowned Babbler occurs on the western slopes and plains but was less common at the higher altitudes of the tablelands. Isolated populations are known from coastal woodlands on the North Coast, in the Hunter Valley and from the South Coast near Nowra (Blakers et al. 1984, Schodde &amp; Mason 1999)' in (DEH, 2011 online @ <a href="http://www.environment.nsw.gov.au/determinations/GreycrownedBabblerVulSpListing.htm">http://www.environment.nsw.gov.au/determinations/GreycrownedBabblerVulSpListing.htm</a>). The</p>	<p>This species is considered unlikely to be significantly affected by the proposed development</p>



		<p>extended family groups of babblers are essential for the cooperative raising of young and avoidance of predators (King, 1980; Blackmore and Heinsohn, 2007).</p> <p>Potential habitat occurs for the Grey-crowned Babbler in association with the eucalypt forest (Vegetation Community 3). This community is expected to be retained in association with the future development. The species was not recorded during survey works.</p>	
Barred Cuckoo-shrike ( <i>Coracina lineata</i> )	Possible	<p>This species has been recorded from a variety of habitats including rainforest, eucalypt forests and woodlands, clearings in secondary growth, swamp woodlands and timber along watercourses within Coastal NSW (NPWS, 2002). Foraging requirements include fruiting tree species within in rainforest, wet sclerophyll forest, vegetation remnants or isolated trees (DEC, 2005) and insects captured among foliage (NPWS, 2002).</p> <p>All forested areas of the site is considered potential habitat for the Barred Cuckoo-shrike. The modification of potential Barred Cuckoo-shrike habitat is only a small proportion in comparison to the existing habitat in the locality. The species was not recorded during survey works of the site.</p>	<p>Modification of an insignificant area of potential habitat will occur.</p> <p>This species is considered unlikely to be significantly affected by the proposed development</p>
White-eared Monarch ( <i>Carterornis leucotis</i> )	Possible	<p>This species generally occurs within Coastal/Subtropical/Littoral Rainforests and occasionally Eucalypt/Riparian Forest, Mangroves and Swamp Sclerophyll with mesomorphic understorey along the eastern coast of Australia from Cape York to the Tweed River (Readers Digest, 2002; DEC, 2005). In NSW, White-eared Monarchs occurs in rainforest, especially drier types, such as littoral rainforest, as well as wet and dry sclerophyll forests, swamp forest and regrowth forest.</p> <ul style="list-style-type: none"> <li>• They appear to prefer the ecotone between rainforest and other open vegetation types or the edges of rainforest, such as along roads.</li> <li>• They are highly active when foraging, characteristically sallying, hovering and fluttering around the outer foliage of rainforest trees. They are usually observed high in the canopy or subcanopy             <ul style="list-style-type: none"> <li>• They eat insects, but their diet is not well studied</li> </ul> </li> <li>• They breed from about September to March, usually nesting high in the canopy, and often at the edge of patches of rainforest. (DEH, 2012 online@ <a href="http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10540">http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10540</a>)</li> </ul> <p>Potential White-eared Monarch foraging and nesting habitat occurs on site in association with the Littoral Rainforest (Vegetation Community 1) and the eucalypt forest (Vegetation Community 3). These communities are proposed to be retained for the future development and will not be modified. In addition, similar habitat at a much larger scale is known to occur within the locality. The species was not recorded during survey works.</p>	<p>This species is considered unlikely to be significantly affected by the proposed development</p>



<p>Spotted-tailed Quoll (<i>Dasyurus maculatus</i>)</p>	<p>Possible</p>	<p>The species has been recorded from a wide range of habitats such as rainforest, open forest, woodland, coastal heathland, and inland riparian forest (Edgar and Belcher, 2002; Forest Practices Board, 2002). Additional habitat requirements include suitable den sites (such as hollow logs, tree hollows, rock outcrops or caves) and an abundance of food (such as birds and small mammals) (NSWNPWS, 1999; Edgar &amp; Belcher, 2001; Belcher, 2000; Jones &amp; Ross, 1996). Habitat range for males has been estimated to be as large as 2000-2200 hectares per individual, while for females, which are more protective of their dens, this value is considerably less at between 700-850 hectares per individual (Belcher, 2000; NPWS, 1999). In addition Quolls are known to frequently swap dens and disperse large distances on any one night. A radio-tracking survey performed by Andrew (2005) noted that quolls generally moved to a new den each day and 90% of stays for females and 76% of stays for males were for a single day. Population density is therefore naturally quite low and has been estimated at 1 individual per 3 km<sup>2</sup> even within optimal 'core' habitat (Jones &amp; Rose, 1996).</p> <p>Whilst potential habitat is present in the form of the eucalypt forest, heathland and rainforests, rocky outcrops/caves providing potential denning were not encountered on site. Several hollow fallen logs are present within the eucalypt forest and littoral rainforest which were searched diurnally with high powered torches with no quolls encountered. Similarly, no quolls were encountered during nocturnal searches. As the quolls is identified as occurring within the locality (Atlas database records community wildlife survey) its traversal of the study area cannot be discounted due to typically large occupied ranges and high daily dispersal potential. Notwithstanding, the proposal will not modify these communities.</p>	<p>This species is considered unlikely to be significantly affected by the proposed development</p>
<p>Brush-tailed Phascogale (<i>Phascogale tapoatafa</i>)</p>	<p>Possible</p>	<p>This species favours dry open eucalypt forest with a sparse groundcover (NPSW, 1999). Studies indicate that home range sizes of animals are very large (females 20-70ha exclusive of other females; males up to 100ha+ overlapping with other males and females) and subsequently individuals occur at low densities within suitable habitat (Soderquist in Strahan eds, 2002; NPWS, 1999; Soderquist et al, 2001; Rhind &amp; Bradely, 2002). Despite male and female ranges overlapping both sexes are predominately solitary (Cuttle, 1982; Soderquist &amp; Ealey, 1994) excluding during the breeding season. Following the annual breeding season all males die with the phascogale being the largest recorded animal to suffer from male semelparity (Scarff et al, 1998; Soderquist et al, 2001; Rhind &amp; Bradley, 2002).</p> <p>Within their home range individuals require multiple, large hollow bearing trees (DBH &gt;80cm) in which to nest (Soderquist et al, 2001; Gibbons &amp; Lindenmayer, 2002). The diet of the species consists mainly of arthropods, such as spiders and centipedes, as well as small invertebrates including cockroaches, beetles and bull ants (Cuttle 1982; Scarff et al, 1998). Phascogales will also forage on the ground and eucalypt nectar is extensively utilised when trees are flowering (Traill and Coates 1993; Scarff et al, 1998).</p> <p>Potential habitat occurs for the species in association with the eucalypt forest (Vegetation Community 3). It is noted that similar habitat occurs within the locality and nearby conservation networks.</p>	<p>This species is considered unlikely to be significantly affected by the proposed development</p>



		Notwithstanding, the favoured eucalypt forest will be retained for the proposed development and therefore, wont significantly impact the Brush-tailed Phascogale. Fauna survey works did not record the species on site.	
Common Planigale ( <i>Planigale maculate</i> )	Possible	<p>This species is known to 'inhabit a broad range of habitats incorporating a dense ground cover layer including rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas (Redhead in Strahan, 2002; Lewis, 2005). In northern NSW, it has been suggested that their distribution often corresponds with the low lying flat and undulating areas of the coastal plains often near intensively settled areas (Gilmore and Parnaby 1994 in Lewis, 2005).</p> <p><i>Planigale maculata</i> is an unspecialised predator foraging mainly on insects, other invertebrates, small vertebrates, and occasionally nectar (Callaghan <i>et al.</i> 2005 and references therein). <i>Planigale maculata</i> is generally most active from slightly before dusk to before sunrise, interspersed with rest periods and periods of high activity, and is capable of eating the equivalent of its own body weight in food daily (Van Dyck 1979). In contrast, Van Dyck (1979) also notes that <i>P. maculata</i> has the ability to enter torpor in response to cold weather or food deprivation. Introduced predators of <i>P. maculata</i> include cats (Redhead 1995) and dogs (Fleay 1981) with foxes also considered likely predators (Callaghan <i>et al.</i> 2005). There is currently little movement data available for <i>P. maculata</i> although other members of this genus are widely recognised as having a shifting home range in response to local climatic conditions and food resources (Denny 1982; Read, 1982; 1988; and Miller 1998; in Lewis 2004)' (and in Hannah, 2007: 5)</p> <p>A small population of the species has been recently recorded on the northern banks of the Cobaki Broadwater in association with Swamp Mahogany/Brushbox Forest (Ecopro, 2004; Lewis Ecological Surveys, 2004). A population of Planigales is also known further south of the site within the Koala Beach development where the species has been recorded within Brushbox Forest, Tall Eucalypt dominated Wet Sclerophyll Forest, Swamp Forest, Regrowth Eucalypt Forest and utilising artificial habitats within recorded habitats (AKF, 2005; TSC, 2007). Habitat features that appear most important to the local Planigale population include:</p> <ul style="list-style-type: none"> <li>i) Dense or scattered tree canopy-cover;</li> <li>ii) Dense ground-cover vegetation; and</li> <li>iii) Areas within or adjacent to low-lying sites subject to seasonally wet conditions, with occasional inundation for short periods (AKF, 2005: 7)</li> </ul> <p>As the Common Planigale is known to occur in a wide variety of habitat types, the entire site possesses potential habitat for the species. The proposal will remove only a small fraction (21.3ha) of potential Common Planigale habitat which is insignificant in comparison to the locality and surrounding conservation networks (Bundjaluing National Park and Broadwater National Park</p>	<p>Modification of an insignificant area of potential habitat will occur.</p> <p>This species is considered unlikely to be significantly affected by the proposed development</p>



		combine in over 20,000ha of protected habitat). The Common Planigale was not recorded during fauna survey works.											
Koala ( <i>Phascolarctos cinereus</i> )	Recorded	<p>This species primarily occurs within Eucalypt Forest and Woodlands containing a suitable density of favoured food trees within coastal eastern and southeastern Australia. Preferred habitat generally contains a high percentage of primary food trees although underlying geology and soil type can be an important factor. Eucalypt Forests associated with drainage lines and floodplains of richer soil types (i.e. moisture and nutrients) can also be favoured due to feed trees containing higher levels of nutrients and less potential for toxicity (Hindell &amp; Lee, 1990; Moore &amp; Foley, 2000).</p> <p>Within SEQLD six primary foraging trees were identified by Pahl (1993); Tallowwood (<i>Eucalyptus microcorys</i>), Blue Gum (<i>E. tereticornis</i>), Scribbly Gum (<i>E. racemosa</i>), Grey Gum (<i>E. propinqua</i>), Red Mahogany (<i>E. resinifera</i>) and White Stringybark (<i>E. tindaliae</i>). Further research undertaken by Phillips &amp; Callaghan (1996) in Tweed Shire indicates that Swamp Mahogany (<i>E. robusta</i>) and Blue Gum (<i>E. tereticornis</i>) [including hybrids of the two] on alluvial deposits and Quaternary and Neranleigh-Fernvale Group geomorphologies were considered to be primary habitats. Areas with sub-dominance of these species on Neranleigh-Fernvale alliances supporting Blue Gum (<i>E. tereticornis</i>), Tallowwood (<i>E. microcorys</i>) and/or Grey Gum (<i>E. propinqua</i>) comprise secondary habitat or primary habitat depending on the density of the latter two species. Phillips &amp; Callaghan (1998) also noted Tallowwood to be a primary browse species and two types of Grey Gum (<i>E. propinqua</i>, <i>E. biturbinata</i>) to be secondary browse species in Currumbin.</p> <p>Recent studies (Biolink, 2007) indicate that <i>Eucalyptus tereticornis</i>, <i>E. microcorys</i> and <i>E. propinqua</i>/<i>E. biturbinata</i> are the most preferred koala food trees throughout the Gold Coast LGA. Within the Tweed Coast Swamp Mahogany <i>Eucalyptus robusta</i> and Forest Red Gum <i>E. tereticornis</i> are the most preferred tree species with Tallowwood <i>E. microcorys</i> and Grey Gum <i>E. propinqua</i> being the next most preferred (Biolink, 2011).</p> <p>Within utilized Eucalypt Forest habitat the koala spends most of its time in distinct home-ranges which may overlap if available habitat area is reduced. Males are territorial but a dominance-hierarchy exists and they may attack during the summer breeding season. Home ranges of the species are considered to be large and can vary dependent upon habitat quality and extent. Studies have shown various home range sizes exist with the males usually larger than the female (Male 135ha, Female: 110ha [Ellis et al, 2002], Male: 34.4ha, Female: 15ha [White, 1999]).</p> <p>A review of a number of published scientific reports notes that Koala density generally ranges between 0.02 and 1.26 animals per hectare. Densities are considered to vary dependent upon habitat quality, size, connectivity, presence of impediments to movement (stock fences, dogs, roads etc).</p>	Recorded  7-part test performed										
		<table border="1"> <thead> <tr> <th>Source</th> <th>Study Location</th> <th>Habitat Type</th> <th>Additional Comments</th> <th>Koala/ha</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Source	Study Location	Habitat Type	Additional Comments	Koala/ha						
Source	Study Location	Habitat Type	Additional Comments	Koala/ha									



		Dique et al, 2003	Southeast QLD Pine Rivers Shire	Tall shrubby open forest (Tertiary surfaces) and Tall open forest upon metamorphics	Stratified by two habitat descriptions  'urban' and 'bushland'	0-0.76	
		Dique et al, 2004	Southeast QLD Koala Coast ~375sqm of Redland, Logan and Brisbane City shires	Eucalypt Forests. Predominately RE  12.9-10.4 & 12.11.5	Study stratified by habitat descriptions: 'urban', 'remnant bushland', 'bushland' and 'other'. Remnant and bushland areas further stratified by proximity to the centre of the study area (high density=close to centre, low density=further away)	Range 0.02-1.26 Urban: 0.17 +/- 0.013 High remnant: 0.70 +/- 0.023 Low remnant: 0.20 +/- 0.014 High bushland: 0.30+/-0.006 Low bushland: 0.11 +/-0.007 Other: 0	
		White and Kunst 1990	Southeast QLD Sheldon	Eucalypt Forest		0.4 (0.3-0.46)	
		Sullivan et a 2004	Southwest QLD	Eucalypt Forest/woodland within the mulgalands	Habitat stratified by floristics and landzone.	0.0007-2.513	
		Biolink 2007	Coomabah Koala Habitat Area	Mapped gold coast city vegetation (per Ryan et al, 2003) filtered to exclude communities not containing eucalypts	Spot assessment technique for koala faecal pellets. Not based upon koala observation transects per <i>Dique, 2003</i> ;  <i>EPA, 2005.</i>	0.22+/-0.04	
		Biolink 2007	Coomera-Pimpama Koala Habitat Area	Mapped gold coast city vegetation (per Ryan et al, 2003) filtered to exclude communities not containing eucalypts	Spot assessment technique for koala faecal pellets. Not based upon koala observation transects per <i>Dique, 2003</i> ;	0.23+/-0.03	



		<p style="text-align: right;"><i>EPA, 2005.</i></p> <p>While no traces of koalas occurred within the development footprint, numerous smooth barked eucalypts within the eucalypt forest contained koala scratches, although no koalas were observed. No koalas responded to the amplified call playback for the species. It is expected that the proposal will not impact the species as the eucalypt forest will be retained for the future development. Additionally, the locality provides thousands of hectares of koala habitat.</p>	
Yellow-bellied Glider ( <i>Petaurus australis</i> )	Possible	<p>The southern species of yellow bellied glider favours tall open eucalypt forests containing sufficient resources of hollow bearing trees generally in areas with high rainfall and nutrient rich soils (DECC, 2005: NPWS, 2003; Goldingay, 2008). This species of glider is an exudivore that forages predominately upon phloem from eucalypts and acacias, nectar and pollen, invertebrates and honeydew and manna. Phloem sap is obtained by gliders incising into the bark in a v-shale and licking the exudates the pools at the bottom of the V (Brown, 2006; DECC, 2005; Lindenmayer, 2003).</p> <p>Home ranges of the glider are very large (20-85ha) with high numbers (up to 19) of den trees utilized by pairs and small social groups within a range (Lindenmayer, 2003; Hume, 2004; Brown, 2006). Modeled population viability analysis undertaken by Goldingay and Possingham (1995) indicate that 9750ha of appropriate forest habitat would be necessary to support a minimum viable population size of 150 gliders assuming all habitat is occupied. When assuming that proportions of the habitat is occupied (28-54%) this necessary habitat size increases to between 18000ha and 35000ha (Goldingay and Possingham, 1995).</p> <p>Potential Yellow-bellied Glider habitat occurs in the form of the western eucalypt forest which contains numerous hollow-bearing trees. As the Brush-tailed Possum and Squirrel Glider were recorded on site, the Yellow-bellied Glider (which utilises similar habitats) is likely to also occur. Potential foraging materials also occur within the acacia regrowth portion of the site (Vegetation Community 2), although it's unlikely the species would occur there as the eucalypt forest contains similar species of acacias. The removal of 7.2ha (Acacia regrowth section) is only a small proportion of habitat in comparison to the surrounding environment. The Yellow-bellied Glider was not recorded during fauna survey works.</p>	<p>Modification of an insignificant area of potential habitat will occur.</p> <p>This species is considered unlikely to be significantly affected by the proposed development</p>
Squirrel Glider ( <i>Petaurus norfolcensis</i> )	Recorded	<p>This species of Glider is associated with dry sclerophyll forest and woodlands although in northern NSW and Qld it has been recorded from wet sclerophyll environments (Suckling in Strahan eds, 2002; Lindenmayer 2002). It is considered to be most abundant in associations containing winter flowering Eucalypts and/or environments with a high abundance of Acacia, Banksia species in the lower layers (Smith &amp; Murray, 2003; Menkhorst et al, 1998; Quinn, 1995).</p> <p>Within the canopy of the preferred habitat numerous trees bearing hollows are critical habitat values required to support populations of the species (Quinn, 1995; Smith &amp; Murray, 2003; Lindenmayer, 2002). Gliders are known to regularly swap den trees and utilise a number of such dens (between 6</p>	Recorded. 7-part test performed



		<p>and 19 den trees per Glider) within their home range (van der Ree, 2000). These results are supported by survey work undertaken by Southern Cross University (June/July 2002) which indicated that 12 radio tracked gliders utilised 37 den trees incorporating live hollow bearing trees and stags (Cited in Warren, 2004).</p> <p>Favoured Squirrel Glider habitat occurs on site in association with the eucalypt forest occurring on the western portions of the site. Spotlighting events recorded two individuals occurring within the eucalypt forest community. It is expected that the proposal will not impact the species as the eucalypt forest will be retained for the future development. Additionally, the locality provides thousands of hectares of Squirrel Glider habitat.</p>	
Grey-headed Flying-fox ( <i>Pteropus poliocephalus</i> )	Recorded	<p>The Grey-headed Flying-fox inhabits subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps (Eby, 1995). Urban gardens and cultivated fruit crops also provide habitat for this species (NSW NPWS 1999c). Grey-headed Flying-foxes forage on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca, Banksia (Eby, 2000) and fruits of rainforest trees and vines (NSW NPWS 1999c). During periods when native food is limited, Grey-headed Flying-foxes disperse from colonial roosts, often foraging in cultivated gardens and fruit crops (NSW NPWS 1999c). This species roosts in large aggregations or camps in close proximity (20 km or less) to a regular food source, often in stands of riparian rainforest, Paperbark or Casuarina forest (Eby, 1995). This species is a canopy-feeding frugivore, blossom-eater and nectarivore of rainforests, open forests, woodlands, Melaleuca swamps and Banksia woodlands. As such, it plays an important ecosystem function by providing a means of seed dispersal and pollination for many indigenous tree species (Eby 1996; Pallin 2000).</p> <p>Potential feed trees are present on site in association with Eucalypts, Melaleucas and Banksias and are considered a likely occurrence during flowering and fruiting periods. This species was well known from the locality and is known to roost within the Littoral Rainforest adjacent to the Silver Sand Caravan Park at Evans Head. An individual was recorded foraging on a Melaleuca within the Heath Community during spotlighting surveying of the site. A large number of individuals were also recorded flying above the sight.</p>	Recorded. 7-part test performed
Common Blossom-bat ( <i>Syconycteris australis</i> )	Possible	<p>This species is one of the smallest members of the flying fox family (Pteropodidae) and is considered to be a specialist pollen feeder favouring Banksia, Melaleuca, Callistemon and certain species of Eucalypt (Strahan eds, 2002). Required habitats include Coastal rainforest, heathlands and Melaleuca swamps. Roosting is noted to occur in Littoral Rainforest with foraging occurring in proximate heathland and melaleuca forest primarily on the flowers of Banksia integrifolia (Law, 1993; 1994; 1996)</p> <p>Potential habitat occurs on site for the species as favoured foraging trees are present (Banksia, Melaleuca, Callistemon and Eucalypts). These species of trees are not restricted to the subject site and are known to occur in abundance within the locality and surrounding conservation networks.</p>	<p>Modification of an insignificant area of potential habitat will occur.</p> <p>This species is considered unlikely to be significantly affected by the proposed development</p>



		Potential roosting habitat occurs on site in association with the Littoral Rainforest, however no individuals were observed during diurnal and nocturnal survey works. The removal of Vegetation Community 2 for the proposal will not significantly impact the species as preferred feed trees are scarce within this community, The Common Blossom-bat was not recorded during fauna survey works of the site.	
Yellow-bellied Sheathtail-bat ( <i>Saccolaimus flaviventris</i> )	Possible	<p>This species of bats utilises most habitats across its wide distribution and hunts over the canopy in forested areas and lower within mallee or open country (DECC, 2005). Roosting may occur within hollow trees and buildings and also within caves and derelict mines (NPWS, 2004; Richards in Van Dyck and Strahan, 2008). DECC (2005) notes that in treeless areas the sheathtail bat is known to utilise mammal burrows.</p> <p>As the species utilises most habitats, the entire site possesses potential Yellow-bellied Sheathtail-bat habitats. Potential roosting habitat also occurs within the eucalypt forest with the abundance of hollow-bearing trees. As the sheithtail-bat is known to utilise a wide variety of habitats, and the proposal will remove only a small portion of habitat in comparison to the locality, no significant impact is expected on the species. The species was not recorded during survey works.</p>	<p>Modification of an insignificant area of potential habitat will occur.</p> <p>This species is considered unlikely to be significantly affected by the proposed development</p>
Large-eared Pied Bat ( <i>Chalinolobus dwyeri</i> )	Possible	<p>The Large-eared Pied Bat occurs within drier habitats, including dry sclerophyll forests and woodlands (Hoye and Schulz in Van Dyck and Strahan, 2008) although it has been recorded within a range of habitats, including wet and dry sclerophyll forest, Cyprus pine dominated forest, tall open eucalypt forest with a rainforest sub-canopy, sub-alpine woodland, but typically in association with sandstone relief. In south-eastern Queensland it has been noted primarily within higher altitude moist tall open forest adjacent to rainforest (Schulz et al. 1999) including Main Range National Park and land west of Mt Barney (Hoye 2005).</p> <p>'Little is known about the habitat and roosting requirements of the Large-eared Pied Bat, but natural roosts may depend heavily on sandstone outcrops. It has been found roosting in disused mine shafts, caves, overhangs and disused Fairy Martin (<i>Hirundo ariel</i>) nests for shelter and to raise young (Hoye &amp; Dwyer 1995; Schulz 1998). It also possibly roosts in the hollows of trees (Duncan et al. 1999).' [in DEWHA, 2009 online @ <a href="http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=183">http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=183</a>.]</p> <p>Similarly to the Yellow-bellied Sheithtail-bat, the Large-eared Pied Bat is known to utilise a wide variety of habitat types. As the proposal will remove a small portion of potential habitat (Vegetation Community 2) in comparison to the available habitat in the surrounding environment, no significant impact is expected to occur for the species. The Large-eared Pied Bat was not recorded during survey works of the site.</p>	<p>Modification of an insignificant area of potential habitat will occur.</p> <p>This species is considered unlikely to be significantly affected by the proposed development</p>
Hoary Wattled Bat ( <i>Chalinolobus nigrogriseus</i> )	Recorded	In NSW the Hoary Wattled Bat occurs in dry open eucalypt forests, favouring forests dominated by Spotted Gum, boxes and ironbarks, and heathy coastal forests where Red Bloodwood and Scribbly Gum are common. Because it flies fast below the canopy level, forests with naturally sparse understorey layers may provide the best habitat (DEH, 2012 online @ <a href="http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10158">http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10158</a> ). This species is a	Recorded. 7-part test performed



		<p>continuous flight forager that primarily searches for a variety of insects close above the canopy and within openings in forested habitat (Fenton 1982, Allison 1995, Churchill 1998). It also forages over open ground adjacent to forested habitat (McKenzie and Rolfe 1986). The presence of insects, such as wingless ants, in scats suggests that some gleaning off foliage and other surfaces occurs (Vestjens and Hall 1977, Allison 1995) in Lumsden et al, 2005: 131). Roosting has been recorded in tree hollows and rock crevices (Kutt et al in Van Dyck and Strahn, 2008).</p> <p>Potential Hoary Wattled Bat habitat occurs in association with the eucalypt forest and the open ground adjacent to the forest. Potential roosting habitat is also available on site in association with the hollow-bearing trees occurring within the eucalypt forest, although none were recorded utilising any. This species was recorded via anabat within the heathland community (Vegetation Community 4). A 7-part test was performed for this species.</p>	
<p>Little Bentwing-bat (<i>Miniopterus australis</i>)</p>	Recorded	<p>This species utilises well-timbered habitats including rainforest, <i>Melaleuca</i> swamps and dry sclerophyll forests where it feeds on insects within the canopy and requires caves, mines, stormwater drains and/or tree hollows to roost (Strahan eds, 2002). DECC (2005) note the following additional particulars with regard to the little bentwing bat:</p> <ul style="list-style-type: none"> <li>• Maternity colonies form in spring. Males and juveniles disperse in summer.</li> <li>• Only five nursery sites /maternity colonies are known in Australia.</li> <li>• Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas.</li> <li>• Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.</li> <li>• They often share roosting sites with the Common Bentwing-bat and, in winter, the two species may form mixed clusters.</li> <li>• In NSW the largest maternity colony is in close association with a large maternity colony of Common Bentwing-bats (<i>M. schreibersii</i>) and appears to depend on the large colony to provide the high temperatures needed to rear its young.</li> </ul> <p>The entire site provides potential Little Bentwing-bat habitat with the exception of the cleared areas (Vegetation Community 2). Potential roosting habitat also occurs in association with hollow-bearing trees occurring within the eucalypt forest. This species was recorded via anabat within the heathland community (Vegetation Community 4). A 7-part test was performed for this species.</p>	Recorded. 7-part test performed
<p>Southern Myotis (<i>Myotis macropus</i>)</p>	Recorded	<p>The Myotis roosts within caves, tunnels, hollow-bearing trees, bridges, buildings and dense tree foliage always in close proximity to permanent water (NPWS, 2002; Richards, 2002). It forages over waterbodies where it scoops insects and small fish from the water surface or catches</p>	Recorded. 7-part test performed



		<p>insects aerially (DEH, 2005; Menkhorst, 1996; Richards, 2002). It has been recorded foraging over small creeks, coastal rivers, estuaries, lakes and inland rivers (Law &amp; Anderson, 1999) and other smaller waterbodies including farm dams (Law et al, 1998).</p> <p>Potential foraging habitat occurs on site in association with the drainage lines within the eastern portion of the site. More suitable and larger foraging habitats occurs within the locality in association with Evans River and the surrounding wetlands and creeklines. Potential roosting habitat also occurs for the species in association with the hollow-bearing trees occurring within the eucalypt forest in the west sections of the site. The site also comprises of dense tree foliage which may provide a roosting habitat for the species. The species was recorded on site via anabat. A 7-part test was conducted on the species.</p>	
Eastern Long-eared Bat ( <i>Nyctophilus bifax</i> )	Possible	<p>This species of bat inhabits lowland subtropical rainforest and wet and swamp eucalypt forest, extending into adjacent moist eucalypt forest with coastal rainforest and patches of coastal scrub particularly favoured (DEC, 2005; NPWS, 2002). Roosting occurs within tree-hollows, under bark and/or palm fronds and within dense foliage with a seasonal shift in roost sites from rainforest edges (summer) to the rainforest interior (winter) (NPWS, 2002; Parnaby in Strahan, 2002; Lunney et al, 1995). Churchill (2008) notes that northern NSW the species is restricted to rainforest.</p> <p>Potential habitat occurs for the Eastern Long-eared Bat in the form of eucalypt forest, littoral rainforest and heathland. Potential roosting trees also occur on site in association with hollow-bearing trees located within the eucalypt forest. Given the small size of the development footprint in comparison to the surrounding vegetation communities and conservation networks, the proposal will not significantly impact the species. The species was not recorded on site during fauna survey works.</p>	This species is considered unlikely to be significantly affected by the proposed development
Greater Broad-nosed Bat ( <i>Scoteanax reuppellii</i> )	Possible	<p>This species of bat favours the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland but also extends to the coast over much of its range (DEC, 2005, Hoyer &amp; Richards in Strahan eds, 2002). Within this range it favours tall wet forest including creek/river corridors although it will also utilise a variety of other habitats such ranging from dry eucalypt woodlands to rainforest ((DEC, 2005, Hoyer &amp; Richards in Strahan eds, 2002). This species is noted to favour roosts within tree hollows although it has also been recorded within buildings (DEC, 2005, Hoyer &amp; Richards in Strahan eds, 2002). Radiotracking within Bundjalung National Park noted the species to roost exclusively within <i>Melaleuca quinquenervia</i> (Campbell, 2001).</p> <p>Marginal habitat occurs on site for the Greater Broad-nosed Bat in association with the drainage lines within the eastern portion of the site, although more suitable waterways exist within the locality in association with Evans Rivers and creeklines within the locality. Marginal habitat also occurs in association with the eucalypt forest and littoral rainforest, however the absence of permanent waterways may deter the species from these areas. Potential roosting habitat for the species</p>	This species is considered unlikely to be significantly affected by the proposed development

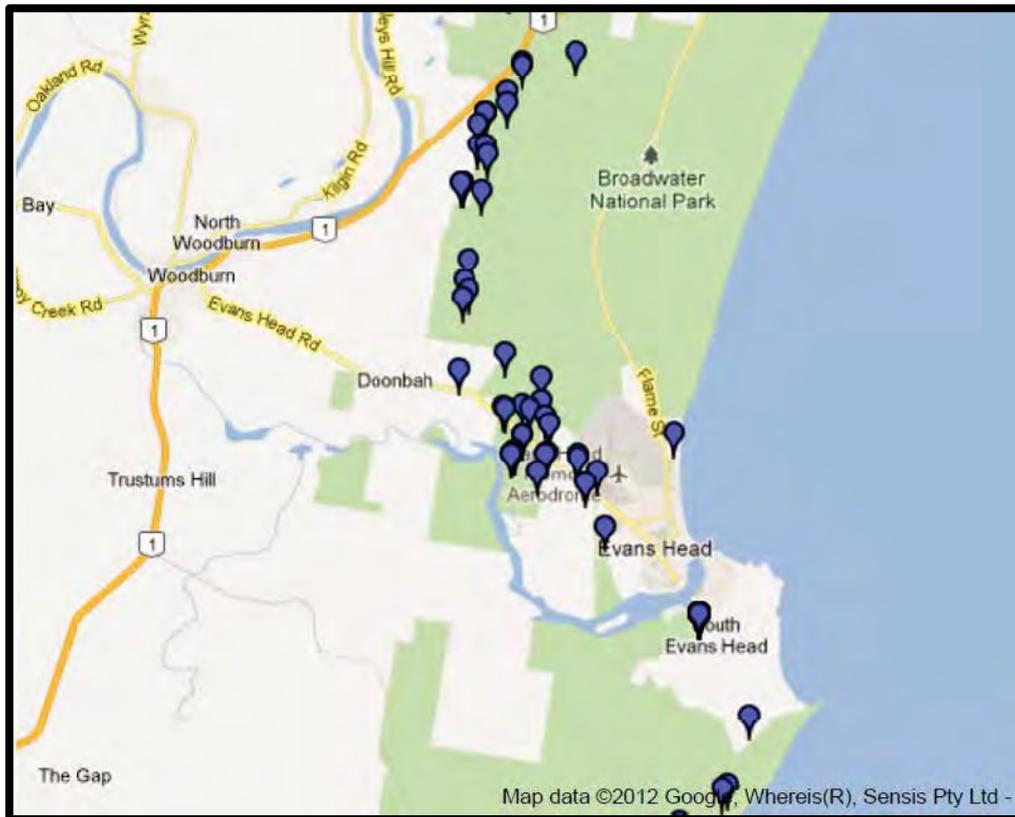


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		occurs within the heathland community (Vegetation Community 4) in association with the <i>Melaleuca quinquenervia</i> abundance occupying this community. It is noted that this community will not be impacted by the future development. The species was not recorded during fauna survey works.	
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#### 5.4 OXLEYAN PYGMY PERCH (*NANNOPERCA OXLEYANA*)

The Oxleyan Pygmy Perch is listed as Endangered under both Commonwealth's *Environment Protection and Biodiversity Act 1999* and NSW's *Fisheries Management Act 1994*.



**FIGURE 6 – I&I NSW RESEARCH RECORDS FOR OXLEYAN PYGMY PERCH AT EVANS HEAD (SOURCE: <http://www.dpi.nsw.gov.au/fisheries/species-protection/records/viewer>)**

Oxleyan Pygmy Perch are usually light brown to olive in colour (darkest on back, sides paler) and mottled, with three to four patchy, dark brown bars extending from head to tail, and a whitish belly (Department of the Environment, 2014). The gill cover (opercular) has a blue iridescence and there is a conspicuous dark round spot with an orange margin at the base of the tail. The scales have dusky margins and the fins are mainly clear. There is a blue ring around the eye (Department of the Environment, 2014). During breeding the dorsal, pelvic and anal fins darken and the lateral stripes and tail turn scarlet (Arthington & Marshall 1996; Kuitert et al. 1996; Thompson et al. 2000). They can grow to about 60 mm in length, but are more commonly around 35 mm (Allen 1989a; McDowall 1996).

The Oxleyan pygmy perch appears only to be found in the swamps, streams and dune lakes that lie in the lowland, coastal 'wallum' heaths between north-eastern NSW and south-eastern

Queensland (including Fraser, Stradbroke and Moreton islands). Their specific habitat requirements include fresh, acidic waters and abundant aquatic vegetation (NSW DPI 2005).

In northern NSW, Oxleyan Pygmy Perch have been recorded in the Woolli area from Lake Minnie Water in 1995 (Lawrence 1998), and again in 2001. Furthermore, surveys undertaken by ANGFA (Australian & New Guinea Fishes Association), and Southern Cross

University have located four additional waterbodies containing Oxleyan Pygmy Perch in the Woolli area, with a new record from Haleys Creek, near Brooms Head. An intensive survey of the Evans Head area (northern NSW) in 2000 resulted in the capture of 566 perch from 25 water bodies in and around Broadwater National Park (Knight 2000). This makes the Evans Head area one of the most important known habitats for the species (NSW DPI 2005j).

While little information exists on their tolerance to disturbance, habitat degradation or pollution (NSW DPI 2005j), Oxleyan Pygmy Perch were found within shallow artificially constructed drains in northern NSW, suggesting that they may be capable of surviving in more degraded areas (Knight 2000). However, the species is mainly restricted to unpopulated or isolated areas where human interference is absent or minimal (Leggett 1990).

The Oxleyan Pygmy Perch feeds primarily on aquatic insects and their larvae (Allen 1989a).

The reproductive biology of the Oxleyan Pygmy Perch is poorly known. It is thought that most populations spawn between October and December (Arthington & Marshall 1993; Arthington et al. 1996). Spawning is probably stimulated by rising water temperatures (NSW DPI 2005j).

Targeted surveying for the species occurred on site in association with the man-made drainage lines occurring on the eastern portions of the site. Survey works were conducted in accordance with EPBCA's *Survey Guidelines for Australia's Threatened Fishes* for trapping over two days.

The two days of trapping events resulted in no Oxleyan Pygmy Perch being trapped. Although potential habitat for the species occurs within both drainage lines, it is considered that the Oxleyan Pygmy Perch is an unlikely occurrence. I&I NSW research records for Oxleyan Pygmy Perch at Evans Head illustrates that no records occur on the subject site (Figure 6). Both drainage lines lack dense vegetation and is restricted from external waterbodies. Water is supplied to both drainage lines via the water table and varies in salinity the further away from Evans River you occur. As mentioned the drainage line along the eastern boundary is tidally influenced in the southern extents.

As previously stated, it is proposed that the drainage lines within the acacia community is to be filled.

The drainage feature in the wet heath community is not affected by the proposal. The retention of the majority of the heath communities additionally buffers preferred habitat areas to the north east.

It is considered that the proposal will not significantly impact the Oxleyan Pygmy Perch.

## 5.5 CRITICAL HABITAT

Critical habitats in the NSW which are listed under the *Threatened Species Conservation Act 1995* include:

- Bomaderry zieria (*Zieria baeuerlenii*) within the Bomaderry bushland;
- Eastern Suburbs Banksia Scrub Endangered Ecological Community;
- Wollemia nobilis (the Wollemi pine);
- Gould's Petrel;
- Little penguin population in Sydney's North Harbour; and
- Mitchell's Rainforest Snail in Stotts Island Nature Reserve

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The proposed development is unlikely to impact upon any of these declared critical habitats.

## 5.6 FAUNA CORRIDORS/LINKAGES

Wildlife corridors can be defined as 'retained and/or restored systems of (linear) habitat which, at a minimum enhance connectivity of wildlife populations and may help them overcome the main consequences of habitat fragmentation' (Wilson & Lindenmayer, 1995). Corridors can assist ecological functioning at a variety of spatial and temporal scales from daily foraging movements of individuals, to broad-scale genetic gradients across biogeographical regions (Parsons Brinkerhoff, 2005).

Corridors serve a number of different functions in terms of biodiversity conservation including:

- providing increased foraging area for wide-ranging species
- providing cover for movement between habitat patches, particularly for cover dependent species and species with poor dispersal ability and enhancing the movement of animals through sub-optimal habitats
- reducing genetic isolation by maintaining continuity between sub-populations in a metapopulation and thereby preventing and /or reversing localised extinction
- facilitating access to a mix of habitats and successional stages to those species which require them for different activities (for example, foraging or breeding)
- providing refuge from disturbances such as fire
- providing habitat in itself (Wilson, A. & Lindenmayer 1995; Lindenmayer, 1994; Bennett, 1999).

How species use the corridor network will depend largely on the home and activity ranges of the species, their habitat requirements and the ecological characteristics of the corridor. For example, some large or mobile species may make direct movements through the corridor network, moving from one patch of habitat to another. These direct movements may be on the scale of a foraging expedition or a migration (Bennett 1990b).

Other species may have movements by single individuals punctuated by pauses in the corridor, which can last anything from a small foraging or resting bout to weeks and even months. If the corridor contains sufficient resources to maintain a population, then continuity through the corridor may be through gene flow through the resident population (Bennett 1990b; Wilson, A. & Lindenmayer 1995).

For example a mobile species with a large home range (i.e. koala) may regularly traverse a corridor to move between favoured feeding grounds or in attempt to access mates, whereas a species with a comparably minor home range (i.e. antechinus) may spend its entire life within a portion of the same corridor.

Reviewing the land use of the site and surrounding locality it is considered that the residual vegetation communities/habitats are highly connected and form an expansive contiguous corridor of remnant habitat (Figure 7).

Notwithstanding, it is considered that the proposal will not introduce a new significant terrestrial fauna dispersal barrier. Existing vegetation will still remain around the entire development, allowing easy fauna movement.



FIGURE 7 – NPWS KEY CORRIDORS IN EVANS RIVER VICINITY

## 5.7 RICHMOND VALLEY LOCAL ENVIRONMENTAL PLAN 2012

### 5.7.1 TERRESTRIAL BIODIVERSITY



**FIGURE 8 – RICHMOND VALLEY LEP 2012 TERRESTRIAL BIODIVERSITY MAP**

In accordance with the Richmond Valley Local Environmental Plan 2012 maps, the entire site is mapped as containing Terrestrial Biodiversity (Figure 8). The LEP states the following for Terrestrial Biodiversity:

- (1) The objective of this clause is to maintain terrestrial biodiversity by:
  - (a) protecting native fauna and flora, and
  - (b) protecting the ecological processes necessary for their continued existence, and
  - (c) encouraging the conservation and recovery of native fauna and flora and their habitats.
- (2) This clause applies to land identified as “Biodiversity” on the Terrestrial Biodiversity Map.
- (3) Before determining a development application for development on land to which this clause applies, the consent authority must consider:
  - (a) whether the development:
    - (i) is likely to have any adverse impact on the condition, ecological value and significance of the fauna and flora on the land, and
    - (ii) is likely to have any adverse impact on the importance of the vegetation on the land to the habitat and survival of native fauna, and
    - (iii) has any potential to fragment, disturb or diminish the biodiversity structure, function and composition of the land, and
    - (iv) is likely to have any adverse impact on the habitat elements providing connectivity on the land, and
  - (b) any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.
- (4) Development consent must not be granted for development on land to which this clause applies unless the consent authority is satisfied that:

- (a) the development is designed, sited and will be managed to avoid any significant adverse environmental impact, or
- (b) if that impact cannot be reasonably avoided by adopting feasible alternatives—the development is designed, sited and will be managed to minimise that impact, or
- (c) if that impact cannot be minimised—the development will be managed to mitigate that impact.

Although the entire site has been mapped as Terrestrial Biodiversity, groundtruthing of the site identified that large portions of the site is cleared or has been previously cleared. The proposal will only directly impact areas which is, or has been previously cleared.

The environmental values of the proposed modified areas of the site represents low ecological values. The environment surrounding the site provides much higher ecological values to the area and will be retained for the development. The development will not significantly impact fauna corridors for the locality.

It is concluded that the proposed development will not create any significant adverse impact on terrestrial biodiversity in the locality.

As indicated the Wattle community is a disturbed / modified community the result of past clearing / seeding. It is not proposed to be retained and the proposal will remove all Wattle from within the development footprint. The area to be removed is 7.23ha.

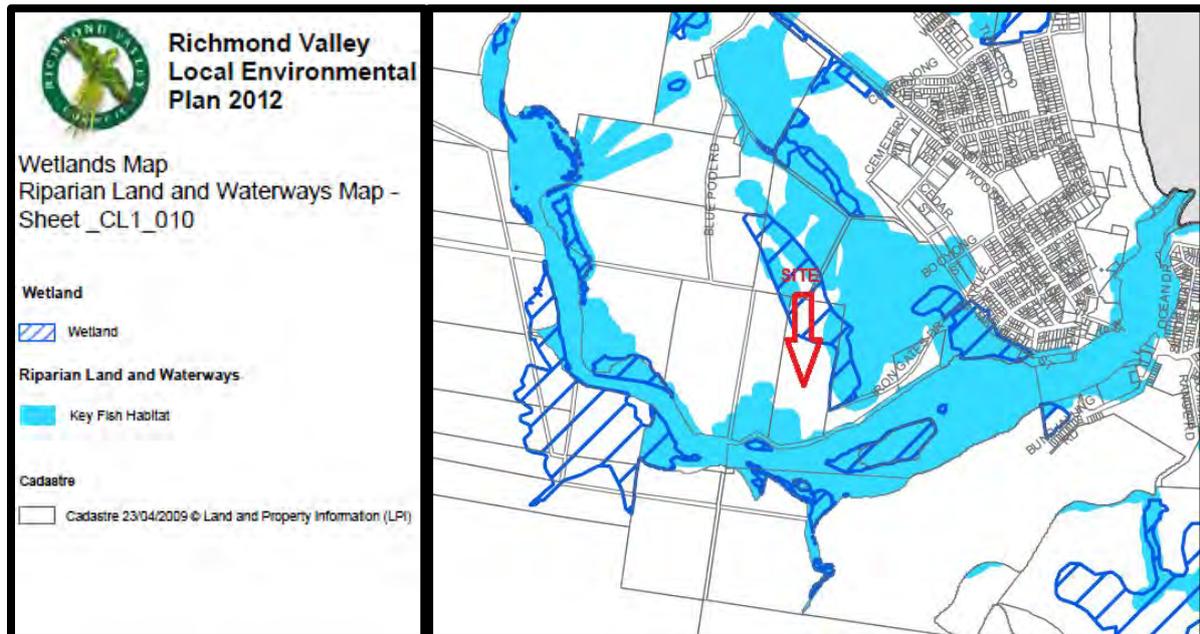
The development will remove approximately 2000m<sup>2</sup> of Open Dry Heath and 1.18ha of Open Dry Heath with mixed Eucalypt. We note this community is vulnerable but locally well conserved in the surrounding conservation network.

The development will require the removal of approximately 1200m<sup>2</sup> of Heathy Scribbly Gum for roads and an additional 400m is proposed for removal with bushfire requirements and lots.

The proposal does not remove any Littoral rainforest. As noted the road extension will necessitate minor pruning of limbs within the road reserve.

Given the minor scale of clearing and the type of vegetation to be removed it is anticipate no decrease in species diversity would be occasioned through the development.

#### 5.7.2 WETLANDS & RIPARIAN LAND AND WATERWAYS



**FIGURE 9 – RICHMOND VALLEY LEP 2012 WETLANDS & RIPARIAN LAND AND WATERWAYS MAP**

In accordance with the Richmond Valley Local Environmental Plan 2012 maps (Figure 9), small portions the site is mapped as containing Wetlands, as well as Riparian Land and Waterways. The LEP states the following for these:

### Wetlands

- (1) The objective of this clause is to ensure that wetlands are preserved and protected from the impacts of development.
- (2) This clause applies to land identified as “Wetland” on the Wetlands Map.
- (3) Before determining a development application for development on land to which this clause applies, the consent authority must consider:
  - (a) whether or not the development is likely to have any significant adverse impact on the following:
    - (i) the condition and significance of the existing native fauna and flora on the land,
    - (ii) the provision and quality of habitats on the land for indigenous and migratory species,
    - (iii) the surface and groundwater characteristics of the land, including water quality, natural water flows and salinity, and
  - (b) any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.
- (4) Development consent must not be granted for development on land to which this clause applies unless the consent authority is satisfied that:
  - (a) the development is designed, sited and will be managed to avoid any significant adverse environmental impact, or
  - (b) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or
  - (c) if that impact cannot be minimised—the development will be managed to mitigate that impact.

The above Figure notes that the site contains Wetlands in the north-eastern portions of the site. While it is acknowledged that a small portion of the developmental footprint is located in

this area, groundtruthing of the site noted that the wetland habitat is slightly further northeast than as mapped and that the developmental footprint is not associated with any natural wetlands. Although the areas immediately to the north and east of the developmental footprint contains Wetlands (Melaleuca Swampland), the proposed development will not impact these areas.

### **Riparian Land and Waterways**

- (1) The objective of this clause is to protect and maintain the following:
  - (a) water quality within watercourses,
  - (b) the stability of the bed and banks of watercourses,
  - (c) aquatic and riparian habitats,
  - (d) ecological processes within watercourses and riparian areas.
- (2) This clause applies to land identified as “Key Fish Habitat” on the Riparian Land and Waterways Map.
- (3) Before determining a development application for development on land to which this clause applies, the consent authority must consider:
  - (a) whether or not the development is likely to have any adverse impact on the following:
    - (i) the water quality and flows within the watercourse,
    - (ii) aquatic and riparian species, habitats and ecosystems of the watercourse,
    - (iii) the stability of the bed and banks of the watercourse,
    - (iv) the free passage of fish and other aquatic organisms within or along the watercourse,
    - (v) any future rehabilitation of the watercourse and its riparian areas, and
  - (b) whether or not the development is likely to increase water extraction from the watercourse, and
  - (c) any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.
- (4) Development consent must not be granted for development on land to which this clause applies unless the consent authority is satisfied that:
  - (a) the development is designed, sited and will be managed to avoid any significant adverse environmental impact, or
  - (b) if that impact cannot be avoided by adopting feasible alternatives—the development is designed, sited and will be managed to minimise that impact, or
  - (c) if that impact cannot be minimised—the development will be managed to mitigate that impact.

In accordance to the above Figure, the northeast portion of the site associated with the Heath Community is mapped as containing wetlands.

In addition, the site is mapped as containing Riparian Land and Waterways (Key Fish Habitat) in the southern and northeaster sections of the site. Groundtruthing of the site notes that it is highly unlikely that the southern portion of the site provides any Key Fish Habitat as mapped as the site is significantly elevated from the river. The site is elevated approximately 1.0m above the HAT for the river. While it is noted that the mangroves and saltmarsh located along the site’s riverfront provides Key Fish Habitat, the proposal will not impact these areas.

In relation to the Key Fish Habitat Located on the north-eastern portion of the site, it is highly unlikely that the proposal will not impact these areas as the only Riparian Land & Waterways located within the development footprint is located within the man-made drainage lines. Fish trapping of these drainage lines (in association with Oxleyan Pygmy Perch surveys) did not result in any fish being trapped. The drainage feature in the north east of the site and occurring within the mapped wetland designation is retained and buffered from development.

It is concluded that the proposed development will not create any significant adverse impact on Wetlands & Riparian Land and Waterways in the locality.

## 6.0 STATUTORY CONSIDERATIONS – THE 7-PART TEST OF SIGNIFICANCE

Further to the provisions of Schedules 1 and 2 of the *Threatened Species Conservation Act 1995*, Section 5A of the *Environmental Planning and Assessment Act 1979* (the '7-Part Test') is applied to assess any potentially adverse impacts of the site-proposal on threatened species, populations and/or communities occurring within the site or surrounding locality.

The Assessment of Significance is not a 'pass/fail' test or technique based on a scoring system. Instead, the outcome of each factor needs to be considered as to whether effects are likely and whether they are significant (NPWS 1996a).

It is further noted that a positive finding in respect of one or more factors of the 7-part test of significance does not necessarily lead to the conclusion that an SIS is then required (Talbot in *Gales Holdings Pty Ltd v Tweed Shire Council* [2006] NSWLEC 212). Rather it allows consideration as to whether a particular effect may be present or occur as a result of the development and whether that effect is likely to be significant.

The 7-Part Test is applied to scheduled flora, fauna, populations and communities (where applicable) to assess potentially adverse impacts of the proposal on threatened species, populations or communities identified on or likely to utilise the site based on available habitat components, geography and local environmental conditions.

Note that threatened species, populations and/or communities have been excluded from this assessment where:

- No direct observations of threatened species, populations or communities were made on the site during survey works;
- No previous sightings of threatened species, populations or communities within a 10-kilometre radius of the site have been registered within the NPWS database and scheduled under the *Threatened Species Conservation Act 1995*; and
- An abundance of primary habitat requirements for said species are not located on or within the locality of the proposal (refer previous sections)
- Potential habitat (feeding, roosting, nesting or refuge) will not be or will be minimally affected by the proposal (refer previous sections)

As such it is considered that, of the scheduled species, populations and/or communities described previously within this report, the following ten species of threatened fauna and one endangered ecological communities were recorded on the site or are considered potential occurrences within the area based upon available habitat components and may have the potential to be significantly affected through any development of the site.

<b>Table 13: Threatened Species And Communities Subject To 7-Part Test</b>	
Ecological Communities	VEGETATION COMMUNITY 1: TALL TO VERY TALL MIXED CLOSED FOREST CONTAINING A WIDE VARIETY OF RAINFOREST SPECIES  [LITTORAL RAINFOREST IN THE NSW NORTH COAST, SYDNEY BASIN AND SOUTH EAST CORNER BIOREGIONS]

Populations	N/A
Flora	Lesser Swamp Orchid ( <i>Phaius australis</i> )
	Greater Swamp Orchid ( <i>Phaius tancarvilleae</i> )
Fauna	Grey-headed Flying-fox ( <i>Pteropus poliocephalus</i> )
	Hoary Wattled Bat ( <i>Chalinolobus nigrogriseus</i> )
	Little Bentwing-bat ( <i>Miniopterus australis</i> )
	Southern Myotis ( <i>Myotis macropus</i> )
	Koala ( <i>Phascolarctos cinereus</i> )
	Squirrel Glider ( <i>Petaurus norfolcensis</i> )
	Wallum Froglet ( <i>Crinia tinnula</i> )

### 6.1.1 FACTORS OF ASSESSMENT 7-PART TEST

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The National Parks and Wildlife Service (NPWS) describe a local population as one “that occurs within the study area, unless the existence of contiguous or proximal occupied habitat and the movement of individuals or exchange of genetic material across the boundary of the study area can be demonstrated.”

DECC (2007) & DPI (2008) further expands the local population definition to include:

- The *local population* of a threatened *plant* species comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the study area.
- The *local population* of *resident fauna* species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area.
- The *local population* of *migratory or nomadic fauna* species comprises those individuals that are likely to occur in the study area from time to time.

DECC (2007) & DPI (2008) further states that the key assessment for this component is the “risk of extinction of the local population. The risk of extinction will increase if any factor operates to reduce population size or reproduction success.” It is further noted that any known or presumed local population should be assumed to be viable for the purpose of this assessment unless otherwise proven.

#### Megachiropterans (Grey-headed Flying-fox)

##### *Local Population*

As the noted mega-bat species are considered to be wide ranging in the region, it is considered that they are not genetically isolated on the subject site and form part of populations within the wider region. This species was well known from the locality and is known to roost within the littoral rainforest near the Silver Sands Holiday Park. The forests of the Iluka Peninsula are used as temporary summer camps by the Grey-headed Fly-fox (NPWS 1997).

This species was recorded flying over the site during dusk survey works. An individual (1) was recorded within the Heath community (Vegetation Community 4) foraging on a *Melaleuca quinquenervia* during spotlight search. The NPWS database contains thirty-five (35) records of this species within 10 kilometres of the site.

*Stages of lifecycle potentially affected by development*

Habitat Preference	Roosting/Breeding
<p>The Grey-headed Flying-fox inhabits subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps (Eby, 1995). Urban gardens and cultivated fruit crops also provide habitat for this species (NSW NPWS 1999c). Grey-headed Flying-foxes forage on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca, Banksia (Eby, 2000) and fruits of rainforest trees and vines (NSW NPWS 1999c). During periods when native food is limited, Grey-headed Flying-foxes disperse from colonial roosts, often foraging in cultivated gardens and fruit crops (NSW NPWS 1999c). This species is a canopy-feeding frugivore, blossom-eater and nectarivore of rainforests, open forests, woodlands, Melaleuca swamps and Banksia woodlands. As such, it plays an important ecosystem function by providing a means of seed dispersal and pollination for many indigenous tree species (Eby 1996; Pallin 2000).</p>	<p>This species roosts in large aggregations or camps in close proximity (20 km or less) to a regular food source, often in stands of riparian rainforest, Paperbark or Casuarina forest (Eby, 1995). Camps provide resting habitat, sites of social interactions and refuge for animals during significant phases of their annual cycle, such as birth, lactation and conception (Parry-Jones and Augee 1992, 2001).</p> <p>“Roosting habitat critical to survival: Grey-headed Flying-foxes roost in large aggregations in the exposed branches of canopy trees (Ratcliffe 1931, Nelson 1965a, Parry-Jones and Augee 1992). The locations of camps are generally stable through time, and several sites have documented histories that exceed 100 years (Lunney and Moon 1997). Camps provide resting habitat, sites of social interactions and refuge for animals during significant phases of their annual cycle, such as birth, lactation and conception (Parry-Jones and Augee 1992, 2001).</p> <p>On the basis of current knowledge, roosting habitat that meets at least one of the following criteria can be explicitly identified as habitat critical to survival, or essential habitat, for Grey-headed Flying-foxes. Roosting habitat that:</p> <ol style="list-style-type: none"> <li>1. is used as a camp either continuously or seasonally in &gt; 50% of years</li> <li>2. has been used as a camp at least once in 10 years (beginning in 1995) and is known to have contained &gt; 10 000 individuals, unless such habitat has been used only as a temporary refuge, and the use has been of limited duration (i.e. in the order of days rather than weeks or months)</li> <li>3. has been used as a camp at least once in 10 years (beginning in 1995) and is known to have contained &gt; 2 500 individuals, including reproductive females during the final stages of pregnancy, during lactation, or during the period of conception (i.e. September to May) (in DECCW, 2009)</li> </ol>

A review of the available habitats of the site indicates that general potential foraging habitats (flowering and fruiting trees) are available within the majority of the site (with the exception of the cleared areas). Although the site features foraging habitat for the Grey-headed Flying-fox, it must also be considered that the majority of the locality also provides foraging habitat for the species.

The combination of Bundjalung National Park and Broadwater National Park consists of approximately 20800ha of protected areas which features preferable foraging and roosting habitat for the species.



The proposal will remove approximately 7.2ha of marginal Grey-headed flying fox habitat in association with the Acacia Regrowth within Vegetation Community 2. The clearing and removal of forage resource is insignificant in comparison to the surrounding conservation networks available. Furthermore, as no roost sites were recorded within the site, it is considered that breeding requirements will not be disturbed as part of the proposal. It is highly unlikely that the removal of this vegetation will significantly impact the Grey-headed Flying-fox population within the locality.

*Likelihood of Local Extinction*

Reviewing the above, it is considered unlikely that the proposal will disrupt the lifecycle of the local population of the discussed megabat to the point that they are at risk of extinction.

Threatened Microchiropteran Bats (Hoary Wattled Bat, Little Bentwing-bat and Southern Myotis)

As the noted micro-bat species are considered to be wide ranging in the region, it is considered that they are not genetically isolated on the subject site and form part of populations within the wider region.

Hoary Wattled Bat

This species was recorded via anabat detection north of the site foraging within the Melaleuca Heath within the study area. The NPWS database contains 5 records of this species within 10 kilometres of the site.

Little Bentwing-bat

This species was recorded via anabat detection north of the site foraging within the Melaleuca Heath within the study area. The NPWS database contains 21 records of this species within 10 kilometres of the site.

Southern Myotis

This species was recorded via anabat detection north of the site foraging within the Melaleuca Heath within the study area. The NPWS database contains 3 records of this species within 10 kilometres of the site.

Species	Habitat Preference	Roosting/Breeding
Hoary Wattled Bat	In NSW the Hoary Wattled Bat occurs in dry open eucalypt forests, favouring forests dominated by Spotted Gum, boxes and ironbarks, and heathy coastal forests where Red Bloodwood and Scribbly Gum are common. Because it flies fast below the canopy level, forests with naturally sparse understorey layers may provide the best habitat (DEH, 2012 online @ <a href="http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10158">http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10158</a> ). This species is a continuous flight forager that primarily searches for a variety of insects close above the canopy and within openings in forested habitat (Fenton 1982, Allison 1995, Churchill 1998). It also forages over open ground adjacent to forested habitat (McKenzie and Rolfe 1986). The presence of insects, such as wingless ants, in scats suggests that some gleaning	Roosting has been recorded in tree hollows and rock crevices (Kutt et al in Van Dyck and Strahn, 2008).



	off foliage and other surfaces occurs (Vestjens and Hall 1977, Allison 1995) in Lumsden et al, 2005: 131).	
Little Bentwing-bat	This species utilises well-timbered habitats including rainforest, <i>Melaleuca</i> swamps and dry sclerophyll forests where it feeds on insects within the canopy.	<p>DECC (2005) note the following particulars with regard to the little bentwing bat:</p> <ul style="list-style-type: none"> <li>• Maternity colonies form in spring. Males and juveniles disperse in summer.</li> <li>• Only five nursery sites /maternity colonies are known in Australia.</li> <li>• Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, <i>Melaleuca</i> swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas.</li> <li>• Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day</li> <li>• They often share roosting sites with the Common Bentwing-bat and, in winter, the two species may form mixed clusters.</li> </ul> <p>In NSW the largest maternity colony is in close association with a large maternity colony of Common Bentwing-bats (<i>M. schreibersii</i>) and appears to depend on the large colony to provide the high temperatures needed to rear its young.</p>
Southern Myotis	It forages over waterbodies where it scoops insects and small fish from the water surface or catches insects aerially (DEH, 2005; Menkhorst, 1996; Richards, 2002). It has been recorded foraging over small creeks, coastal rivers, estuaries, lakes and inland rivers (Law & Anderson, 1999) and other smaller waterbodies including farm dams (Law et al, 1998).	The Myotis roosts within caves, tunnels, hollow-bearing trees, bridges, buildings and dense tree foliage always in close proximity to permanent water (NPWS, 2002; Richards, 2002).

A review of existing habitats indicates that the site provides potential habitat (Eucalypt Forest) for the Hoary Wattled Bat, potential habitat (Eucalypt Forest, Heathland and Littoral Rainforest) for the Little Bentwing-bat and potential habitat (Drainage Lines associated with the Acacia Regrowth) for the Southern Myotis.

A review of the above species indicates that tree cavities and caves/crevices are necessary for roosting/breeding. In addition to providing shelter, maternity places and retreats for hibernation, roosts are also important places for social interactions among bats. The availability of suitable roosts is therefore critical for forest bat survival (Herr, 1998). Within the site it is considered that cave/mine potential breeding sites are absent, although hollow bearing trees are abundant. These hollow-bearing trees associated with the Eucalypt Forest will not be removed for the future development.

As all three species are wide ranging and the proposal will result in only a minor modification of potential foraging habitat it is considered unlikely that a significant impact to any of species will be occasioned by the development proposal

#### *Likelihood of Local Extinction*

Reviewing the above, it is considered unlikely that the proposal will disrupt the lifecycle of the local population of the discussed micro-bats to the point that they are at risk of extinction.

#### Koala

As the Koala is wide ranging in the region, it is considered that it is not genetically isolated on the subject site and would form part of a population within the wider region.

Although the Koala was not directly observed, scratches on several smooth barked eucalypts were noted within Vegetation Community 3 (eucalypt forest) during the recent site visit. The NPWS database contains 19 records of this species within 10 kilometres of the site

#### *Stages of lifecycle potentially affected by development*

The Koala primarily occurs within Eucalypt Forest and Woodlands containing a suitable density of favoured food trees within coastal eastern and southeastern Australia. Preferred habitat generally contains a high percentage of primary food trees although underlying geology and soil type can be an important factor. Eucalypt Forests associated with drainage lines and floodplains of richer soil types (i.e. moisture and nutrients) can also be favoured due to feed trees containing higher levels of nutrients and less potential for toxicity (Hindell & Lee, 1990; Moore & Foley, 2000).

Within SEQLD six primary foraging trees were identified by Pahl (1993); Tallowwood (*Eucalyptus microcorys*), Blue Gum (*E. tereticornis*), Scribbly Gum (*E. racemosa*), Grey Gum (*E. propinqua*), Red Mahogany (*E. resinifera*) and White Stringybark (*E. tindaliae*). Further research undertaken by Phillips & Callaghan (1996) in Tweed Shire indicates that Swamp Mahogany (*E. robusta*) and Blue Gum (*E. tereticornis*) [including hybrids of the two] on alluvial deposits and Quaternary and Neranleigh- Fernvale Group geomorphologies were considered to be primary habitats. Areas with sub-dominance of these species on Neranleigh-Fernvale alliances supporting Blue Gum (*E. tereticornis*), Tallowwood (*E. microcorys*) and/or Grey Gum (*E. propinqua*) comprise secondary habitat or primary habitat depending on the density of the latter two species. Phillips & Callaghan (1998) also noted Tallowwood to be a primary browse species and two types of Grey Gum (*E. propinqua*, *E. biturbinata*) to be secondary browse species in Currumbin.

Recent studies (Biolink, 2007) indicate that *Eucalyptus tereticornis*, *E. microcorys* and *E. propinqua*/*E. biturbinata* are the most preferred koala food trees throughout the Gold Coast LGA. Within the Tweed Coast Swamp Mahogany *Eucalyptus robusta* and Forest Red Gum *E. tereticornis* are the most preferred tree species with Tallowwood *E. microcorys* and Grey Gum *E. propinqua* being the next most preferred (Biolink, 2011).

Within utilized Eucalypt Forest habitat the koala spends most of its time in distinct home-ranges which may overlap if available habitat area is reduced. Males are territorial but a dominance-hierarchy exists and they may attack during the summer breeding season. Home ranges of the species are considered to be large and can vary dependent upon habitat quality and extent. Studies have shown various home range sizes exist with the males

usually larger than the female (Male 135ha, Female: 110ha [Ellis et al, 2002], Male: 34.4ha, Female: 15ha [White, 1999]).

A review of a number of published scientific reports notes that Koala density generally ranges between 0.02 and 1.26 animals per hectare. Densities are considered to vary dependent upon habitat quality, size, connectivity, presence of impediments to movement (stock fences, dogs, roads etc).

Source	Study Location	Habitat Type	Additional Comments	Koala/ha
Dique et al, 2003	Southeast QLD Pine Rivers Shire	Tall shrubby open forest (Tertiary surfaces) and Tall open forest upon metamorphics	Stratified by two habitat descriptions 'urban' and 'bushland'	0-0.76
Dique et al, 2004	Southeast QLD Koala Coast ~375sqm of Redland, Logan and Brisbane City shires	Eucalypt Forests. Predominately RE 12.9-10.4 & 12.11.5	Study stratified by habitat descriptions: 'urban', 'remnant bushland', 'bushland' and 'other'. Remnant and bushland areas further stratified by proximity to the centre of the study area (high density=close to centre, low density=further away)	Range 0.02-1.26 Urban: 0.17 +/-0.013 High remnant: 0.70 +/-0.023 Low remnant: 0.20 +/-0.014 High bushland: 0.30+/-0.006 Low bushland: 0.11 +/-0.007 Other: 0
White and Kunst	Southeast QLD Sheldon	Eucalypt Forest		0.4 (0.3-0.46)
Sullivan et a 2004	Southwest QLD	Eucalypt Forest/woodland within the mulgalands	Habitat stratified by floristics and landzone.	0.0007-2.513
Biolink 2007	Coombah Koala Habitat Area	Mapped gold coast city vegetation (per Ryan et al, 2003) filtered to exclude communities not containing eucalypts	Spot assessment technique for koala faecal pellets. Not based upon koala observation transects per <i>Dique, 2003; EPA, 2005.</i>	0.22+/-0.04
Biolink 2007	Coomera- Pimpama Koala Habitat Area	Mapped gold coast city vegetation (per Ryan et al, 2003) filtered to exclude communities not containing eucalypts	Spot assessment technique for koala faecal pellets. Not based upon koala observation transects per <i>Dique, 2003; EPA, 2005.</i>	0.23+/-0.03

Numerous koala scratch marks were observed on Blue Gums and Scribbly Gums and favoured foraging trees within the Eucalypt Forest (Vegetation Community 3) indicates that the Koala is a regular occurrence on the Iron Gates site. No individuals were however observed and amplified call playback failed to initiate a koala response.

In association with the proposal, no areas of potential koala habitat (Eucalypt Forest) will be modified for the proposed development. No trees within the impact zone were observed to contain koalas, koala trace or scats.

Vegetation communities within the locality and the adjacent conservation networks (Bundjalung National Park and Broadwater National Park) provide over 20,000ha of similar habitat types located on site.

#### PREDATION/DISRUPTION BY FERAL/DOMESTIC ANIMALS

Mortality of koalas as a result of dog attacks is considered to be a key conservation concern for koala management with some studies reporting that dog attacks account for between 5% and 40% of total recorded mortalities (McAlpine et al, 2007). Within the 'koala coast' of SEQLD an average of 300 koalas each year die as a result of dog attacks (EPA, 2006). Studies into dispersal patterns of koalas undertaken by Dique et al (2003) indicates that in addition to mortality the presence of dogs within or proximate to koala habitats is likely to disrupt behaviour and associated dispersal options which can lead to those impacts discussed in 5.2 above.

While not as widely studied it is considered that presence of feral species such as dingoes or foxes within utilised habitat may have a similar impact to koala mortality and dispersal behaviour as domestic dogs. The recovery plan for koalas (NPWS, 2003) lists the key threatening process 'Predation by the Red Fox *Vulpes vulpes*' as being relevant to the koala.

To mitigate the potential impact of domestic animals on resident fauna the following measures are recommended:

- Imposition of a 'dog and cat restriction' covenant as follows:
  - Dogs and cats on the allotment shall not be permitted unrestrained in areas external to the designated dwelling envelope
  - Dog and cat containment fencing shall only be permitted on the boundaries of the proposed dwelling envelope. Containment fencing shall not be permitted throughout areas external to the designated building envelope

#### MORTALITY ASSOCIATED WITH BUSHFIRE

High-intensity wildfires pose a threat to koalas, particularly where refuge habitat is not available. High-intensity fires burn the canopy and can cause the death or injury of koalas and a reduction in the availability of foraging habitat. In addition, fast-moving fires fanned by strong winds reduce the ability for koalas to escape to refuge areas (NPWS, 2003: 23).

To reduce the potential risk of fire spread from inappropriate burning of waste/garden refuse following measures are proposed:

- Prohibition of lighting of fires external to the dwelling envelope

#### MORTALITY ASSOCIATED WITH ROADWAYS

It is widely accepted that koala mortality associated with vehicle strike on roadways intersecting or proximate to habitat represents a serious through to the ongoing viability of populations (Dique et al, 2003; NPWS, 2003; McAlpine et al, 2007; EPA, 2006). Vehicle strikes are heightened where arterial and other roads bisect bushland, remnant bushland or urban habitat areas, resulting in high mortality of resident koalas, or limited success of dispersing animals that must cross roads to reach suitable habitat and mates (Dique *et al.* 2003 in EPA, 2007). NPWS (2003) note that habitat bisecting roadways are particularly likely to lead to increased vehicle strike on koalas where traffic volume is high, speeds exceed 60km/hr, where visibility of road edges is reduced and/or where lighting is absent.

In this instance it is considered that whilst additional daily vehicle movements will occur on the site. It is recommended that speed limits within the developmental site should not exceed 20km/h and koala road signs are to be erected to warn drivers of their presence in the locality.

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## MORTALITY ASSOCIATED WITH DROWNING IN SWIMMING POOLS

Although swimming pools are not considered to be a major threat to koala populations they can lead to occasional deaths due to individuals falling into the pool and being unable to climb out (NPWS, 2003, AKF, undated).

The following measures are proposed should the future resident propose to construct a swimming pool within the dwelling envelope:

- Swimming pools are to be fenced to restrict koala access
- As a contingency in the event that a koala negotiates the exclusion fence and enters pool area the pool is to include a 50mm or greater diameter rope attached to a poolside fixture to be left draped in the pool when not in use (i.e. to allow a koala to climb back out should one fall into the pool).

### *Likelihood of Local Extinction*

Reviewing the above, it is considered unlikely that the proposal will disrupt the lifecycle of koala populations to the point that they are at risk of extinction.

### Squirrel Glider

As the Squirrel Glider is considered to be wide ranging in the locality, it is considered that it is not genetically isolated on the subject site and form part of a population within the wider region. Two individuals were recorded within the Eucalypt Forest (Vegetation Community 3) during spotlighting events. The NPWS database contains 4 records of this species within 10km of the site.

### *Stages of lifecycle potentially affected by development*

This species of Glider is associated with dry sclerophyll forest and woodlands although in northern NSW and Qld it has been recorded from wet sclerophyll environments (Suckling in Strahan eds, 2002; Lindenmayer 2002). It is considered to be most abundant in associations containing winter flowering Eucalypts and/or environments with a high abundance of Acacia, Banksia species in the lower layers (Smith & Murray, 2003; Menkhorst et al, 1998; Quinn, 1995).

Within the canopy of the preferred habitat numerous trees bearing hollows are critical habitat values required to support populations of the species (Quinn, 1995; Smith & Murray, 2003; Lindenmayer, 2002). Gliders are known to regularly swap den trees and utilise a number of such dens (between 6 and 19 den trees per Glider) within their home range (van der Ree, 2000). These results are supported by survey work undertaken by Southern Cross University (June/July 2002) which indicated that 12 radio tracked gliders utilised 37 den trees incorporating live hollow bearing trees and stags (Cited in Warren, 2004).

In association with the proposal minor clearing of potential habitat (<1600m)habitat (Eucalypt Forest) will be modified for the proposed development.

Vegetation communities within the locality and the adjacent conservation networks (Bundjalung National Park and Broadwater National Park) provide over 20,000ha of similar habitat types located on site.

Recommendations on the design of the development to mitigate Squirrel Glider impacts are as described within the koala section above.

### *Likelihood of Local Extinction*

Reviewing the above, it is considered unlikely that the proposal will disrupt the lifecycle of Squirrel Glider populations to the point that they are at risk of extinction.

### Wallum Froglet

As the Wallum Froglet is considered to be wide ranging in the locality, it is considered that it is not genetically isolated on the subject site and form part of a population within the wider region. The specie was recorded vocalising within the drainage line along the eastern boundary line during survey events. The specie was also recorded within the melaleuca swamps, adjacent to the site to the east. The NPWS database contains 44 records of this species within 10km of the site.

### *Stages of lifecycle potentially affected by development*

The Wallum Froglet is one of four wallum-dependent 'acid' frog species that specifically breed in acidic (low pH) waters along the central eastern coast of Australia. The Wallum Froglet is the only species of acid frog to continue breeding throughout the winter months. Breeding occurs in low nutrient, acidic (pH < 6), tannin-stained ephemeral ponds and swamps associated with coastal banksia, melaleuca, wet heath and/or adjacent eucalypt forest/woodland (Meyer et al., 2005). Male frogs call from secluded positions at the bases of sedges near water or atop matted sedges (Meyer et al., 2005). Female frogs attach their eggs to submerged vegetation, and lay an average of 80 eggs per clutch. Tadpoles may take between two to six months to develop into frogs (Straughan & Main, 1966; Anstis, 2002; Meyer et al., 2005).

During non-breeding periods, wallum froglets may disperse into nearby eucalypt forest. During the day, wallum froglets can be found sheltering in crayfish burrows as well as under leaf litter, sometimes well away from water (Straughan & Main, 1966; Cogger, et al., 1983; Baker et al., 1995; McFarland, 2007).

An adult Wallum Froglet's diet consists of several species of arthropods, whereas the tadpole diet consists of sediment and algae (Cogger et al., 1983; Anstis, 2002).

In regards with the proposal, minor Wallum Froglet will be removed in association with the man-made drainage lines, which has a consent order to be filled.

The proposal will unlikely significantly impact the local population of the species as preferred habitat occurs within the Heathland Community drainage lines and the Melaleuca Swampland (mapped as SEPP 14).

Prior to the fill works, a qualified fauna spotter-catcher will remove and relocate all Wallum Froglets into suitable habitats within the locality.

### *Likelihood of Local Extinction*

Reviewing the above, it is considered unlikely that the proposal will disrupt the lifecycle of Wallum Froglet populations to the point that they are at risk of extinction. The proposal does retain a natural drainage feature within the wet Heath community in the north which would constitute preferred habitat and is connected to areas to the east where the specie was heard vocalizing.

## THREATENED FLORA SPECIES

One naturally occurring threatened species of flora was recorded during survey surveys of the site (refer Figure 10). The species found is either the Lesser Swamp Orchid (*Phaius australis*) or the Greater Swamp Orchid (*Phaius tancarvilleae*). These species can only be distinguished from one another by characteristics of their flowers. As the survey works were conducted outside their flowering period and the exact species is unknown, both orchids will undertake the 7-part test.

Species	Abundance on site	Local Records
Lesser Swamp Orchid	Approximately 159 stems of either the Lesser Swamp Orchid or the Greater Swamp Orchid were recorded within the Littoral Rainforest of the site.	The NPWS database contains 4 records of this species within 10km of the site.
Greater Swamp Orchid		The NPWS database contains 0 records of this species

### *Stages of lifecycle potentially affected by development*

The habitat preference of the recorded threatened plant species are tabulated below:

Species	Habitat Preference	Site Specific Comments
Lesser Swamp Orchid	<p>The Lesser Swamp-orchid is endemic to Australia and occurs in southern Queensland and northern NSW (Benwell 1994b; D.L. Jones 1999, pers. comm.).</p> <p>The Lesser Swamp-orchid is commonly associated with coastal wet heath/sedgeland wetlands (Barry 2005), swampy grassland or swampy forest (NSW DECCW 2005iw) and often where Broad-leaved Paperbark or Swamp Mahogany are found (NH NSW 2006; Sparshott &amp; Bostock 1993). Typically, the Lesser Swamp-orchid is restricted to the swamp-forest margins, where it occurs in swamp sclerophyll forest (Broad-leaved Paperbark/Swamp Mahogany/Swamp Box (<i>Lophostemon suaveolens</i>)), swampy rainforest (often with sclerophyll emergents), or fringing open forest. It is often associated with rainforest elements such as Bangalow Palm (<i>Archontophoenix cunninghamiana</i>) or Cabbage Tree Palm (<i>Livistona australis</i>) (Benwell 1994b; Bishop 1996; Weston in Harden 1993).</p> <p>This orchid species is relatively adaptable in its requirements for light and soil type. Soils range from acidic waterlogged peat, with a pH of 4.2 to peaty-sand, with a pH of 7.0 (Sparshott &amp; Bostock 1993). Soil parent materials include marine aeolian sand, the most common substrate, alluvium, granite, metasediments, hailstone gravel and sandstone. Soil types on sand range from shallow peat to humus/groundwater podzol (Benwell 1994b; Bishop 1996; Weston in Harden 1993).</p>	<p>Potentially approximately 159 individuals were recorded within Vegetation Community 1 (Littoral Rainforest)</p> <p>This vegetation community is external to the development footprint and will be retained</p>
Greater Swamp Orchid	Swamp Lily occurs in north-east and south-east Queensland and north east NSW as well as globally from Papua New Guinea to China and Asia (Threatened Species Scientific	Potentially approximately 159 stems were recorded within Vegetation

	<p>Committee, 2008).</p> <p>Swamp Lily tends to occur in sunny positions in swamp forest ecotones. Associated vegetation includes swamp sclerophyll forest (<i>Melaleuca quinquenervia-Eucalyptus robusta-Lophostemon suaveolens</i>), swampy rainforest (often with sclerophyll emergents), or fringing open forest. It is often associated with rainforest elements <i>Archontophoenix cunninghamiana</i> or <i>Livistona australis</i> (Harden 1993; Benwell 1994; Bishop, 1996). Soil parent materials include marine Aeolian sand, alluvium, granite, metasediments and sandstone. On sand, soils range from shallow peat to humus or podzols (Harden 1993; Benwell 1994; Bishop 1996).</p>	<p>Community 1 (Littoral Rainforest)</p> <p>This vegetation community is external to the development footprint and will be retained</p>
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**FIGURE 10 – GPS TRACK OF THE SWAMP ORCHID**

NB. The numbers associated with the GPS tracks indicates the number of stems recorded at the GPS location (e.g O4 = 4 stems recorded).

#### *Likelihood of Local Extinction*

Reviewing the above, it is considered unlikely that the proposed development will not disrupt the lifecycle of the recorded Lesser Swamp Orchid/Greater Swamp Orchid population to the point that it is at risk of extinction within the locality. The population recorded on site is external to the works zone and will be retained.

*(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,*

N/A

No endangered fauna populations listed under Part 2 Schedule 1 of the *Threatened Species Conservation Act 1995* are located on or within the proximity of the site. As such, the proposed activity is unlikely to disrupt the lifecycle of any species constituting an endangered population or the viability of such a population. The endangered populations currently listed include the following:

Tusked Frog population in the Nandewar and New England Tablelands  
Bioregions

Emu population in the New South Wales North Coast Bioregion and Port  
Stephens local government area

Gang-gang Cockatoo population in the Hornsby and Ku-ring-gai Local  
Government Areas

Glossy Black-Cockatoo, Riverina population

Little Penguin in the Manly Point Area (being the area on and near the shoreline  
from Cannae Point generally northward to the point near the intersection of Stuart  
Street and Oyama Cove Avenue, and extending 100 metres offshore from that  
shoreline)

White-browed Treecreeper population in Carrathool local government area south  
of the Lachlan River and Griffith local government area

Broad-toothed Rat at Barrington Tops in the local government areas of  
Gloucester, Scone and Dungog

Long-nosed Bandicoot, North Head

Squirrel Glider in the Wagga Wagga Local Government Area

Squirrel Glider on Barrenjoey Peninsula, north of Bushrangers Hill

Koala, Hawks Nest and Tea Gardens population

Koala in the Pittwater Local Government Area

Long-nosed Potoroo, Cobaki Lakes and Tweed Heads West population

*(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

*(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*

*(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,*

DEC (2007) notes the following with regard to EECs:

Ecological communities are usually defined by two major components – the geographical distribution and the species composition which influences the physical structure and ecological function of the ecological community. The relative importance of the geographical distribution and the species composition varies according to the specific listed ecological community. Hence this factor provides for consideration of two criteria:

- (i) local occurrence of the ecological community
- (ii) modification of the ecological community's composition.

Interpretation of key terms used in this factor:

**Local occurrence:** the ecological community that occurs within the study area. However the local occurrence may include adjacent areas if the ecological community on the study area forms part of a larger contiguous area of that ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated.

**Risk of extinction:** similar to the meaning set out in factor (a), this is the likelihood that the local occurrence of the ecological community will become extinct either in the short-term or in the long-term as a result of direct or indirect impacts on the ecological community, and includes changes to ecological function.

**Composition:** both the plant and animal species present, and the physical structure of the ecological community. Note that while many ecological communities are identified primarily by their vascular plant composition, an ecological community consists of all plants and animals as defined under the TSC and FM Acts that occur in that ecological community.

#### *LITTORAL RAINFOREST IN THE NSW NORTH COAST, SYDNEY BASIN AND SOUTH EAST CORNER BIOREGIONS*

It is considered that Community 4 is reflective of the above listed EEC as described by the Scientific Committee (Determination to make a minor amendment to Part 3 of Schedule 1 of the Threatened Species Conservation Act).

It is concluded that approximately 8.1ha of Littoral Rainforest occurs on site. The proposal will not remove any vegetation associated with this community. Minor pruning associated with the extension of Iron Gates road may be required and the community will be protected in accordance with the Vegetation Management Plan provided prior to works.

The proposal will not impact this vegetation community and will not result in a changed ecological function of values to for fauna.

*(d) in relation to the habitat of a threatened species, population or ecological community:*

- (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*
- (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,*

Habitat for a given threatened species, community or population is considered to be an area containing similar known (documented) habitat preferences for that species within the species' geographic distribution.

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In assessing whether a significant area of the habitat of a threatened species, population or ecological community is to be modified or removed the following should be considered:

- The geographic range of the threatened species, population or ecological community and its known or documented occurrence within the region and locality;
- The relative scale and value of the habitat within the region and locality;
- The importance of the habitat (i.e. relationship to life cycle, reproductive success etc)

DEC (2005) indicates that a “quantitative and qualitative approach to assessing the extent to which habitat is likely to be removed or modified/degraded should consist of the following steps:

- an assessment of the amount of habitat of the threatened species, population or ecological community that occurs within the locality;
- an assessment of the amount of habitat of the threatened species, population or ecological community that occurs within the study area;
- an estimation of the area and quality that the habitat of the study area represents in relation to the local distribution of that habitat;
- An estimation of the area and quality of the habitat of the study area which is to be removed or modified by the proposed development or activity;
- a calculation of the amount of the habitat of the region that will be removed or modified by the proposed development, activity or action or indirectly by longer term impacts from the proposed development such as increased predation weed invasion, salinity etc;
- An estimation of the area and quality of the habitat of the region that will be removed or modified by the proposed development, activity or action; and
- an assessment of the ecological integrity of the habitat to be affected and of the habitat which will remain”

As discussed within this report it is considered that the site and study area represents potential and recorded habitat for the threatened species subject to this 7-part test.

The proposal seeks to remove/modify approximately 21.3ha of Vegetation Community 2 (entire community from site). Survey works concluded that this vegetation community features marginal fauna habitat and is not significant within the region. No hollow-bearing trees are proposed to be removed to facilitate the development.

The proposal seeks to offset the proposed clearing by revegetation works. The site will be landscaped with introduced and native species which will provide additional forage areas for common avifauna.

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

N/A. To date the only ‘Critical Habitat Areas’ within the state declared pursuant to the *Threatened Species Conservation Act 1995* are the Mitchell’s Rainforest Snail Habitat of Stott’s Island NR and Little Penguin Population habitat in Sydney’s North Harbour (NPWS, 2005). The Fisherman’s Co-operative proposal is unlikely to affect ‘critical habitat’ areas. The proposal is also considered unlikely to affect nominated ‘critical habitat’ areas which are pending determination by the Scientific Committee

- Bomaderry zieria within the Bomaderry bushland
- Eastern Suburbs Banksia Scrub Endangered Ecological Community
- Wollemia nobilis (the Wollemi pine)

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

Section 69(1) of the TSC Act requires that a public authority implement actions for which they are responsible and “must not make decisions that are inconsistent with the provisions in a recovery plan”. In this regard it is considered important that the proposed development does not conflict with the objectives or actions listed within the recovery plan(s) for recorded or potentially occurring threatened species, populations or communities (as discussed within this report). Recovery plans associated with such threatened species or communities as discussed in this report include:

- Grey-headed Flying Fox (National) Recovery Plan
- Koala Recovery Plan
- Oxleyan Pygmy Perch Recovery Plan

It is noted that under the EP&A Act, it is the responsibility of the consent or determining authority to form a view as to whether a proposed development or activity is likely to significantly affect threatened species, communities, populations or their habitat. This is achieved by undertaking an Assessment of Significance under Section 5A of the EP&A Act. In this regard, an assessment of significance has been conducted for the proposal which concludes that a species impact statement is not required. It is further concluded within this report that the proposal is unlikely to have a significant impact on recorded or potentially occurring threatened species, communities and their associated habitat.

As such, it is considered that the proposal is not in conflict with the objectives or actions of the listed recovery plans.

“Any process can be listed as a key threatening process (KTP) under schedule 3 of the NSW *Threatened Species Conservation Act 1995* (TSC Act), provided the process and its nomination meet the specific requirements and criteria established under the Act. A threat abatement plan or TAP is a statutory document prepared in accordance with the TSC Act, for a KTP listed under the Act. The TAP’s principle aim is to reduce, abate or ameliorate the threat posed by the KTP to threatened species and ecological communities, or those species which may become threatened as a result of the KTP (DEC, 2004: vii). Existing TAPs include:

- Invasion of native plant communities by bitou bush/boneseed (2004)
- Predation by the red fox (2001)
- Predation by *Gambusia holbrooki* (plague minnow) (2003)

None of these species were recorded within the study area although the red fox is encountered in the locality (pers. obs.). The proposal is unlikely to exacerbate the impacts of the red fox on native wildlife and as such is not considered to be in conflict with the objectives or actions of the TAP.

As such, it is considered that the proposal is not in conflict with the objectives or actions of the listed threat abatement plans.



g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The *Threatened Species Conservation Act 1995* defines a 'threatening process' as 'a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities.' Accordingly Key Threatening Processes are nominated within Schedule 3 of the Act and include the following (online @ [http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/home\\_threats.aspx](http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/home_threats.aspx)):

THREATENING PROCESS	COMMENT
Alteration of habitat following subsidence due to longwall mining	Not applicable
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	Not applicable
Anthropogenic climate change	Not applicable
Bushrock removal	Not applicable
Clearing of native vegetation	<p>The proposal will involve clearing of some native vegetation (including clearing of one or more strata within a stand of native vegetation). The NSW Scientific Committee notes in their final determination that 'clearing of native vegetation' is recognised as a major factor contributing to the loss of biological diversity and includes impacts such as the following:</p> <ul style="list-style-type: none"> <li>• Destruction of habitat results in loss of local populations of individual species</li> <li>• Fragmentation</li> <li>• Expansion of dryland salinity</li> <li>• Riparian zone degradation</li> <li>• Increased greenhouse gas emissions</li> <li>• Increased habitat for invasive species</li> <li>• Loss of leaf litter layer</li> <li>• Loss or disruption of ecological function</li> <li>• Changes to soil biota (NSW Scientific Committee, 2001)</li> </ul> <p>However, a review of this report notes that clearance will be restricted to areas of minor ecological significance and the level of clearing proposed is unlikely to significantly impact upon the viability of threatened fauna species and habitat values available within the site and surrounding locality.</p> <p>As indicated the Wattle community is a disturbed / modified community the result of past clearing / seeding. It is not proposed to be retained and the proposal will remove all Wattle from within the development footprint. The area to be removed is 7.23ha.</p> <p>The development will remove approximately 2000m<sup>2</sup> of Open Dry Heath and 1.18ha of Open Dry Heath with mixed Eucalypt. We note this community is vulnerable but locally well conserved in the surrounding conservation network.</p> <p>The development will require the removal of approximately 1200m<sup>2</sup> of Heathy Scribbly Gum for roads and an additional 400m is proposed for removal</p>



	<p>with bushfire requirements and lots.</p> <p>The proposal does not remove any Littoral rainforest. As noted the road extension will necessitate minor pruning of limbs within the road reserve.</p> <p>This clearing is principally regenerated wattle and the proposal does not represent a significant impact.</p>
Competition and grazing by the feral European rabbit ( <i>Oryctolagus cuniculus</i> )	Not applicable
Competition and habitat degradation by feral goats ( <i>Capra hircus</i> )	Not applicable
Competition from feral honey bees ( <i>Apis mellifera</i> )	Not applicable
Death or injury to marine species following capture in shark control programs on ocean beaches	Not applicable
Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments	Not applicable
Forest Eucalypt dieback associated with over-abundant psyllids and bell miners	Not applicable
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	Not applicable
Herbivory and environmental degradation caused by feral deer	Not applicable
Importation of red imported fire ants ( <i>Solenopsis invicta</i> )	Not applicable
Infection by psittacine circoviral (beak and feather) disease affecting endangered psittacine species and populations	Not applicable
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	Not applicable
Infection of native plants by <i>Phytophthora cinnamomi</i>	Not applicable
Introduction and Establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae	Not applicable
Introduction of the large earth bumblebee ( <i>Bombus terrestris</i> )	Not applicable
Invasion and establishment of exotic vines and scramblers	Several exotic vines were recorded onsite. These species should be removed in association with the proposal where they occur within the work zone.
Invasion and establishment of Scotch broom ( <i>Cytisus scoparius</i> )	Not applicable
Invasion and establishment of the cane toad ( <i>Bufo marinus</i> )	The cane toad was recorded onsite. The proposal is unlikely to increase the impacts of this listed threatening process.
Invasion of native plant communities by African Olive <i>Olea europaea</i> L. subsp. <i>cuspidata</i>	Not applicable
Invasion, establishment and spread of <i>Lantana camara</i>	Lantana was recorded on site. The species should be removed in association with the proposal where it occurs within the works zone.
Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed)	Not applicable
Invasion of native plant communities by exotic perennial grasses	Not applicable
Invasion of the yellow crazy ant ( <i>Anoplolepis gracilipes</i> (Fr. Smith)) into NSW	Not applicable



Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	Not applicable
Loss of hollow-bearing trees	Not applicable
Loss or degradation (or both) of sites used for hill-topping by butterflies	Not applicable
Predation and hybridisation of feral dogs ( <i>Canis lupus familiaris</i> )	A dog was recorded onsite within the heath community. The proposal is unlikely to increase the impacts of this listed threatening process.
Predation by the European red fox ( <i>Vulpes vulpes</i> )	Not applicable
Predation by the feral cat ( <i>Felis catus</i> )	Several cats were recorded throughout the site. The proposal is unlikely to increase the impacts of this listed threatening process
Predation by <i>Gambusia holbrooki</i> Girard, 1859 (plague minnow or mosquito fish)	Not applicable
Predation by the ship rat ( <i>Rattus rattus</i> ) on Lord Howe Island	Not applicable
Predation, habitat degradation, competition and disease transmission by feral pigs ( <i>Sus scrofa</i> )	Not applicable
Removal of dead wood and dead trees	Not applicable

## CONCLUSION

Based upon the above assessments, it is considered that a Species Impact Statement (SIS) is not required.

## **6.2 SEPP 14 COASTAL WETLAND PROTECTION**

*State Environmental Planning Policy No. 14* aims to preserve and protect coastal wetlands in the environmental and economic interest of the State. It does this by defining any development that involves clearing, draining or filling wetlands, or constructing levees on wetlands to be designated development (EDO, 2007).

Mapping of the site (Figure 11) indicates that the northeast portion is designated a SEPP 14 Coastal Wetland Protection. As outlined in the report the extant affected by the wetland mapping does not reflect the site vegetation. The area noted as occurring within the allotment as illustrated is regenerating acacia and or cleared land. No permanent water exists in this location. The area does not display characteristics of a wetland in either physical conditions or vegetation communities. An area to the north of this which is also designated as part of the SEPP wetland is reflective of this designation and is mapped as wet heath with *Melealeuca* over storey. This community intergrades with Dry Heath. The mapped vegetation in Figure 4 (attachment 2) is considered a better reflection of the SEPP area.

The proposal does not impact on the SEPP wetland and the proposed filling of the eastern drainage line may assist in reducing draw down of the water table from within the mapped SEPP area.



**FIGURE 11 – SEPP 14 COASTAL WETLAND PROTECTION MAPPING and VEGETATION COMMUNITY MAPPING**

### 6.3 SEPP 26 LITTORAL RAINFOREST

*State Environmental Planning Policy No. 26* relates to development applications likely to damage or destroy littoral rainforest (rainforests in coastal areas) (EDO, 2007). The site is not mapped as containing SEPP 26 Littoral Rainforest, although it was concluded that Vegetation Community 1 represents Littoral Rainforest. As stated previously, this vegetation community will be retained. Minor branch /limb pruning may be required for the road extension. An existing vehicle track occurs in the proposed road extension.

### 6.4 SEPP 44 KOALA HABITAT ASSESSMENTS

In February 1995 the NSW Department of Infrastructure, Planning and Natural Resources enacted the *State Environmental Planning Policy No. 44: Koala Habitat Protection*. This Policy ‘aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline.’

In association with development applications and in areas where the policy applies a number of criteria are to be addressed to determine levels of assessment and to govern management considerations. The steps are as follows:

1. *Does the Policy Apply?*

Is the land greater than 1ha in size and located within one of the Local Government areas listed within Schedule 1 of SEPP 44?

Yes. The land is greater than 1ha in area and located within the Richmond Valley Council Local Government Area.

## 2. *Is the land potential koala habitat?*

The SEPP defines 'potential koala habitat' as 'areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.' The trees within Schedule 2 are tabulated below:

Scientific Name	Common Name
<i>Eucalyptus tereticornis</i>	Forest red gum
<i>Eucalyptus microcorys</i>	Tallowwood
<i>Eucalyptus punctata</i>	Grey Gum
<i>Eucalyptus viminalis</i>	Ribbon or manna gum
<i>Eucalyptus camaldulensis</i>	River red gum
<i>Eucalyptus haemastoma</i>	Broad leaved scribbly gum
<i>Eucalyptus signata</i>	Scribbly gum
<i>Eucalyptus albens</i>	White box
<i>Eucalyptus populnea</i>	Bimble box or poplar box
<i>Eucalyptus robusta</i>	Swamp mahogany

Although eucalypt forest in association with Vegetation Community 3 contains koala trees as listed in the above table, the extent of clearing is minimal. The area to be cleared is approximately 1600m<sup>2</sup> and would require the removal of approximately 10 -15 trees. These are offset through plantings in the open space and or street trees..

## 3. *Is the land core koala habitat?*

The SEPP defines 'core koala habitat' means 'an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population.'

Whilst the Koala is noted to be present in the locality and scratch marks were present on several eucalypts immediately external to the development footprint, no individuals were recorded within the works zone.

The proposal will unlikely significantly impact the species as the development site is immediately adjacent to large conservation networks with similar habitats. As such, it is considered that the proposal with respect to its definition under SEPP 44 is not located within land that is core koala habitat.

## 4. *Is there a requirement to prepare a Plan of Management for land containing core koala habitat?*

No. It is considered that the site does not contain core Koala habitat as described.

## 7.0 SITE IMPACTS

This section of the report reviews the development proposal and likely resultant impact to flora, fauna and habitat value.

### 7.1 SIGNIFICANCE OF IMPACTS TO THREATENED SPECIES AND/OR COMMUNITIES

DEC (2005 & 2007) outline assessments relating to the significance of impacts of actions to threatened species, communities and populations. DEC (2005) notes that evaluation of impacts should involve not only the magnitude and extent of impacts, but also the significance of the impacts as related to the conservation importance of the habitat, individuals and populations likely to be affected.

Impacts are considered more significant if:

- Areas of high conservation value are affected.
- Individual animals and/or plants and/or subpopulations that are likely to be affected by a proposal play an important role in maintaining the long-term viability of the species, population or ecological community.
- Habitat features that are likely to be affected by a proposal play an important role in maintaining the long-term viability of the species, population or ecological community.
- The impacts are likely to be long-term in duration.
- The impacts are likely to be permanent and irreversible.

Seven (7) threatened species have been within the study area and individuals of these species may be impacted through the removal of vegetation or disturbance to habitat. Significance assessments for these threatened species have been undertaken in Section 6.

The significance assessments indicate that the proposed action is unlikely to have a significant impact on any EECs, endangered populations, critical habitats, threatened plants or threatened animals (as summarized below).

<b>Table 14: SUMMARY OF SPECIES FOR WHICH SIGNIFICANCE TESTS WERE UNDERTAKEN</b>		
<b>Type</b>	<b>TSC Act</b>	<b>Likely To Be Significantly Affected By Proposed Action?</b>
<b>Endangered Ecological Community</b>		
<i>LITTORAL RAINFOREST IN THE NSW NORTH COAST, SYDNEY BASIN AND SOUTH EAST CORNER BIOREGIONS</i>	E	No
<b>Threatened Animals</b>		
Grey-headed Flying Fox	V	No
Hoary Wattled Bat	V	No
Little Bentwing-bat	V	No
Southern Myotis	V	No
Koala	V	No
Squirrel Glider	V	No
<b>Threatened Flora</b>		
Lesser Swamp Orchid	E	No
Greater Swamp Orchid	E	No

## 7.2 IMPACTS TO VEGETATION CLEARING

Clearing of vegetation (native and exotic) will be the major direct impact associated with the intended establishment of the dwelling envelope. Clearing is recognised as a key threatening process under the TSCA 1995.

The proposal will result in the removal/modification;  
7.23ha of the disturbed / modified Wattle community is a community.



The development will remove approximately 2000m<sup>2</sup> of the Open Dry Heath and 1.18ha of Open Dry Heath with mixed Eucalypt which is well conserved in the surrounding conservation network.

The development will require the removal of approximately 1200m<sup>2</sup> of Healthy Scribbly Gum for roads and an additional 400m is proposed for removal with bushfire requirements and lots.

The proposal does not remove any Littoral rainforest. As noted the road extension will necessitate minor pruning of limbs within the road reserve.

As discussed in this report it is considered that these works will not have a significant environmental impact due to the highly modified nature of the areas to be affected. The clearing does not result in fragmentation or increased edge effects given the existing configuration of the remnants.

A summary of the proposed clearing rates for described communities associated with the dwelling envelope is tabulated below:

**Table 15:** Clearing of Vegetation Communities As a Result of the Proposal

Mapped Community	EEC?	Approx. extent to be cleared (HA)
VEGETATION COMMUNITY 4: TALL TO VERY TALL MIXED CLOSED FOREST CONTAINING A WIDE VARIETY OF RAINFOREST SPECIES [T8M]	YES	0
VEGETATION COMMUNITY 1: DISTURBED/CLEARED AREAS WITH SCATTERED TREES, OPEN Paddock AND REGROWTH ( <i>ACACIA AULACOCARPA</i> )	NO	21.3
VEGETATION COMMUNITY 3: TALL TO VERY TALL EUCALYPT OPEN FOREST TO WOODLAND: <i>CORYMBIA INTERMEDIA</i> , <i>EUCALYPTUS PLANCHONIANA</i> , <i>E. TERETICORNIS</i> , <i>E. SIGNATA</i> AND OTHER EUCALYPTS [T8M]	NO	1600
VEGETATION COMMUNITY 2: TALL-VERY TALL OPEN HEATH SHRUB (HEATHLAND) DOMINATED BY <i>MELALEUCA QUINEQUENERVIA</i> WITH OTHER HEATH SPECIES	NO	1.38
<b>TOTAL</b>		<b>22.84</b>



**FIGURE 12 – VEGETATION WITHIN PROPOSED CLEARING ZONE**



**FIGURE 13 – IRON GATES AERIAL FROM 1998**

The aerial provided within Figure 13 illustrates that the developmental footprint has been previously cleared and that the majority of today's vegetation occurring on is regrowth.



**FIGURE 14 – AERIAL OF THE IRON GATES LOCALITY (2014)**

The aerials provided within Figure 14 above illustrates the abundance of vegetation within the locality and that the removal of disturbed/cleared habitat (Vegetation Community 1) will not significantly impact species. The aerials also illustrates that the proposal will not significantly impact fauna corridors and that species are easily able to disperse in the area. The above aerials do not incorporate the full extent of the Bundjalung National Park and Broadwater National Park which is significantly larger than what is shown within the above aerials.

### **7.3 IMPACTS TO FAUNA HABITAT**

The proposal involves minor clearing of vegetation which it is considered does not constitute core or critical habitat for threatened species recorded in the locality. The minor forage area lost is insignificant to that found in the locality and is offset by revegetation works. Following stabilization and development a modified habitat zone (i.e. residential areas with gardens beds, lawn, buildings etc) will be restored within the disturbance area.

This zone however is likely to only favour common species ((i.e. common animals tolerant to human proximity). The remaining vegetation communities will be maintained in their existing state to retain fauna habitat across the site. No hollow-bearing trees are proposed to be removed for the development.

An evaluation of the clearing on threatened species is provided in section 6.

### **7.4 FAUNA MORTALITY/INJURY**

Any level of vegetation clearing, construction or earthworks modification undertaken has the potential to kill or injure fauna species. The surveying work has identified that the majority of species recorded are highly mobile and with an appropriate fauna management plan it is unlikely impacts would arise.

### **7.5 HABITAT FRAGMENTATION, BARRIER EFFECTS AND EDGE EFFECTS**

Habitat fragmentation is considered to be the division of a single area of habitat into two or more smaller habitats separated by a new habitat type in the area between the remaining fragments (PB, 2007). Often the dividing habitat is anthropogenic (i.e. crop, roadway, residential development etc) which limits continued interaction and movement of individuals between the new patches to varying degrees (i.e. birds may be still able to move between patches). Additionally the dividing habitat tends to favour a different assemblage of animals typically described as generalist and/or aggressive (i.e. crows, noisy minors, black rat). This is particularly relevant to urban development where domestic and feral species (cats, foxes, dogs) are favoured by the new habitat to the exclusion of native species.

The resultant habitat fragments or patches are also impacted as a result of a reduction in patch size, reduction in the 'interior' area and creation or expansion of the habitat 'edge.' Edge areas also typically favour aggressive and generalist species particularly in relation to exotic flora. Dominance of exotic flora or weeds can threatened the integrity of the 'interior' habitat thus expanding the edge further. Weed dominance also typically simplifies the structural and floristic diversity to the exclusion of numerous 'niches' and the fauna that occupy such spaces.

Many wildlife studies have shown how the relative abundance of fauna species changes with habitat fragment size (e.g. Ambuel and Temple 1983; Lynch and Whigham 1984; Robinson *et al.* 1997) with some species showing a greater abundance in smaller remnants, while

others decrease or even disappear from remnants due to habitat fragmentation (Berry, 2001).

“Species can be grouped according to their response to edges. ‘Edge’ species are those that increase in abundance at habitat edges. Typically, these are habitat generalist or open-country species, and often they are species also found in greater numbers in small habitat remnants. In contrast, ‘interior’ species decrease in abundance or are absent from habitat edges; these are typically specialists, have large home ranges, inhabit large forest areas, and are rare or absent from small habitat remnants (Ambuel and Temple 1983; Ford *et al.* 1995; Canady 1997; Luck *et al.* 1999). For example, Catterall *et al.* (1991) found that in forest–suburb boundaries in Brisbane, forest-interior birds were typically smaller and insectivorous, while forest-edge species were usually larger and fed on open ground” (Berry, 2001: 240).

Some of the above and more commonly discussed impacts are summarized below:

Barrier effects “result when severed habitat connections restrict the movement of species (Yahner 1988). Barrier effects can result from relatively small-scale anthropogenic disjunction of habitat and may preclude dispersal or migration and disrupt population processes (e.g. Mansergh and Scotts 1989). The distance over which such effects operate may vary among species. For example, many bird species may be able to readily cross discontinuities in suitable habitat by using small remnants as stepping stones (e.g. Date *et al.* 1991). In contrast, forest-dependent mammals may be reluctant to cross relatively small areas of open habitat (e.g. Burnett 1992)” (Goldingah & Whelan, 1997:24-25)

Genetic isolation may occur when individuals from a previously connected population can no longer interbreed due to the creation of fragments and barrier effects. Such isolation can result in problems associated with inbreeding (and associated loss of genetic diversity and risk of disease, mutation, population crash), divergence and genetic drift.

Edge effects may occur when a new boundary is established within an existing habitat, producing a change in the remaining habitat (Harris 1984). Abiotic and biotic factors may be responsible for an edge effect (Murcia 1995). Abiotic factors include changes in microclimate such as altered temperature regimes, increased light levels and greater wind speeds (e.g. Scougall *et al.* 1993). Changes in the nutrient status of the soil surrounding an edge may occur when remnant habitat occurs adjacent to agricultural land. Biotic factors include changes in the abundance of animals and plants. These may occur in response to the abiotic factors or because particular species are favoured by the close association of two different habitat types. Edges may promote access by predators to existing habitat, particularly those that favour boundaries between open and remnant habitat (Harris 1988). This may increase the vulnerability of species and lead to a decline in their abundance near the edge (Yahner 1988; Marini *et al.* 1995)” (Goldingah & Whelan, 1997:24)

As discussed in Section 5.6 above it is considered that the works are of a minor nature in the context of the regional terrestrial corridors in the locality and will remove modified/cleared areas which does not represent significant fauna habitats.

The proposal including revegetation ensures that the existing vegetation remnants will not be further fragmented.

Additionally, it is considered that the proposal will not introduce a new terrestrial fauna dispersal barrier or intensify an existing barrier as the works proposed are not constructing barriers such as fences between vegetation communities. The existing corridor value of the locality is therefore unlikely to be reduced by the proposal.

## 7.6 MORTALITY ASSOCIATED WITH ROADWAYS/VEHICLE STRIKE

Roads and traffic are widely accepted as having impacts upon terrestrial wildlife. "Roads cut across landscape features and divide wildlife habitats. Consequently, they are one of the main obstacles to the movement of land vertebrates (Yanes *et al.* 1995).

The implications of movement barriers to wildlife populations are considerable. Barriers tend to create metapopulations (subpopulations) where a road divides a large continuous population into smaller, partially isolated local populations (Forman and Alexander 1998). Small populations fluctuate in size more widely and have a higher probability of extinction than do large populations (van der Zande *et al.* 1980). In addition, disruption of population dispersal (Mansergh and Scotts 1989) and recolonisation (Mader 1984; Andrews 1990) may result from the barrier-effect of roads.

Roads also result in vehicle collisions with wildlife (road-kill) and can represent a significant source of mortality for declining populations of some wildlife species (Harris and Gallagher 1989; Saunders 1990; Sheridan 1991; Scott *et al.* 1999).

It is widely accepted that terrestrial fauna (in particular koala) mortality associated with vehicle strike on roadways intersecting or proximate to habitat represents a serious through to the ongoing viability of populations (Dique *et al.* 2003; NPWS, 2003; McAlpine *et al.* 2007; EPA, 2006). Vehicle strikes are heightened where arterial and other roads bisect bushland, remnant bushland or urban habitat areas, resulting in high mortality of resident koalas, or limited success of dispersing animals that must cross roads to reach suitable habitat and mates (Dique *et al.* 2003 in EPA, 2007). NPWS (2003) note that habitat bisecting roadways are particularly likely to lead to increased vehicle strike where traffic volume is high, speeds exceed 60km/hr, where visibility of road edges is reduced and/or where lighting is absent.

Larger species or species with restricted distributions, or those regularly in contact with roads (e.g. migration paths or home ranges), are those most affected by road-kill (Bennett 1991; Forman and Alexander 1998) [in Taylor and Goldingay, 2003]". Mortality rates can also be particularly high for species which are slow moving (i.e. arboreal mammals), those which become distracted by vehicle lights (i.e. kangaroos) and those which require many individual movements to cross the roadway (i.e. small reptiles and amphibians).

In this instance it is considered that whilst additional daily vehicle movements will occur on the site. It is recommended that speed limits within the developmental site should not exceed 20km/h and wildlife road signs are to be erected to warn drivers of their presence in the locality.

## 7.7 ESTABLISHMENT OF WEEDS

Weed invasion occurs when unwanted or exotic plants become established in native bushland via natural dispersal vectors such as wind, water, insects, birds and other animals, however, humans are by far the most effective and efficient vector of plants (Coutts-Smith and Downey, 2006; Randall, 2007 in TSSC, 2010). Humans may facilitate the direct introduction weeds by inappropriate garden dumping, via vehicles, imported agricultural

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products and stock rotation/movement. The potential impacts of weed invasion in Australia are well documented and summarized in TSSC (2010) including:

#### *Genetic effects*

Environmental weeds cause a decline in the number of genetically distinct sub-populations that make up a native species. It is reasonable to conclude that an associated reduction in the genetic diversity of the affected species is likely to result. The invasion of weeds may also affect the genetic diversity of native species through cross breeding or hybridisation, whereby foreign genes are introduced into local plant populations

#### *Introduction of diseases*

The introduction of weeds often results in the introduction of pathogens (fungi, nematodes, bacteria and viruses) that are associated with these plants in their natural range (ILDA, 2009).

#### *Competition for resources*

Competition between species is inevitable when more than one species occupy the same niche and have similar requirements for a limited resource (Cadotte, 2007). Weeds are known to compete with native plants for limited resources such as moisture, nutrients, sunlight, pollinators and space (Csurches and Edwards, 1998; Blood, 2001; Brunskill, 2002).

#### *Prevention of recruitment*

Growth of weeds can be sufficiently vigorous to reduce or prevent the establishment of native plant species (Csurches and Edwards, 1998)

#### *Alteration of ecosystem processes*

Invasive weeds are also capable of altering various ecosystem processes such as geomorphological processes, hydrological cycles, nutrient dynamics and disturbance regimes (Csurches and Edwards, 1998). Alterations to ecosystem processes can potentially influence many if not all species within a community (Vranjic et al., 2000).

#### *Changes to abundance of indigenous fauna*

Weeds that become invasive can both directly and indirectly change the abundance of indigenous fauna. Fauna such as the Richmond Birdwing Butterfly and *Petrogale persephone* (Proserpine Rock Wallaby) are directly impacted by escaped garden plants, Dutchman's Pipe (*Aristolochia elegans*) and Pink Periwinkle (*Catharanthus roseus*), respectively, both of which are attractive as a food source and yet toxic to them when consumed (Watts and Vidler, 2006). Indirectly, weeds impact indigenous fauna by altering the availability of suitable habitat, including food and shelter, and by creating habitats that harbour other pest species that can, in turn, have a detrimental effect.

As discussed in this report, weeds are abundant within the site, in particularly Community 2 which is proposed to be cleared/modified. To minimise the potential future impact of unmitigated continued spread of this species it is considered appropriate that the existing infestation be eradicated in association with this proposal.

## **7.8 PREDATION/DISRUPTION BY CATS AND DOGS**



Pest/domestic animals (i.e. foxes, dogs and cats) are noted to be established within the locality. Mortality of fauna (especially koalas) as a result of dog attacks is considered to be a key conservation concern for koala management with some studies reporting that dog attacks account for between 5% and 40% of total recorded mortalities (McAlpine et al, 2007). Within the 'koala coast' of SEQLD an average of 300 koalas each year die as a result of dog attacks (EPA, 2006).

Studies into dispersal patterns of koalas undertaken by Dique et al (2003) indicates that in addition to mortality the presence of dogs within or proximate to habitats is likely to disrupt behaviour and associated dispersal options which can lead to those impacts discussed in 7.5 above. The risk of predation can strongly alter the behaviour and activity of potential prey (Lima and Dill 1990). In assessing predation hazards, many species use remote cues of risk because of the dangers of direct encounters with predators, including avoidance of open areas (e.g. Banks et al. 1999) or changing the time that they forage (in Banks et al, 2003; 406). Wild dogs may also potentially carry diseases such as distemper and an array of parasites e.g. hydatids).

Cats also have direct impacts on native fauna through predation. 'They can kill vertebrates weighing as much as 3kg (Dickman 1996), but preferentially kill mammals weighing less than 220g and birds less than 200g. They also kill and eat reptiles, amphibians and invertebrates (Dickman 1996). Cats can also have indirect effects on native fauna by carrying and transmitting infectious diseases (DEH 2004). They are thought to have contributed to the extinction of many small to medium-sized mammals and ground-nesting birds in the arid zone, and to have seriously affected populations of bilby, mala and numbat (DEH 2004)'(DEWHA, 2008).

The development proposal will introduce the incremental risk of domestic fauna impact upon native fauna species although such risks are well established within the locality and an isolated ban on domestic animals at this location would be unreasonable. It is noted that dogs and cats would not be permitted to free roam within the proposed open space areas to be an on-leash area only to minimise harassment of residual fauna.

## **8.0 MEASURES TO AVOID AND MINIMISE ECOLOGICAL IMPACTS**

### **8.1 PROTECTION & AVOIDANCE**

The proposal seeks to avoid tree clearing through locating development in cleared areas and thus protecting the sites habitat. The design into these disturbed cleared spaces reduces fragmentation. These as well as a general locally endemic landscape requirement would ensure the sites values are protected.

The proposed vegetation to be removed are of a disturbed/cleared nature and do not provide significant ecological values.

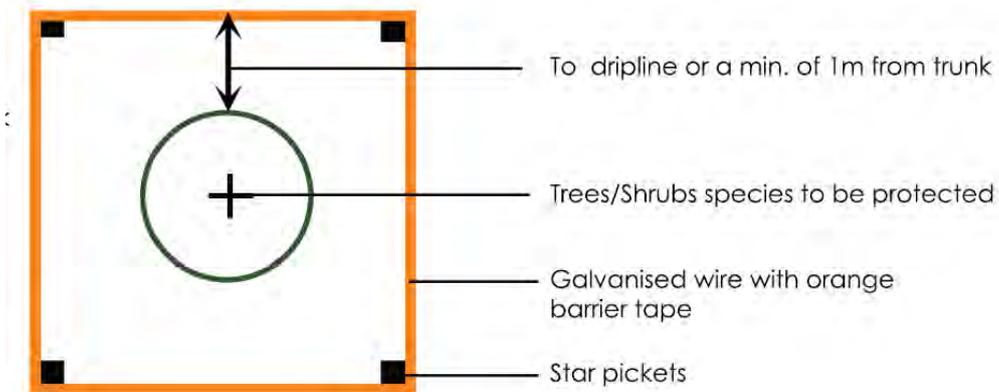
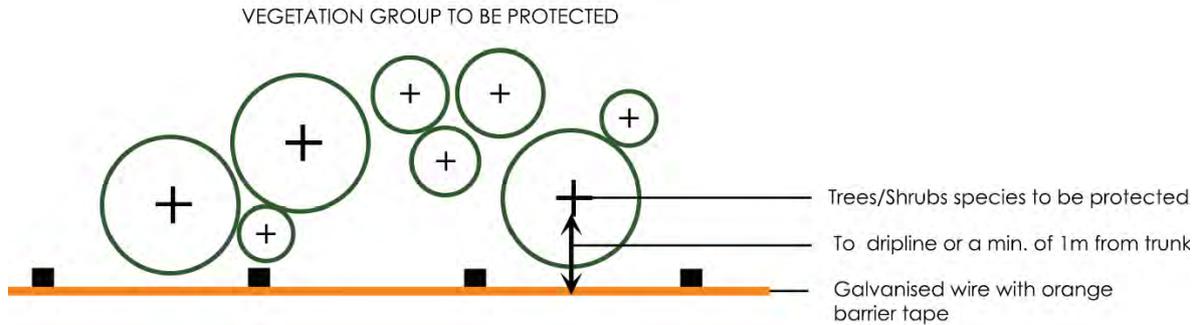
As discussed in this report, the proposed works are considered unlikely to significantly impact upon any threatened flora/fauna species or endangered ecological communities occurring elsewhere within the locality.

### **8.2 MITIGATION MEASURES**

The following measures are proposed to mitigate potential impacts associated with site development:

### 8.2.1 IMPACT OF VEGETATION AND HABITAT CLEARING

Disturbance to areas of native and exotic vegetation as described in this report will be unavoidable to deliver the proposal. To ensure that clearing impacts do not occur outside of the designated construction zone it will be necessary to clearly identify and mark the boundaries the works zones onsite prior to construction. Such boundaries are to be protected via high visibility fencing, sediment fencing and/or signage identifying that no construction activities (including temporary storage, stockpiling, vehicle movement etc) are permitted beyond.



INDIVIDUAL TREE TO BE PROTECTED



**FIGURE 15 – EXAMPLES OF VEGETATION PROTECTION FENCING**

Within the designated dwelling envelope identification of areas to be cleared are to be pre-assessed by an experienced ecologist and wildlife spotter/catcher. This pre-assessment shall allow for an inventory of trees bearing bird nests and/or other trees representing fauna habitat to be undertaken prior to felling works. A wildlife spotter catcher is to be utilised during all phases of clearing of the site to ensure safe dispersal and relocation of native fauna.

Salvageable habitat components such as hollow stems or ground logs shall also be stockpiled and randomly dispersed throughout the retained bushland external to the proposal site.

Any pruning works to be supervised.

### **8.2.2 IMPACTS ASSOCIATED WITH EDGE EFFECTS & WEED MANAGEMENT**

The following design and management initiatives are proposed in association with site development to progressively reduce the impact of 'edge effects' on the retained, interconnected native vegetation remnants:

### **8.2.3 TERRESTRIAL FAUNA DISPERSAL BARRIERS, BARRIER EFFECTS**

As discussed in the previous sections the following measures are proposed to reduce the potential impact of the proposal on continued terrestrial fauna dispersal within the locality:

- Limited clearing of habitat which represents low ecological values to a to a small area at the edge of the existing semi-contiguous remnant

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## 8.3 ENHANCEMENT & RESTORATION

The following actions are aimed at providing a level of enhancement to retained habitats and restoration of degraded areas of the site. These actions focus upon bush regeneration activities, replacing fauna habitats and restoring native vegetation biomass following construction:

### 8.3.1 REVEGETATION & RESTORATION OF DISTURBED AREAS

Following stabilisation and development, a modified habitat zone (i.e. residential areas with gardens beds, lawn, buildings etc) will be restored within the disturbance area. This zone however is likely to only favour common species ((i.e. common animals tolerant to human proximity).

### 8.3.2 WEED MANAGEMENT

It is recommended that treatment of weeds within the site (in particular within the retained vegetation) be undertaken.

Control techniques will vary depending upon the species being targeted and its location. In areas of low significance (i.e. weed thickets external to bushland or drainage lines etc) broad scale application of herbicide or mechanical removal will be appropriate. Within the proximity to areas of native floral species dominance more selective removal techniques (i.e. cut stump, stem application, hand removal etc) and spot application of a non-residual herbicide (i.e. roundup bioactive) would be necessary.

In addition, a general weed propagule protocol should also be applied whereby vehicles and machinery is checked for vegetative material (particularly in tyres or chassis) prior to entry to the site. An exit inspection should also be undertaken to ensure material is not removed from the site to an external bushland location.

## 9.0 SUMMARY & CONCLUSIONS

Planit Consulting has been commissioned by Gold Coral Pty Ltd to prepare terrestrial flora and fauna assessment report relating to the proposed residential development located at Iron Gates, Evans Head. The development footprint incorporates Part Lot 277 DP755624, Part Lot 276 DP755624 and Part Lot 163 DP831052 which is accessed by Iron Gates Road within the suburb of Evans Head. The assessment has included the following:

- Survey, ground truthing and mapping of vegetation communities and determining conservation status reflective of reference reports and onsite condition
- Survey for faunal species including an assessment of the site's habitat value
- Survey for threatened flora species
- Providing an flora and fauna assessment report identifying development constraints, impacts and mitigation methods for proposed activities
- Addressing statutory requirements including Section 5A of the Environmental Planning and Assessment Act and the required SEPP assessments.

The flora survey of the study area identified four vegetation communities occurring. One flora species (Lesser Swamp Orchid or Greater Swamp Orchid) listed as endangered under the *Threatened Species Conservation Act 1995* was recorded on site.



One Endangered Ecological Community (Littoral Rainforest) was recorded on site and had a mapped area of approximately 8.1ha. No areas of this EEC will be removed for the proposal.

The development will remove approximately 2000m<sup>2</sup> of the Open Dry Heath and 1.18ha of Open Dry Heath with mixed Eucalypt which is well conserved in the surrounding conservation network.

The development will require the removal of approximately 1200m<sup>2</sup> of Heathy Scribbly Gum for roads and an additional 400m is proposed for removal with bushfire requirements and lots.

The proposal does not remove any Littoral rainforest. As noted the road extension will necessitate minor pruning of limbs within the road reserve.

As discussed in this report it is considered that these works will not have a significant environmental impact due to the highly modified nature of the areas to be affected. The clearing does not result in fragmentation or increased edge effects given the existing configuration of the remnants.

The fauna survey of the study area (and immediately adjacent areas) resulted in the recording of 74 species of bird, 8 reptiles, 5 amphibians and 26 mammals (or evidence of their previous presence). Of these species 7 (Grey Headed Flying-fox, Hoary Wattled Bat, Little Bentwing-bat, Southern Myotis, Koala, Wallum Froglet and Squirrel Glider) are scheduled under the *Threatened Species Conservation Act 1995*.

A Section 5A of the *Environmental Planning and Assessment Act 1979* (the '7-Part Test of Significance') was conducted for the seven recorded fauna species to determine whether the proposal may have the potential to impact the species. Section 5A was also conducted for the recorded Endangered Ecological Community (Littoral Rainforest) and the recorded Swamp Orchid.

The assessment concludes that the impacts of the proposed development are unlikely to threaten the viability of any local populations of the nominated species/communities and the proposal did not result in a significant impact. A species impact is therefore not required.

A SEPP 44 assessment was also conducted which concludes that the site does not contain core koala habitat. A Koala Management Plan is therefore not required.

Whilst the Iron Gates development proposal is considered unlikely to significantly affect native flora, fauna or associated habitat, it will result in the minor loss of local habitat for native species through tree removal/vegetation removal.

In this regard recommendations have been included in this report regarding the management of works to minimize disruption to native fauna, minimize damage to retained vegetation and local weed management and revegetation to compensate for minor habitat losses.

## **10.0 ATTACHMENTS**

**ATTACHMENT 1: PROPOSED PLANS**

**ATTACHMENT 2: BROAD VEGETATION COMMUNITY MAP**

**ATTACHMENT 3: FAUNA SURVEY MAP**

**ATTACHMENT 4: NPWS ATLAS OF NSW WILDLIFE DATABASE SEARCH**



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## **ATTACHMENT 1**

### **PROPOSED PLANS FOR THE DEVELOPMENT**

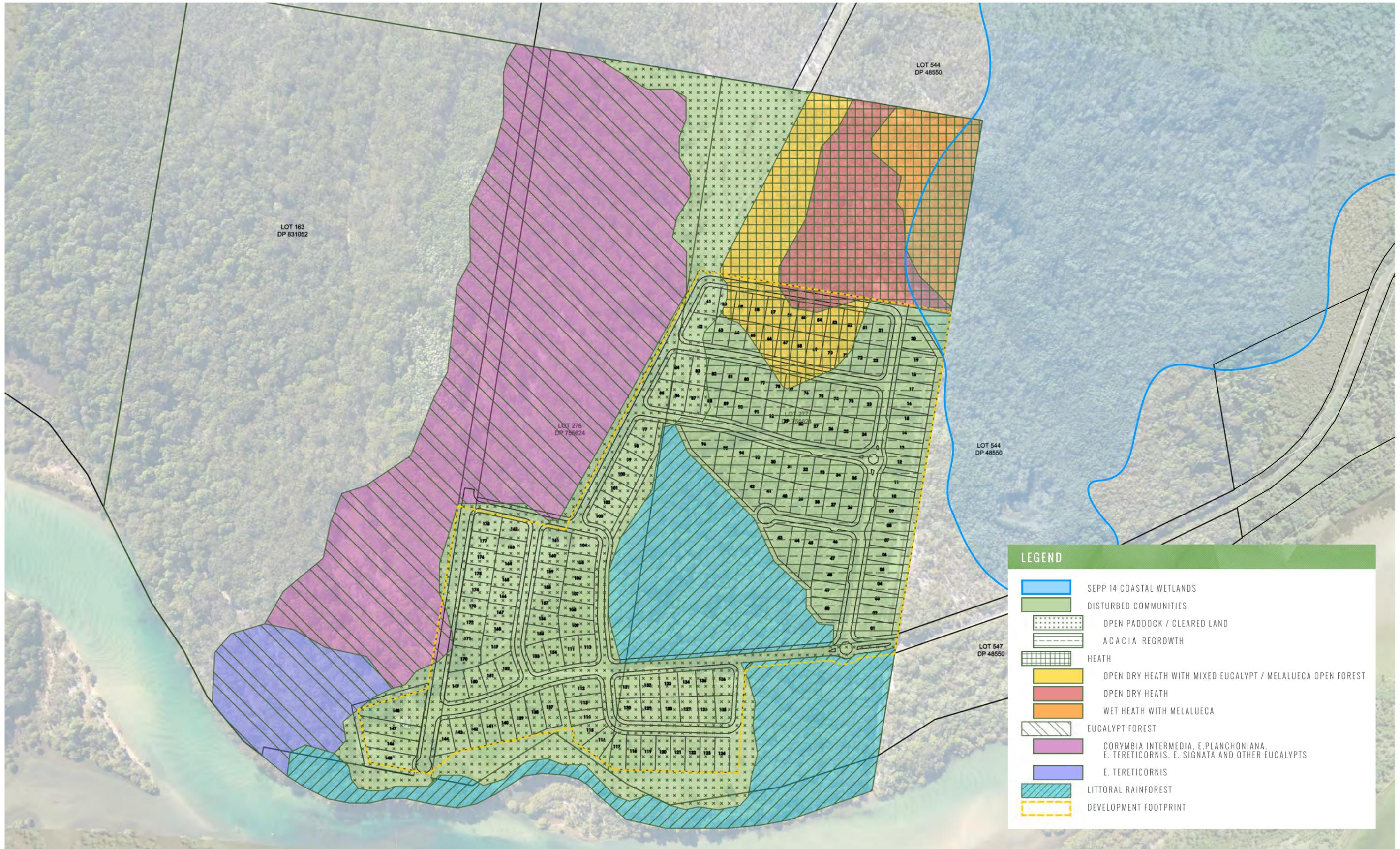
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## **ATTACHMENT 2**

### **BROAD VEGETATION COMMUNITY MAP**

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# IRON GATES, EVANS HEAD

BROAD VEGETATION COMMUNITIES

SCALE: 1:4000 @ A1  
DATE: 08/14  
REV: 01

DRAWN: ZP  
CHECKED: BS  
DRAWN NO: IRONGATES\_BVC\_00



Level 1 2247 Gold Coast Hwy  
Nobby Beach  
PO Box 206 Nobby Beach QLD 4218

Telephone: 07 5526 1500  
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## **ATTACHMENT 3**

### **FAUNA SURVEY MAP**

---



**LEGEND**

-  ANA BAT
-  DIGI RECORDER
-  PLAY BACK
-  GROUND SEARCH
-  DUSK / DAWN SURVEY
-  SPOT LIGHT SEARCH

**IRON GATES, EVANS HEAD**  
 FAUNA SURVEYING TECHNIQUES - PART 1

SCALE: 1:4000 @ A1  
 DATE: 08/14  
 REV: 00

DRAWN: ZP  
 CHECKED: BS  
 DRAWN NO: IRONGATES\_FST\_01



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**LEGEND**

- P PITFALL
- C CAGE
- E ELLIOT TRAP
- H HAIR TRAP

# IRON GATES, EVANS HEAD

FAUNA SURVEYING TECHNIQUES - PART 2

SCALE: 1:4000 @ A1  
 DATE: 08/14  
 REV: 00

DRAWN: ZP  
 CHECKED: BS  
 DRAWN NO: IRONGATES\_FST\_02



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## **ATTACHMENT 4**

# **NPWS ATLAS OF NSW WILDLIFE DATABASE SEARCH**

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Data from the BioNet Atlas of NSW Wildlife website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions.

Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°; ^^ rounded to 0.01°).

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Search criteria : Public Report of all Valid Records of Entities in selected area [North: -29.07 West: 153.35999999999999 East: 153.45999999999998 South: -29.17] returned a total of 5,041 records of 1,023 species.

Report generated on 13/05/2014 10:48 AM

Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Animalia	Amphibia	Myobatrachidae	3001	<i>Adelotus brevis</i>		Tusked Frog	P		2	
Animalia	Amphibia	Myobatrachidae	3131	<i>Crinia parinsignifera</i>		Eastern Sign-bearing Froglet	P		6	
Animalia	Amphibia	Myobatrachidae	3134	<i>Crinia signifera</i>		Common Eastern Froglet	P		22	
Animalia	Amphibia	Myobatrachidae	3137	<i>Crinia tinnula</i>		Wallum Froglet	V,P		19	
Animalia	Amphibia	Myobatrachidae	3112	<i>Limnodynastes ornatus</i>		Ornate Burrowing Frog	P		1	
Animalia	Amphibia	Myobatrachidae	3061	<i>Limnodynastes peronii</i>		Brown-striped Frog	P		19	
Animalia	Amphibia	Myobatrachidae	3063	<i>Limnodynastes tasmaniensis</i>		Spotted Grass Frog	P		1	
Animalia	Amphibia	Myobatrachidae	3064	<i>Limnodynastes terraereginae</i>		Northern Banjo Frog	P		4	
Animalia	Amphibia	Myobatrachidae	3074	<i>Mixophyes fasciolatus</i>		Great Barred Frog	P		2	
Animalia	Amphibia	Myobatrachidae	3117	<i>Pseudophryne bibronii</i>		Bibron's Toadlet	P		1	
Animalia	Amphibia	Myobatrachidae	3118	<i>Pseudophryne coriacea</i>		Red-backed Toadlet	P		10	
Animalia	Amphibia	Myobatrachidae	3035	<i>Uperoleia fusca</i>		Dusky Toadlet	P		2	
Animalia	Amphibia	Hylidae	3171	<i>Litoria caerulea</i>		Green Tree Frog	P		4	
Animalia	Amphibia	Hylidae	3183	<i>Litoria fallax</i>		Eastern Dwarf Tree Frog	P		23	
Animalia	Amphibia	Hylidae	3184	<i>Litoria freycineti</i>		Freycinet's Frog	P		11	
Animalia	Amphibia	Hylidae	3187	<i>Litoria gracilentata</i>		Dainty Green Tree Frog	P		2	
Animalia	Amphibia	Hylidae	3191	<i>Litoria latopalmata</i>		Broad-palmed Frog	P		4	
Animalia	Amphibia	Hylidae	3316	<i>Litoria lesueuri</i>		Lesueur's Frog	P		1	
Animalia	Amphibia	Hylidae	3199	<i>Litoria nasuta</i>		Rocket Frog	P		9	
Animalia	Amphibia	Hylidae	3202	<i>Litoria olongburensis</i>		Olongburra Frog	V,P	V	8	
Animalia	Amphibia	Hylidae	3204	<i>Litoria peronii</i>		Peron's Tree Frog	P		2	
Animalia	Amphibia	Hylidae	3206	<i>Litoria phyllochroa</i>		Leaf-green Tree Frog	P		1	
Animalia	Amphibia	Hylidae	3219	<i>Litoria revelata</i>		Revealed Frog	P		1	
Animalia	Amphibia	Hylidae	3214	<i>Litoria tyleri</i>		Tyler's Tree Frog	P		8	
Animalia	Amphibia	Bufonidae	3269	<i>Rhinella marina</i>	*	Cane Toad			10	
Animalia	Reptilia	Cheloniidae	2004	<i>Caretta caretta</i>		Loggerhead Turtle	E1,P	E	2	
Animalia	Reptilia	Cheloniidae	2007	<i>Chelonia mydas</i>		Green Turtle	V,P	V	2	
Animalia	Reptilia	Dermochelyidae	2013	<i>Dermochelys coriacea</i>		Leatherback Turtle	E1,P	E	1	
Animalia	Reptilia	Chelidae	2017	<i>Chelodina longicollis</i>		Eastern Snake-necked Turtle	P		5	
Animalia	Reptilia	Chelidae	2951	<i>Emydura macquarii macquarii</i>		Macquarie River Turtle	P		1	

Animalia	Reptilia	Pygopodidae	2170	<i>Lialis burtonis</i>	Burton's Snake-lizard	P	1
Animalia	Reptilia	Scincidae	2411	<i>Bellatorias frerei</i>	Major Skink	P	2
Animalia	Reptilia	Scincidae	2417	<i>Bellatorias major</i>	Land Mullet	P	5
Animalia	Reptilia	Scincidae	2031	<i>Calyptotis ruficauda</i>	Red-tailed Calyptotis	P	1
Animalia	Reptilia	Scincidae	2331	<i>Cryptoblepharus virgatus</i>	Cream-striped Shinning-skink	P	3
Animalia	Reptilia	Scincidae	2375	<i>Ctenotus robustus</i>	Robust Ctenotus	P	5
Animalia	Reptilia	Scincidae	2386	<i>Ctenotus taeniolatus</i>	Copper-tailed Skink	P	4
Animalia	Reptilia	Scincidae	2557	<i>Eulamprus quoyii</i>	Eastern Water-skink	P	5
Animalia	Reptilia	Scincidae	2450	<i>Lampropholis delicata</i>	Dark-flecked Garden Sunskink	P	4
Animalia	Reptilia	Scincidae	2451	<i>Lampropholis guichenoti</i>	Pale-flecked Garden Sunskink	P	2
Animalia	Reptilia	Scincidae	2542	<i>Saiphos equalis</i>	Three-toed Skink	P	6
Animalia	Reptilia	Agamidae	2195	<i>Amphibolurus nobbi</i>	Nobbi	P	5
Animalia	Reptilia	Agamidae	2252	<i>Intellagama lesueurii</i>	Eastern Water Dragon	P	4
Animalia	Reptilia	Agamidae	2177	<i>Pogona barbata</i>	Bearded Dragon	P	3
Animalia	Reptilia	Varanidae	2271	<i>Varanus gouldii</i>	Gould's Goanna	P	3
Animalia	Reptilia	Varanidae	2283	<i>Varanus varius</i>	Lace Monitor	P	8
Animalia	Reptilia	Boidae	2625	<i>Morelia spilota</i>	Carpet & Diamond Pythons	P	1
Animalia	Reptilia	Boidae	5095	<i>Morelia spilota mcdowelli</i>	Eastern Carpet Python	P	3
Animalia	Reptilia	Colubridae	2630	<i>Boiga irregularis</i>	Brown Tree Snake	P	1
Animalia	Reptilia	Colubridae	2633	<i>Dendrelaphis punctulatus</i>	Common Tree Snake	P	3
Animalia	Reptilia	Elapidae	2640	<i>Acanthophis antarcticus</i>	Common Death Adder	P	2
Animalia	Reptilia	Elapidae	5136	<i>Cryptophis nigrescens</i>	Eastern Small-eyed Snake	P	4
Animalia	Reptilia	Elapidae	2655	<i>Demansia psammophis</i>	Yellow-faced Whip Snake	P	2
Animalia	Reptilia	Elapidae	2674	<i>Hemiaspis signata</i>	Black-bellied Swamp Snake	P	4
Animalia	Reptilia	Elapidae	2681	<i>Notechis scutatus</i>	Tiger Snake	P	1
Animalia	Reptilia	Elapidae	2770	<i>Pelamis platurus</i>	Yellow-bellied Seasnake	P	2
Animalia	Reptilia	Elapidae	2693	<i>Pseudechis porphyriacus</i>	Red-bellied Black Snake	P	5
Animalia	Reptilia	Elapidae	2699	<i>Pseudonaja textilis</i>	Eastern Brown Snake	P	1
Animalia	Reptilia	Elapidae	2734	<i>Vermicella annulata</i>	Bandy-bandy	P	3
Animalia	Aves	Casuariidae	0001	<i>Dromaius novaehollandiae</i>	Emu	P	7
Animalia	Aves	Casuariidae	0001	<i>Dromaius novaehollandiae</i>	Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area	E2,P	7
Animalia	Aves	Phasianidae	0011	<i>Coturnix ypsilophora</i>	Brown Quail	P	10
Animalia	Aves	Phasianidae	0012	<i>Excalfactoria chinensis</i>	King Quail	P	2
Animalia	Aves	Anatidae	0210	<i>Anas castanea</i>	Chestnut Teal	P	1
Animalia	Aves	Anatidae	0211	<i>Anas gracilis</i>	Grey Teal	P	2
Animalia	Aves	Anatidae	0208	<i>Anas superciliosa</i>	Pacific Black Duck	P	11
Animalia	Aves	Anatidae	0215	<i>Aythya australis</i>	Hardhead	P	1
Animalia	Aves	Anatidae	0217	<i>Biziura lobata</i>	Musk Duck	P	1
Animalia	Aves	Anatidae	0202	<i>Chenonetta jubata</i>	Australian Wood Duck	P	3
Animalia	Aves	Anatidae	0203	<i>Cygnus atratus</i>	Black Swan	P	2
Animalia	Aves	Podicipedidae	0061	<i>Tachybaptus novaehollandiae</i>	Australasian Grebe	P	1
Animalia	Aves	Columbidae	0033	<i>Chalcophaps indica</i>	Emerald Dove	P	1
Animalia	Aves	Columbidae	0028	<i>Columba leucomela</i>	White-headed Pigeon	P	1





Animalia	Aves	Threskiornithidae	0180	<i>Threskiornis spinicollis</i>	Straw-necked Ibis	P		7	
Animalia	Aves	Accipitridae	0222	<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk	P		1	
Animalia	Aves	Accipitridae	0221	<i>Accipiter fasciatus</i>	Brown Goshawk	P		6	
Animalia	Aves	Accipitridae	0224	<i>Aquila audax</i>	Wedge-tailed Eagle	P		4	
Animalia	Aves	Accipitridae	0234	<i>Aviceda subcristata</i>	Pacific Baza	P		1	
Animalia	Aves	Accipitridae	0219	<i>Circus approximans</i>	Swamp Harrier	P		26	
Animalia	Aves	Accipitridae	0218	<i>Circus assimilis</i>	Spotted Harrier	V,P		4	
Animalia	Aves	Accipitridae	0232	<i>Elanus axillaris</i>	Black-shouldered Kite	P		9	
Animalia	Aves	Accipitridae	0223	<i>Erythrotriorchis radiatus</i>	Red Goshawk	E4A,P,2	V	2	
Animalia	Aves	Accipitridae	0226	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	P	C	20	
Animalia	Aves	Accipitridae	0227	<i>Haliaeetus indus</i>	Brahminy Kite	P		23	
Animalia	Aves	Accipitridae	0228	<i>Haliaeetus spheurnus</i>	Whistling Kite	P		41	
Animalia	Aves	Accipitridae	0225	<i>Hieraaetus morphnoides</i>	Little Eagle	V,P		5	
Animalia	Aves	Accipitridae	8739	<i>Pandion cristatus</i>	Eastern Osprey	V,P,3		37	
Animalia	Aves	Falconidae	0239	<i>Falco berigora</i>	Brown Falcon	P		6	
Animalia	Aves	Falconidae	0240	<i>Falco cenchroides</i>	Nankeen Kestrel	P		1	
Animalia	Aves	Falconidae	0235	<i>Falco longipennis</i>	Australian Hobby	P		1	
Animalia	Aves	Falconidae	0237	<i>Falco peregrinus</i>	Peregrine Falcon	P		3	
Animalia	Aves	Gruidae	0177	<i>Grus rubicunda</i>	Brolga	V,P		12	
Animalia	Aves	Rallidae	0053	<i>Amaurornis moluccana</i>	Pale-vented Bush-hen	V,P		2	
Animalia	Aves	Rallidae	0059	<i>Fulica atra</i>	Eurasian Coot	P		2	
Animalia	Aves	Rallidae	0056	<i>Gallinula tenebrosa</i>	Dusky Moorhen	P		4	
Animalia	Aves	Rallidae	0046	<i>Gallirallus philippensis</i>	Buff-banded Rail	P		4	
Animalia	Aves	Rallidae	0045	<i>Lewinia pectoralis</i>	Lewin's Rail	P		3	
Animalia	Aves	Rallidae	0058	<i>Porphyrio porphyrio</i>	Purple Swamphen	P		4	
Animalia	Aves	Rallidae	0050	<i>Porzana pusilla</i>	Baillon's Crane	P		1	
Animalia	Aves	Rallidae	0051	<i>Porzana tabuensis</i>	Spotless Crane	P		1	
Animalia	Aves	Burhinidae	0174	<i>Burhinus gallarius</i>	Bush Stone-curlew	E1,P		1	
Animalia	Aves	Burhinidae	0175	<i>Esacus magnirostris</i>	Beach Stone-curlew	E4A,P		15	
Animalia	Aves	Haematopodidae	0131	<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	V,P		3	
Animalia	Aves	Haematopodidae	0130	<i>Haematopus longirostris</i>	Pied Oystercatcher	E1,P		36	
Animalia	Aves	Recurvirostridae	0146	<i>Himantopus himantopus</i>	Black-winged Stilt	P		7	
Animalia	Aves	Charadriidae	0141	<i>Charadrius leschenaultii</i>	Greater Sand-plover	V,P	C,J,K	1	
Animalia	Aves	Charadriidae	0139	<i>Charadrius mongolus</i>	Lesser Sand-plover	V,P	C,J,K	1	
Animalia	Aves	Charadriidae	0143	<i>Charadrius ruficapillus</i>	Red-capped Plover	P		5	
Animalia	Aves	Charadriidae	0144	<i>Elseya melanops</i>	Black-fronted Dotterel	P		2	
Animalia	Aves	Charadriidae	0132	<i>Erythrogonys cinctus</i>	Red-kneed Dotterel	P		1	
Animalia	Aves	Charadriidae	8006	<i>Pluvialis fulva</i>	Pacific Golden Plover	P	C,J,K	9	
Animalia	Aves	Charadriidae	0133	<i>Vanellus miles</i>	Masked Lapwing	P			
								23	
Animalia	Aves	Jacanidae	0171	<i>Irediparra gallinacea</i>	Comb-crested Jacana	V,P		1	

Animalia	Aves	Scolopacidae	0157	<i>Actitis hypoleucos</i>	Common Sandpiper	P	C,J,K	1	
Animalia	Aves	Scolopacidae	0129	<i>Arenaria interpres</i>	Ruddy Turnstone	P	C,J,K	1	
Animalia	Aves	Scolopacidae	0163	<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	P	C,J,K		
								3	
Animalia	Aves	Scolopacidae	0161	<i>Calidris ferruginea</i>	Curlew Sandpiper	E1,P	C,J,K	2	
Animalia	Aves	Scolopacidae	0162	<i>Calidris ruficollis</i>	Red-necked Stint	P	C,J,K	2	
Animalia	Aves	Scolopacidae	0168	<i>Gallinago hardwickii</i>	Latham's Snipe	P	C,J,K	3	
Animalia	Aves	Scolopacidae	0167	<i>Limicola falcinellus</i>	Broad-billed Sandpiper	V,P	C,J,K	1	
Animalia	Aves	Scolopacidae	0153	<i>Limosa lapponica</i>	Bar-tailed Godwit	P	C,J,K	15	
Animalia	Aves	Scolopacidae	0149	<i>Numenius madagascariensis</i>	Eastern Curlew	P	C,J,K	16	
Animalia	Aves	Scolopacidae	0150	<i>Numenius phaeopus</i>	Whimbrel	P	C,J,K	20	
Animalia	Aves	Scolopacidae	0155	<i>Tringa brevipes</i>	Grey-tailed Tattler	P	C,J,K	8	
Animalia	Aves	Scolopacidae	0158	<i>Tringa nebularia</i>	Common Greenshank	P	C,J,K	11	
Animalia	Aves	Scolopacidae	0159	<i>Tringa stagnatilis</i>	Marsh Sandpiper	P	C,J,K	1	
Animalia	Aves	Turnicidae	0014	<i>Turnix varius</i>	Painted Button-quail	P		2	
Animalia	Aves	Laridae	0110	<i>Chlidonias hybrida</i>	Whiskered Tern	P		3	
Animalia	Aves	Laridae	0125	<i>Chroicocephalus novaehollandiae</i>	Silver Gull	P		24	
Animalia	Aves	Laridae	0111	<i>Gelochelidon nilotica</i>	Gull-billed Tern	P		10	
Animalia	Aves	Laridae	0953	<i>Sterna hirundo</i>	Common Tern	P	C,J,K	12	
Animalia	Aves	Laridae	0952	<i>Sterna paradisaea</i>	Arctic Tern	P			
								1	
Animalia	Aves	Laridae	0117	<i>Sterna albifrons</i>	Little Tern	E1,P	C,J,K	5	
Animalia	Aves	Laridae	0115	<i>Thalasseus bergii</i>	Crested Tern	P		33	
Animalia	Aves	Cacatuidae	0267	<i>Calyptorhynchus funereus</i>	Yellow-tailed Black-Cockatoo	P		14	
Animalia	Aves	Cacatuidae	0265	<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V,P,2		7	
Animalia	Aves	Cacatuidae	0273	<i>Eolophus roseicapillus</i>	Galah	P		3	
Animalia	Aves	Psittacidae	0281	<i>Alisterus scapularis</i>	Australian King-Parrot	P		2	
Animalia	Aves	Psittacidae	0260	<i>Glossopsitta pusilla</i>	Little Lorikeet	V,P		3	
Animalia	Aves	Psittacidae	8913	<i>Pezoporus wallicus wallicus</i>	Eastern Ground Parrot	V,P,3		22	
Animalia	Aves	Psittacidae	0282	<i>Platycercus elegans</i>	Crimson Rosella	P		1	
Animalia	Aves	Psittacidae	0288	<i>Platycercus eximius</i>	Eastern Rosella	P		2	
Animalia	Aves	Psittacidae	0256	<i>Trichoglossus chlorolepidotus</i>	Scaly-breasted Lorikeet	P		11	
Animalia	Aves	Psittacidae	9947	<i>Trichoglossus haematodus</i>	Rainbow Lorikeet	P		9	
Animalia	Aves	Centropodidae	0349	<i>Centropus phasianinus</i>	Pheasant Coucal	P		14	
Animalia	Aves	Cuculidae	0338	<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo	P		9	
Animalia	Aves	Cuculidae	0337	<i>Cacomantis pallidus</i>	Pallid Cuckoo	P		1	
Animalia	Aves	Cuculidae	0339	<i>Cacomantis variolosus</i>	Brush Cuckoo	P		2	
Animalia	Aves	Cuculidae	0342	<i>Chalcites basalis</i>	Horsfield's Bronze-Cuckoo	P		5	
Animalia	Aves	Cuculidae	0343	<i>Chalcites lucidus</i>	Shining Bronze-Cuckoo	P		6	
Animalia	Aves	Cuculidae	0347	<i>Eudynamys orientalis</i>	Eastern Koel	P		9	
Animalia	Aves	Cuculidae	0348	<i>Scythrops novaehollandiae</i>	Channel-billed Cuckoo	P		1	
Animalia	Aves	Strigidae	9922	<i>Ninox novaeseelandiae</i>	Southern Boobook	P		1	
Animalia	Aves	Strigidae	0248	<i>Ninox strenua</i>	Powerful Owl	V,P,3		1	

Animalia	Aves	Tytonidae	9923	<i>Tyto javanica</i>	Eastern Barn Owl	P	2	
Animalia	Aves	Tytonidae	0252	^^ <i>Tyto longimembris</i>	Eastern Grass Owl	V,P,3	13	
Animalia	Aves	Tytonidae	0250	^^ <i>Tyto novaehollandiae</i>	Masked Owl	V,P,3	2	
Animalia	Aves	Alcedinidae	0319	<i>Ceyx azureus</i>	Azure Kingfisher	P	6	
Animalia	Aves	Alcedinidae	0322	<i>Dacelo novaeguineae</i>	Laughing Kookaburra	P	10	
Animalia	Aves	Alcedinidae	0324	<i>Todiramphus macleayii</i>	Forest Kingfisher	P	2	
Animalia	Aves	Alcedinidae	0326	<i>Todiramphus sanctus</i>	Sacred Kingfisher	P	17	
Animalia	Aves	Meropidae	0329	<i>Merops ornatus</i>	Rainbow Bee-eater	P	J	21
Animalia	Aves	Coraciidae	0318	<i>Eurystomus orientalis</i>	Dollarbird	P	7	
Animalia	Aves	Pittidae	0352	<i>Pitta versicolor</i>	Noisy Pitta	P	1	
Animalia	Aves	Climacteridae	0558	<i>Cormobates leucophaea</i>	White-throated Treecreeper	P	3	
Animalia	Aves	Ptilonorhynchidae	0684	<i>Sericulus chrysocephalus</i>	Regent Bowerbird	P	1	
Animalia	Aves	Maluridae	0529	<i>Malurus cyaneus</i>	Superb Fairy-wren	P	9	
Animalia	Aves	Maluridae	0536	<i>Malurus lamberti</i>	Variagated Fairy-wren	P	12	
Animalia	Aves	Maluridae	0541	<i>Malurus melanocephalus</i>	Red-backed Fairy-wren	P	4	
Animalia	Aves	Maluridae	0526	<i>Stipiturus malachurus</i>	Southern Emu-wren	P	11	
Animalia	Aves	Acanthizidae	0475	<i>Acanthiza pusilla</i>	Brown Thornbill	P	14	
Animalia	Aves	Acanthizidae	0484	<i>Acanthiza reguloides</i>	Buff-rumped Thornbill	P	1	
Animalia	Aves	Acanthizidae	0460	<i>Gerygone levigaster</i>	Mangrove Gerygone	P	7	
Animalia	Aves	Acanthizidae	0453	<i>Gerygone olivacea</i>	White-throated Gerygone	P	8	
Animalia	Aves	Acanthizidae	0488	<i>Sericornis frontalis</i>	White-browed Scrubwren	P	9	
Animalia	Aves	Acanthizidae	0494	<i>Sericornis magnirostra</i>	Large-billed Scrubwren	P	1	
Animalia	Aves	Pardalotidae	0565	<i>Pardalotus punctatus</i>	Spotted Pardalote	P	4	
Animalia	Aves	Pardalotidae	0976	<i>Pardalotus striatus</i>	Striated Pardalote	P	13	
Animalia	Aves	Meliphagidae	0591	<i>Acanthorhynchus tenuirostris</i>	Eastern Spinebill	P	3	
Animalia	Aves	Meliphagidae	0638	<i>Anthochaera carunculata</i>	Red Wattlebird	P	1	
Animalia	Aves	Meliphagidae	0710	<i>Anthochaera chrysoptera</i>	Little Wattlebird	P	18	
Animalia	Aves	Meliphagidae	0603	<i>Anthochaera phrygia</i>	Regent Honeyeater	E4A,P	E	
							2	
Animalia	Aves	Meliphagidae	0641	<i>Entomyzon cyanotis</i>	Blue-faced Honeyeater	P	6	
Animalia	Aves	Meliphagidae	0593	<i>Gliciphila melanops</i>	Tawny-crowned Honeyeater	P	10	
Animalia	Aves	Meliphagidae	0614	<i>Lichenostomus chrysops</i>	Yellow-faced Honeyeater	P	7	
Animalia	Aves	Meliphagidae	0617	<i>Lichenostomus leucotis</i>	White-eared Honeyeater	P	1	
Animalia	Aves	Meliphagidae	0597	<i>Lichmera indistincta</i>	Brown Honeyeater	P	22	
Animalia	Aves	Meliphagidae	0634	<i>Manorina melanocephala</i>	Noisy Miner	P	5	
Animalia	Aves	Meliphagidae	0605	<i>Meliphaga lewinii</i>	Lewin's Honeyeater	P	19	
Animalia	Aves	Meliphagidae	0579	<i>Melithreptus albogularis</i>	White-throated Honeyeater	P	5	
Animalia	Aves	Meliphagidae	0586	<i>Myzomela sanguinolenta</i>	Scarlet Honeyeater	P	17	
Animalia	Aves	Meliphagidae	0646	<i>Philemon citreogularis</i>	Little Friarbird	P	3	
Animalia	Aves	Meliphagidae	0645	<i>Philemon corniculatus</i>	Noisy Friarbird	P	19	
Animalia	Aves	Meliphagidae	0632	<i>Phylidonyris niger</i>	White-cheeked Honeyeater	P	20	
Animalia	Aves	Meliphagidae	0631	<i>Phylidonyris novaehollandiae</i>	New Holland Honeyeater	P	1	
Animalia	Aves	Meliphagidae	0585	<i>Plectorhyncha lanceolata</i>	Striped Honeyeater	P	2	
Animalia	Aves	Pomatostomidae	8388	<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V,P	2	
Animalia	Aves	Psophodidae	0421	<i>Psophodes olivaceus</i>	Eastern Whipbird	P	8	

Animalia	Aves	Campephagidae	0428	<i>Coracina lineata</i>	Barred Cuckoo-shrike	V,P	2
Animalia	Aves	Campephagidae	0424	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	P	12
Animalia	Aves	Campephagidae	0429	<i>Coracina tenuirostris</i>	Cicadabird	P	6
Animalia	Aves	Campephagidae	0431	<i>Lalage leucomela</i>	Varied Triller	P	9
Animalia	Aves	Campephagidae	0430	<i>Lalage sueurii</i>	White-winged Triller	P	2
Animalia	Aves	Pachycephalidae	0408	<i>Colluricincla harmonica</i>	Grey Shrike-thrush	P	16
Animalia	Aves	Pachycephalidae	0413	<i>Colluricincla megarhyncha</i>	Little Shrike-thrush	P	3
Animalia	Aves	Pachycephalidae	0398	<i>Pachycephala pectoralis</i>	Golden Whistler	P	5
Animalia	Aves	Pachycephalidae	0401	<i>Pachycephala rufiventris</i>	Rufous Whistler	P	11
Animalia	Aves	Oriolidae	0671	<i>Oriolus sagittatus</i>	Olive-backed Oriole	P	7
Animalia	Aves	Oriolidae	0432	<i>Sphecotheres vieilloti</i>	Australasian Figbird	P	6
Animalia	Aves	Artamidae	0547	<i>Artamus cyanopterus</i>	Dusky Woodswallow	P	6
Animalia	Aves	Artamidae	0543	<i>Artamus leucorhynchus</i>	White-breasted Woodswallow	P	8
Animalia	Aves	Artamidae	0544	<i>Artamus personatus</i>	Masked Woodswallow	P	2
Animalia	Aves	Artamidae	0545	<i>Artamus superciliosus</i>	White-browed Woodswallow	P	3
Animalia	Aves	Artamidae	0700	<i>Cracticus nigrogularis</i>	Pied Butcherbird	P	10
Animalia	Aves	Artamidae	0705	<i>Cracticus tibicen</i>	Australian Magpie	P	12
Animalia	Aves	Artamidae	0702	<i>Cracticus torquatus</i>	Grey Butcherbird	P	6
Animalia	Aves	Artamidae	0694	<i>Strepera graculina</i>	Pied Currawong	P	10
Animalia	Aves	Dicruridae	0673	<i>Dicrurus bracteatus</i>	Spangled Drongo	P	10
Animalia	Aves	Rhipiduridae	0361	<i>Rhipidura albiscapa</i>	Grey Fantail	P	21
Animalia	Aves	Rhipiduridae	0364	<i>Rhipidura leucophrys</i>	Willie Wagtail	P	2
Animalia	Aves	Rhipiduridae	0362	<i>Rhipidura rufifrons</i>	Rufous Fantail	P	3
Animalia	Aves	Corvidae	0930	<i>Corvus coronoides</i>	Australian Raven	P	1
Animalia	Aves	Corvidae	9902	<i>Corvus orru</i>	Torresian Crow	P	
							18
Animalia	Aves	Monarchidae	0376	<i>Carteromis leucotis</i>	White-eared Monarch	V,P	1
Animalia	Aves	Monarchidae	0415	<i>Grallina cyanoleuca</i>	Magpie-lark	P	6
Animalia	Aves	Monarchidae	0373	<i>Monarcha melanopsis</i>	Black-faced Monarch	P	5
Animalia	Aves	Monarchidae	0365	<i>Myiagra rubecula</i>	Leaden Flycatcher	P	12
Animalia	Aves	Monarchidae	0375	<i>Symphysia trivirgatus</i>	Spectacled Monarch	P	2
Animalia	Aves	Petroicidae	0392	<i>Eopsaltria australis</i>	Eastern Yellow Robin	P	11
Animalia	Aves	Petroicidae	0377	<i>Microeca fascinans</i>	Jacky Winter	P	1
Animalia	Aves	Petroicidae	0384	<i>Petroica rosea</i>	Rose Robin	P	2
Animalia	Aves	Cisticolidae	0525	<i>Cisticola exilis</i>	Golden-headed Cisticola	P	4
Animalia	Aves	Acrocephalidae	0524	<i>Acrocephalus australis</i>	Australian Reed-Warbler	P	1
Animalia	Aves	Megaluridae	0509	<i>Cincloramphus mathewsi</i>	Rufous Songlark	P	1
Animalia	Aves	Megaluridae	0523	<i>Megalurus timoriensis</i>	Tawny Grassbird	P	12
Animalia	Aves	Timaliidae	0574	<i>Zosterops lateralis</i>	Silvereye	P	13
Animalia	Aves	Hirundinidae	0357	<i>Hirundo neoxena</i>	Welcome Swallow	P	18
Animalia	Aves	Hirundinidae	0359	<i>Petrochelidon nigricans</i>	Tree Martin	P	4
Animalia	Aves	Sturnidae	0999	<i>Sturnus vulgaris</i>	Common Starling	*	1
Animalia	Aves	Nectariniidae	0564	<i>Dicaeum hirundinaceum</i>	Mistletoebird	P	21
Animalia	Aves	Estrildidae	0662	<i>Neochmia temporalis</i>	Red-browed Finch	P	4
Animalia	Aves	Estrildidae	0655	<i>Taeniopygia bichenovii</i>	Double-barred Finch	P	3
Animalia	Aves	Passeridae	0995	<i>Passer domesticus</i>	House Sparrow	*	1
Animalia	Aves	Motacillidae	0647	<i>Anthus novaeseelandiae</i>	Australian Pipit	P	4



Animalia	Mammalia	Ornithorhynchidae	1001	<i>Ornithorhynchus anatinus</i>	Platypus	P		1	
Animalia	Mammalia	Tachyglossidae	1003	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna	P		15	
Animalia	Mammalia	Dasyuridae	1027	<i>Antechinus flavipes</i>	Yellow-footed Antechinus	P		22	
Animalia	Mammalia	Dasyuridae	1674	<i>Antechinus stuartii</i>	Brown Antechinus	P		5	
Animalia	Mammalia	Dasyuridae	1008	<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V,P	E	6	
Animalia	Mammalia	Dasyuridae	1017	<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	V,P		9	
Animalia	Mammalia	Dasyuridae	1045	<i>Planigale maculata</i>	Common Planigale	V,P		6	
Animalia	Mammalia	Dasyuridae	1061	<i>Sminthopsis murina</i>	Common Dunnart	P		5	
Animalia	Mammalia	Peramelidae	1093	<i>Isoodon macrourus</i>	Northern Brown Bandicoot	P		29	
Animalia	Mammalia	Peramelidae	To81	<i>Isoodon/Perameles sp.</i>	unidentified Bandicoot	P		3	
Animalia	Mammalia	Peramelidae	1097	<i>Perameles nasuta</i>	Long-nosed Bandicoot	P		5	
Animalia	Mammalia	Phascolarctidae	1162	<i>Phascolarctos cinereus</i>	Koala	V,P	V	19	
Animalia	Mammalia	Petauridae	1136	<i>Petaurus australis</i>	Yellow-bellied Glider	V,P		4	
Animalia	Mammalia	Petauridae	1138	<i>Petaurus breviceps</i>	Sugar Glider	P		10	
Animalia	Mammalia	Petauridae	1137	<i>Petaurus norfolcensis</i>	Squirrel Glider	V,P		4	
Animalia	Mammalia	Pseudocheiridae	1133	<i>Petauroides volans</i>	Greater Glider	P		4	
Animalia	Mammalia	Pseudocheiridae	1129	<i>Pseudocheirus peregrinus</i>	Common Ringtail Possum	P		6	
Animalia	Mammalia	Acrobatidae	1147	<i>Acrobates pygmaeus</i>	Feathertail Glider	P		2	
Animalia	Mammalia	Phalangeridae	1735	<i>Trichosurus caninus</i>	Short-eared Possum	P		1	
Animalia	Mammalia	Phalangeridae	To82	<i>Trichosurus sp.</i>	brushtail possum	P		2	
Animalia	Mammalia	Phalangeridae	1113	<i>Trichosurus vulpecula</i>	Common Brushtail Possum	P		2	
Animalia	Mammalia	Macropodidae	1265	<i>Macropus giganteus</i>	Eastern Grey Kangaroo	P		16	
Animalia	Mammalia	Macropodidae	1259	<i>Macropus parryi</i>	Whiptail Wallaby	P		6	
Animalia	Mammalia	Macropodidae	1261	<i>Macropus rufogriseus</i>	Red-necked Wallaby	P		4	
Animalia	Mammalia	Macropodidae	1242	<i>Wallabia bicolor</i>	Swamp Wallaby	P		54	
Animalia	Mammalia	Pteropodidae	1282	<i>Pteropus alecto</i>	Black Flying-fox	P		18	
Animalia	Mammalia	Pteropodidae	1280	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V,P	V	34	
Animalia	Mammalia	Pteropodidae	1281	<i>Pteropus scapulatus</i>	Little Red Flying-fox	P		3	
Animalia	Mammalia	Pteropodidae	1294	<i>Syconycteris australis</i>	Common Blossom-bat	V,P		7	
Animalia	Mammalia	Rhinolophidae	1303	<i>Rhinolophus megaphyllus</i>	Eastern Horseshoe-bat	P		1	
Animalia	Mammalia	Emballonuridae	1321	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheathtail-bat	V,P		3	
Animalia	Mammalia	Molossidae	9065	<i>Mormopterus norfolkensis/sp 1</i>	Unidentified Mastiff-bat	P		1	
Animalia	Mammalia	Molossidae	1324	<i>Tadarida australis</i>	White-striped Freetail-bat	P		4	
Animalia	Mammalia	Vespertilionidae	1353	<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V,P	V	1	
Animalia	Mammalia	Vespertilionidae	1354	<i>Chalinolobus nigrogriseus</i>	Hoary Wattled Bat	V,P		5	
Animalia	Mammalia	Vespertilionidae	1346	<i>Miniopterus australis</i>	Little Bentwing-bat	V,P		17	
Animalia	Mammalia	Vespertilionidae	1357	<i>Myotis macropus</i>	Southern Myotis	V,P		3	
Animalia	Mammalia	Vespertilionidae	1336	<i>Nyctophilus bifax</i>	Eastern Long-eared Bat	V,P		8	
Animalia	Mammalia	Vespertilionidae	1334	<i>Nyctophilus gouldi</i>	Gould's Long-eared Bat	P		7	
Animalia	Mammalia	Vespertilionidae	To92	<i>Nyctophilus sp.</i>	long-eared bat	P		1	
Animalia	Mammalia	Vespertilionidae	1361	<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V,P		2	
Animalia	Mammalia	Vespertilionidae	1362	<i>Scotorepens greyii</i>	Little Broad-nosed Bat	P		3	

Animalia	Mammalia	Vespertilionidae	9029	<i>Scotorepens sp 1</i>	Central-eastern Broad-nosed Bat	P			1	
Animalia	Mammalia	Vespertilionidae	T089	<i>Scotorepens sp.</i>	Unidentified broad-nosed bat	P			4	
Animalia	Mammalia	Vespertilionidae	1377	<i>Vespadelus pumilus</i>	Eastern Forest Bat	P			3	
Animalia	Mammalia	Muridae	1415	<i>Hydromys chrysogaster</i>	Water-rat	P			2	
Animalia	Mammalia	Muridae	1500	<i>Melomys burtoni</i>	Grassland Melomys	P			22	
Animalia	Mammalia	Muridae	1497	<i>Melomys cervinipes</i>	Fawn-footed Melomys	P			4	
Animalia	Mammalia	Muridae	T101	<i>Melomys sp.</i>	Unidentified Melomys	P			12	
Animalia	Mammalia	Muridae	T104	<i>Muridae sp.</i>	unidentified murid rodent	P			5	
Animalia	Mammalia	Muridae	1412	<i>Mus musculus</i>	House Mouse					
									25	
Animalia	Mammalia	Muridae	1455	<i>Pseudomys novaehollandiae</i>	New Holland Mouse	P	V		7	
Animalia	Mammalia	Muridae	1395	<i>Rattus fuscipes</i>	Bush Rat	P			11	
Animalia	Mammalia	Muridae	1398	<i>Rattus lutreolus</i>	Swamp Rat	P			22	
Animalia	Mammalia	Muridae	1408	<i>Rattus rattus</i>	Black Rat				4	
Animalia	Mammalia	Muridae	T094	<i>Rattus sp.</i>	rat	P			6	
Animalia	Mammalia	Muridae	1401	<i>Rattus tunneyi</i>	Pale Field-rat	P				
									36	
Animalia	Mammalia	Otariidae	1882	<i>Arctocephalus pusillus doriferus</i>	Australian Fur-seal	V,P			1	
Animalia	Mammalia	Otariidae	T099	<i>Arctocephalus sp.</i>	Unidentified Fur-seal	P			1	
Animalia	Mammalia	Canidae	T106	<i>Canidae sp.</i>	unidentified canid				2	
Animalia	Mammalia	Canidae	1531	<i>Canis lupus</i>	Dingo, domestic dog				15	
Animalia	Mammalia	Canidae	1532	<i>Vulpes vulpes</i>	Fox				6	
Animalia	Mammalia	Felidae	1536	<i>Felis catus</i>	Cat				2	
Animalia	Mammalia	Leporidae	1511	<i>Lepus capensis</i>	Brown Hare				1	
Animalia	Mammalia	Leporidae	1510	<i>Oryctolagus cuniculus</i>	Rabbit				1	
Animalia	Mammalia	Bovidae	1518	<i>Bos taurus</i>	European cattle					
									3	
Animalia	Mammalia	Balaenopteridae	1575	<i>Megaptera novaeangliae</i>	Humpback Whale	V,P	V		2	
Plantae	Flora	Acanthaceae	1003	<i>Brunoniella australis</i>	Blue Trumpet				1	
Plantae	Flora	Acanthaceae	1010	<i>Pseuderanthemum variabile</i>	Pastel Flower				4	
Plantae	Flora	Acrobolbaceae	11534	<i>Goebelobryum spp.</i>					1	
Plantae	Flora	Adiantaceae	7997	<i>Adiantum aethiopicum</i>	Common Maidenhair	P			3	
Plantae	Flora	Adiantaceae	8000	<i>Adiantum hispidulum</i>	Rough Maidenhair	P			2	
Plantae	Flora	Adiantaceae	12633	<i>Adiantum hispidulum var. hypoglaucum</i>		P			1	
Plantae	Flora	Adiantaceae	8001	<i>Adiantum silvaticum</i>		P			1	
Plantae	Flora	Adiantaceae	8007	<i>Cheilanthes sieberi subsp. sieberi</i>	Rock Fern				4	
Plantae	Flora	Adiantaceae	12635	<i>Pityrogramma calomelanos var. austroamericana</i>	Gold Fern				1	
Plantae	Flora	Aizoaceae	1025	<i>Carpobrotus glaucescens</i>	Pigface				3	
Plantae	Flora	Aizoaceae	3907	<i>Macarthuria neocamblica</i>					2	
Plantae	Flora	Amaranthaceae	6478	<i>Alternanthera denticulata</i>	Lesser Joyweed				2	
Plantae	Flora	Amaranthaceae	6575	<i>Guilleminea densa</i>	Small Matweed				1	

Plantae	Flora	Anacardiaceae	7734	<i>Euroschinus falcatus</i> var. <i>falcatus</i>	Ribbonwood		3
Plantae	Flora	Anthericaceae	3535	<i>Caesia parviflora</i>	Pale Grass-lily		1
Plantae	Flora	Anthericaceae	7183	<i>Caesia parviflora</i> var. <i>parviflora</i>			1
Plantae	Flora	Anthericaceae	3556	<i>Laxmannia gracilis</i>	Slender Wire Lily		3
Plantae	Flora	Anthericaceae	3574	<i>Thysanotus tuberosus</i>	Common Fringe-lily		1
Plantae	Flora	Anthericaceae	7355	<i>Tricoryne elatior</i>	Yellow Autumn-lily		3
Plantae	Flora	Apiaceae	1094	<i>Actinotus helianthi</i>	Flannel Flower	P	3
Plantae	Flora	Apiaceae	1106	<i>Centella asiatica</i>	Indian Pennywort		3
Plantae	Flora	Apiaceae	7959	<i>Hydrocotyle acutiloba</i>			4
Plantae	Flora	Apiaceae	7961	<i>Hydrocotyle sibthorpioides</i>			2
Plantae	Flora	Apiaceae	1143	<i>Platysace ericoides</i>			12
Plantae	Flora	Apiaceae	11142	<i>Platysace heterophylla</i> var. <i>heterophylla</i>			2
Plantae	Flora	Apiaceae	1145	<i>Platysace linearifolia</i>			1
Plantae	Flora	Apiaceae	8785	<i>Trachymene incisa</i> subsp. <i>incisa</i>			3
Plantae	Flora	Apiaceae	1162	<i>Xanthosia pilosa</i>	Woolly Xanthosia		2
Plantae	Flora	Apocynaceae	1167	<i>Alyxia ruscifolia</i>	Prickly Alyxia		3
Plantae	Flora	Apocynaceae	1228	<i>Gomphocarpus physocarpus</i> *	Balloon Cotton Bush		3
Plantae	Flora	Apocynaceae	7742	<i>Hoya australis</i> subsp. <i>australis</i>	Native Hoya		2
Plantae	Flora	Apocynaceae	7118	<i>Hoya oligotricha</i> subsp. <i>oligotricha</i>			1
Plantae	Flora	Apocynaceae	1232	<i>Marsdenia fraseri</i>	Narrow-leaved Milk Vine		1
Plantae	Flora	Apocynaceae	1234	<i>Marsdenia rostrata</i>	Milk Vine		5
Plantae	Flora	Apocynaceae	1185	<i>Parsonsia straminea</i>	Common Silkpod		20
Plantae	Flora	Apocynaceae	8620	<i>Tabernaemontana pandacaqui</i>	Banana Bush		1
Plantae	Flora	Apocynaceae	1244	<i>Tylophora paniculata</i>	Thin-leaved Tylophora		1
Plantae	Flora	Araceae	1195	<i>Gymnostachys anceps</i>	Settler's Twine		2
Plantae	Flora	Araliaceae	1205	<i>Astrotricha longifolia</i>			1
Plantae	Flora	Araliaceae	12091	<i>Astrotricha longifolia</i> f. 'Coastal'			6
Plantae	Flora	Araliaceae	1209	<i>Polyscias elegans</i>	Celery Wood		3
Plantae	Flora	Araucariaceae	1213	<i>Araucaria cunninghamii</i>	Hoop Pine		2
Plantae	Flora	Arecaceae	6458	<i>Archontophoenix</i> <i>cunninghamiana</i>	Bangalow Palm	P	5
Plantae	Flora	Arecaceae	1221	<i>Livistona australis</i>	Cabbage Palm	P	12
Plantae	Flora	Asparagaceae	11785	<i>Asparagus plumosus</i> *	Climbing Asparagus Fern		1
Plantae	Flora	Aspleniaceae	8031	<i>Asplenium australasicum</i>	Bird's Nest Fern	P	6
Plantae	Flora	Aspleniaceae	7415	<i>Asplenium difforme</i>			1
Plantae	Flora	Asteliaceae	1018	<i>Cordyline stricta</i>	Narrow-leaved Palm Lily	P	7
Plantae	Flora	Asteraceae	8976	<i>Acmella grandiflora</i> var. <i>brachyglossa</i>			1
Plantae	Flora	Asteraceae	1255	<i>Ageratina adenophora</i> *	Crofton Weed		3
Plantae	Flora	Asteraceae	1258	<i>Ageratum houstonianum</i> *			1
Plantae	Flora	Asteraceae	1259	<i>Ambrosia artemisiifolia</i> *	Annual Ragweed		1

Plantae	Flora	Asteraceae	1280	<i>Aster subulatus</i>	*	Wild Aster			5
Plantae	Flora	Asteraceae	1281	<i>Baccharis halimifolia</i>	*	Groundsel Bush			5
Plantae	Flora	Asteraceae	1283	<i>Bidens pilosa</i>	*	Cobbler's Pegs			3
Plantae	Flora	Asteraceae	7360	<i>Blumea mollis</i>					1
Plantae	Flora	Asteraceae	6872	<i>Brachyscome microcarpa</i>					2
Plantae	Flora	Asteraceae	1392	<i>Chrysanthemoides monilifera</i>	*				1
Plantae	Flora	Asteraceae	9400	<i>Chrysanthemoides monilifera subsp. monilifera</i>	*	Boneseed			1
Plantae	Flora	Asteraceae	8686	<i>Chrysanthemoides monilifera subsp. rotundata</i>	*	Bitou Bush			11
Plantae	Flora	Asteraceae	1400	<i>Cirsium vulgare</i>	*	Spear Thistle			1
Plantae	Flora	Asteraceae	1404	<i>Conyza bonariensis</i>	*	Flaxleaf Fleabane			1
Plantae	Flora	Asteraceae	CONY	<i>Conyza spp.</i>	*	A Fleabane			1
Plantae	Flora	Asteraceae	10442	<i>Conyza sumatrensis</i>	*	Tall fleabane			2
Plantae	Flora	Asteraceae	1421	<i>Crassocephalum crepidioides</i>	*	Thickhead			1
Plantae	Flora	Asteraceae	7903	<i>Eclipta platyglossa</i>		Yellow Twin-heads			3
Plantae	Flora	Asteraceae	1437	<i>Enydra fluctuans</i>					2
Plantae	Flora	Asteraceae	7425	<i>Epaltes australis</i>		Spreading Nut-heads			4
Plantae	Flora	Asteraceae	9904	<i>Euchiton involucratus</i>		Star Cudweed			2
Plantae	Flora	Asteraceae	8960	<i>Hypochaeris microcephala var. albiflora</i>	*	White Flatweed			2
Plantae	Flora	Asteraceae	8788	<i>Hypochaeris radicata</i>	*	Catsear			4
Plantae	Flora	Asteraceae	1605	<i>Olearia nernstii</i>					1
Plantae	Flora	Asteraceae	1643	<i>Rutidosia heterogama</i>		Heath Wrinklewort	V,P	V	1
Plantae	Flora	Asteraceae	1651	<i>Senecio amygdalifolius</i>					2
Plantae	Flora	Asteraceae	6465	<i>Senecio madagascariensis</i>	*	Fireweed			3
Plantae	Flora	Asteraceae	12811	<i>Senecio pinnatifolius var. pinnatifolius</i>					4
Plantae	Flora	Asteraceae	1690	<i>Sonchus oleraceus</i>	*	Common Sowthistle			1
Plantae	Flora	Asteraceae	9254	<i>Vernonia cinerea var. cinerea</i>					9
Plantae	Flora	Asteraceae	1724	<i>Wedelia spilanthis</i>					1
Plantae	Flora	Azollaceae	9260	<i>Azolla filiculoides</i>		Pacific Azolla			2
Plantae	Flora	Bignoniaceae	1740	<i>Pandorea pandorana</i>		Wonga Wonga Vine			6
Plantae	Flora	Blandfordiaceae	3528	<i>Blandfordia grandiflora</i>		Christmas Bells	P		1
Plantae	Flora	Blechnaceae	8052	<i>Blechnum cartilagineum</i>		Gristle Fern			2
Plantae	Flora	Blechnaceae	8057	<i>Blechnum indicum</i>		Swamp Water Fern			7
Plantae	Flora	Blechnaceae	8064	<i>Doodia aspera</i>		Prickly Rasp Fern			4
Plantae	Flora	Blechnaceae	8065	<i>Doodia caudata</i>		Small Rasp Fern			3
Plantae	Flora	Burmanniaceae	7104	<i>Burmannia disticha</i>					2
Plantae	Flora	Casuarinaceae	2012	<i>Allocasuarina littoralis</i>		Black She-Oak			4
Plantae	Flora	Casuarinaceae	2017	<i>Allocasuarina torulosa</i>		Forest Oak			4
Plantae	Flora	Casuarinaceae	9247	<i>Casuarina equisetifolia subsp. incana</i>		Coastal She-oak			1
Plantae	Flora	Casuarinaceae	2022	<i>Casuarina glauca</i>		Swamp Oak			22



Plantae	Flora	Celastraceae	8387	<i>Denhamia celastroides</i>	Denhamia		3
Plantae	Flora	Celastraceae	2029	<i>Elaeodendron australe</i>			1
Plantae	Flora	Chenopodiaceae	2085	<i>Chenopodium ambrosioides</i>	* Mexican Tea		1
Plantae	Flora	Chenopodiaceae	9423	<i>Sarcocornia quinqueflora subsp. quinqueflora</i>			2
Plantae	Flora	Cladoniaceae	11545	<i>Cladonia terrae-novae</i>			1
Plantae	Flora	Clusiaceae	7240	<i>Hypericum gramineum</i>	Small St John's Wort		4
Plantae	Flora	Colchicaceae	3533	<i>Burchardia umbellata</i>	Milkmaids		3
Plantae	Flora	Commelinaceae	2206	<i>Aneilema acuminatum</i>			2
Plantae	Flora	Commelinaceae	2209	<i>Commelina cyanea</i>	Native Wandering Jew		7
Plantae	Flora	Commelinaceae	6788	<i>Murdannia graminea</i>			1
Plantae	Flora	Commelinaceae	10508	<i>Tradescantia fluminensis</i>	* Wandering Jew		2
Plantae	Flora	Convolvulaceae	2215	<i>Calystegia marginata</i>			1
Plantae	Flora	Convolvulaceae	2222	<i>Dichondra repens</i>	Kidney Weed		2
Plantae	Flora	Convolvulaceae	2225	<i>Ipomoea cairica</i>	*		8
Plantae	Flora	Convolvulaceae	2231	<i>Polymeria calycina</i>			5
Plantae	Flora	Cunoniaceae	2267	<i>Bauera capitata</i>			6
Plantae	Flora	Cunoniaceae	2272	<i>Ceratopetalum gummiferum</i>	Christmas Bush	P	2
Plantae	Flora	Cunoniaceae	2275	<i>Schizomeria ovata</i>	Crabapple		3
Plantae	Flora	Cupressaceae	2278	<i>Callitris columellaris</i>			2
Plantae	Flora	Cyperaceae	8856	<i>Abildgaardia ovata</i>			1
Plantae	Flora	Cyperaceae	2296	<i>Baumea articulata</i>	Jointed Twig-rush		5
Plantae	Flora	Cyperaceae	2299	<i>Baumea juncea</i>			8
Plantae	Flora	Cyperaceae	2300	<i>Baumea muelleri</i>			2
Plantae	Flora	Cyperaceae	2302	<i>Baumea rubiginosa</i>			1
Plantae	Flora	Cyperaceae	2303	<i>Baumea teretifolia</i>			2
Plantae	Flora	Cyperaceae	7748	<i>Bulbostylis barbata</i>			1
Plantae	Flora	Cyperaceae	8855	<i>Carex maculata</i>			3
Plantae	Flora	Cyperaceae	2335	<i>Carex pumila</i>			1
Plantae	Flora	Cyperaceae	2343	<i>Caustis recurvata</i>		P	12
Plantae	Flora	Cyperaceae	CAUS	<i>Caustis spp.</i>		P	1
Plantae	Flora	Cyperaceae	2344	<i>Chorizandra cymbaria</i>			1
Plantae	Flora	Cyperaceae	2345	<i>Chorizandra sphaerocephala</i>	Roundhead Bristle-sedge		3
Plantae	Flora	Cyperaceae	2346	<i>Cladium procerum</i>			6
Plantae	Flora	Cyperaceae	7013	<i>Cyperus aquatilis</i>	Water Nutgrass	E1,P	1
Plantae	Flora	Cyperaceae	9144	<i>Cyperus eglobosus</i>			2
Plantae	Flora	Cyperaceae	2368	<i>Cyperus flaccidus</i>	Lax Flat-sedge		1
Plantae	Flora	Cyperaceae	2379	<i>Cyperus laevigatus</i>			2
Plantae	Flora	Cyperaceae	2380	<i>Cyperus laevis</i>			1
Plantae	Flora	Cyperaceae	2381	<i>Cyperus leiocaulon</i>			3
Plantae	Flora	Cyperaceae	8483	<i>Cyperus polystachyos</i>			4
Plantae	Flora	Cyperaceae	2399	<i>Cyperus sphaeroideus</i>			1
Plantae	Flora	Cyperaceae	2400	<i>Cyperus stradbrogensis</i>			2



Plantae	Flora	Cyperaceae	2404	<i>Cyperus trinervis</i>		2
Plantae	Flora	Cyperaceae	2413	<i>Eleocharis equisetina</i>		2
Plantae	Flora	Cyperaceae	12416	<i>Ficinia nodosa</i>	Knobby Club-rush	6
Plantae	Flora	Cyperaceae	6663	<i>Fimbristylis cinnamometorum</i>		2
Plantae	Flora	Cyperaceae	7328	<i>Fimbristylis ferruginea</i>		3
Plantae	Flora	Cyperaceae	7300	<i>Fimbristylis nutans</i>		2
Plantae	Flora	Cyperaceae	2428	<i>Fimbristylis tristachya</i>		3
Plantae	Flora	Cyperaceae	2431	<i>Gahnia aspera</i>	Rough Saw-sedge	12
Plantae	Flora	Cyperaceae	2432	<i>Gahnia clarkei</i>	Tall Saw-sedge	3
Plantae	Flora	Cyperaceae	2442	<i>Gahnia sieberiana</i>	Red-fruit Saw-sedge	P 8
Plantae	Flora	Cyperaceae	GAHN	<i>Gahnia spp.</i>		1
Plantae	Flora	Cyperaceae	2448	<i>Isolepis cernua</i>	Nodding Club-rush	1
Plantae	Flora	Cyperaceae	2454	<i>Isolepis inundata</i>	Club-rush	2
Plantae	Flora	Cyperaceae	2465	<i>Lepidosperma filiforme</i>		2
Plantae	Flora	Cyperaceae	6402	<i>Lepidosperma laterale</i>	Variable Sword-sedge	10
Plantae	Flora	Cyperaceae	2470	<i>Lepidosperma longitudinale</i>	Pithy Sword-sedge	2
Plantae	Flora	Cyperaceae	2471	<i>Lepidosperma neesii</i>		1
Plantae	Flora	Cyperaceae	2472	<i>Lepidosperma quadrangulatum</i>		2
Plantae	Flora	Cyperaceae	2476	<i>Lepironia articulata</i>		4
Plantae	Flora	Cyperaceae	8956	<i>Ptilothrix deusta</i>		4
Plantae	Flora	Cyperaceae	11946	<i>Schoenoplectus subulatus</i>		2
Plantae	Flora	Cyperaceae	2491	<i>Schoenus apogon</i>	Fluke Bogrush	3
Plantae	Flora	Cyperaceae	2492	<i>Schoenus brevifolius</i>		7
Plantae	Flora	Cyperaceae	2495	<i>Schoenus ericetorum</i>		9
Plantae	Flora	Cyperaceae	2502	<i>Schoenus nitens</i>		1
Plantae	Flora	Cyperaceae	2504	<i>Schoenus paludosus</i>		3
Plantae	Flora	Cyperaceae	2505	<i>Schoenus scabripes</i>		2
Plantae	Flora	Cyperaceae	2507	<i>Schoenus turbinatus</i>		1
Plantae	Flora	Cyperaceae	7207	<i>Scleria levis</i>		1
Plantae	Flora	Cyperaceae	7719	<i>Scleria rugosa</i>		2
Plantae	Flora	Davalliaceae	10647	<i>Davallia solida</i> var. <i>pyxidata</i>	Hare's Foot Fern	3
Plantae	Flora	Davalliaceae	8088	<i>Nephrolepis cordifolia</i>	Fishbone Fern	3
Plantae	Flora	Dennstaedtiaceae	7271	<i>Histiopteris incisa</i>	Bat's Wing Fern	1
Plantae	Flora	Dennstaedtiaceae	7749	<i>Hypolepis muelleri</i>	Harsh Ground Fern	3
Plantae	Flora	Dennstaedtiaceae	6403	<i>Pteridium esculentum</i>	Bracken	18
Plantae	Flora	Dicksoniaceae	8341	<i>Calochlaena dubia</i>	Rainbow Fern	1
Plantae	Flora	Dilleniaceae	2525	<i>Adrastaea salicifolia</i>		4
Plantae	Flora	Dilleniaceae	2526	<i>Hibbertia acicularis</i>		1
Plantae	Flora	Dilleniaceae	2527	<i>Hibbertia aspera</i>	Rough Guinea Flower	2
Plantae	Flora	Dilleniaceae	2533	<i>Hibbertia diffusa</i>	Wedge Guinea Flower	3
Plantae	Flora	Dilleniaceae	10863	<i>Hibbertia empetrifolia</i> subsp. <i>empetrifolia</i>		1
Plantae	Flora	Dilleniaceae	2536	<i>Hibbertia fasciculata</i>		2
Plantae	Flora	Dilleniaceae	2539	<i>Hibbertia linearis</i>		10

Plantae	Flora	Dilleniaceae	2545	<i>Hibbertia riparia</i>		1
Plantae	Flora	Dilleniaceae	2548	<i>Hibbertia scandens</i>	Climbing Guinea Flower	20
Plantae	Flora	Dilleniaceae	2551	<i>Hibbertia vestita</i>		9
Plantae	Flora	Dioscoreaceae	6446	<i>Dioscorea transversa</i>	Native Yam	4
Plantae	Flora	Droseraceae	6434	<i>Aldrovanda vesiculosa</i>	Waterwheel Plant	E1,P 1
Plantae	Flora	Droseraceae	2557	<i>Drosera binata</i>	Forked Sundew	1
Plantae	Flora	Droseraceae	2561	<i>Drosera spatulata</i>		2
Plantae	Flora	Elaeocarpaceae	2573	<i>Elaeocarpus obovatus</i>	Hard Quandong	4
Plantae	Flora	Elaeocarpaceae	2574	<i>Elaeocarpus reticulatus</i>	Blueberry Ash	3
Plantae	Flora	Elaeocarpaceae	6214	<i>Tetratheca thymifolia</i>	Black-eyed Susan	5
Plantae	Flora	Ericaceae	12011	<i>Agiortia pedicellata</i>		11
Plantae	Flora	Ericaceae	2585	<i>Astroloma pinifolium</i>	Pine Heath	1
Plantae	Flora	Ericaceae	2586	<i>Brachyloma daphnoides</i>	Daphne Heath	2
Plantae	Flora	Ericaceae	10689	<i>Brachyloma daphnoides</i> subsp. <i>daphnoides</i>		2
Plantae	Flora	Ericaceae	2587	<i>Brachyloma scortechinii</i>		1
Plantae	Flora	Ericaceae	2599	<i>Epacris microphylla</i>	Coral Heath	3
Plantae	Flora	Ericaceae	2602	<i>Epacris obtusifolia</i>	Blunt-leaf Heath	6
Plantae	Flora	Ericaceae	2605	<i>Epacris pulchella</i>	Wallum Heath	4
Plantae	Flora	Ericaceae	2616	<i>Leucopogon ericoides</i>	Pink Beard-heath	9
Plantae	Flora	Ericaceae	2624	<i>Leucopogon lanceolatus</i>		1
Plantae	Flora	Ericaceae	6845	<i>Leucopogon lanceolatus</i> var. <i>gracilis</i>		9
Plantae	Flora	Ericaceae	6425	<i>Leucopogon lanceolatus</i> var. <i>lanceolatus</i>		4
Plantae	Flora	Ericaceae	2625	<i>Leucopogon leptospermoides</i>		18
Plantae	Flora	Ericaceae	2627	<i>Leucopogon margarodes</i>		2
Plantae	Flora	Ericaceae	2632	<i>Leucopogon parviflorus</i>	Coastal Beard-heath	4
Plantae	Flora	Ericaceae	2639	<i>Leucopogon virgatus</i>		11
Plantae	Flora	Ericaceae	2647	<i>Monotoca elliptica</i>	Tree Broom-heath	7
Plantae	Flora	Ericaceae	2649	<i>Monotoca scoparia</i>		11
Plantae	Flora	Ericaceae	2655	<i>Sprengelia sprengelioides</i>		10
Plantae	Flora	Ericaceae	2662	<i>Styphelia viridis</i>		3
Plantae	Flora	Ericaceae	9226	<i>Styphelia viridis</i> subsp. <i>breviflora</i>		4
Plantae	Flora	Ericaceae	2663	<i>Trochocarpa laurina</i>	Tree Heath	9
Plantae	Flora	Ericaceae	2664	<i>Woolisia pungens</i>		2
Plantae	Flora	Euphorbiaceae	2706	<i>Croton verreauxii</i>	Green Native Cascarilla	3
Plantae	Flora	Euphorbiaceae	13994	<i>Homalanthus stillingijifolius</i>		3
Plantae	Flora	Euphorbiaceae	2742	<i>Petalostigma trilocolare</i>	Long-leaved Bitter Bark	4
Plantae	Flora	Euphorbiaceae	2756	<i>Pseudanthus orientalis</i>		11
Plantae	Flora	Euphorbiaceae	2759	<i>Ricinocarpos pinifolius</i>	Wedding Bush	11
Plantae	Flora	Eupomatiaceae	2768	<i>Eupomatia laurina</i>	Bolwarra	3



Plantae	Flora	Fabaceae (Caesalpinioideae)	8772	<i>Senna acclinis</i>	Rainforest Cassia	E1,P		2
Plantae	Flora	Fabaceae (Caesalpinioideae)	6644	<i>Senna barclayana</i>	Smooth Senna			1
Plantae	Flora	Fabaceae (Caesalpinioideae)	7377	<i>Senna pendula var. glabrata</i>	*			1
Plantae	Flora	Fabaceae (Caesalpinioideae)	10505	<i>Senna septemtrionalis</i>	*	Arsenic Bush		1
Plantae	Flora	Fabaceae (Faboideae)	2770	<i>Aotus ericoides</i>				5
Plantae	Flora	Fabaceae (Faboideae)	2771	<i>Aotus lanigera</i>				5
Plantae	Flora	Fabaceae (Faboideae)	2778	<i>Bossiaea ensata</i>		Sword Bossiaea		8
Plantae	Flora	Fabaceae (Faboideae)	2780	<i>Bossiaea heterophylla</i>		Variable Bossiaea		6
Plantae	Flora	Fabaceae (Faboideae)	2786	<i>Bossiaea prostrata</i>				2
Plantae	Flora	Fabaceae (Faboideae)	2790	<i>Bossiaea scortechinii</i>				1
Plantae	Flora	Fabaceae (Faboideae)	2797	<i>Chorizema parviflorum</i>		Eastern Flame Pea		2
Plantae	Flora	Fabaceae (Faboideae)	12020	<i>Crotalaria montana var. angustifolia</i>				2
Plantae	Flora	Fabaceae (Faboideae)	2827	<i>Daviesia ulicifolia</i>		Gorse Bitter Pea		1
Plantae	Flora	Fabaceae (Faboideae)	2828	<i>Daviesia umbellulata</i>				3
Plantae	Flora	Fabaceae (Faboideae)	6621	<i>Desmodium gunnii</i>		Slender Tick-trefoil		1
Plantae	Flora	Fabaceae (Faboideae)	2839	<i>Desmodium rhytidophyllum</i>				5
Plantae	Flora	Fabaceae (Faboideae)	2840	<i>Desmodium varians</i>		Slender Tick-trefoil		4
Plantae	Flora	Fabaceae (Faboideae)	2843	<i>Dillwynia floribunda</i>				4
Plantae	Flora	Fabaceae (Faboideae)	2850	<i>Dillwynia retorta</i>				7
Plantae	Flora	Fabaceae (Faboideae)	DILL	<i>Dillwynia spp.</i>				1
Plantae	Flora	Fabaceae (Faboideae)	13000	<i>Glycine appressa</i>				1
Plantae	Flora	Fabaceae (Faboideae)	2860	<i>Glycine clandestina</i>		Twining glycine		6
Plantae	Flora	Fabaceae (Faboideae)	7208	<i>Glycine microphylla</i>		Small-leaf Glycine		1

Plantae	Flora	Fabaceae (Faboideae)	2861	<i>Glycine tabacina</i>	Variable Glycine		1
Plantae	Flora	Fabaceae (Faboideae)	7844	<i>Glycine tomentella</i>	Woolly Glycine		1
Plantae	Flora	Fabaceae (Faboideae)	2868	<i>Gompholobium pinnatum</i>	Pinnate Wedge Pea		3
Plantae	Flora	Fabaceae (Faboideae)	2870	<i>Gompholobium virgatum</i>	Leafy Wedge Pea		8
Plantae	Flora	Fabaceae (Faboideae)	2873	<i>Hardenbergia violacea</i>	False Sarsaparilla		8
Plantae	Flora	Fabaceae (Faboideae)	2874	<i>Hovea acutifolia</i>			1
Plantae	Flora	Fabaceae (Faboideae)	11015	<i>Hovea heterophylla</i>			1
Plantae	Flora	Fabaceae (Faboideae)	2892	<i>Jacksonia scoparia</i>	Dogwood		2
Plantae	Flora	Fabaceae (Faboideae)	2893	<i>Jacksonia stackhousei</i>	Wallum Dogwood		6
Plantae	Flora	Fabaceae (Faboideae)	2898	<i>Kennedia rubicunda</i>	Dusky Coral Pea		1
Plantae	Flora	Fabaceae (Faboideae)	2938	<i>Mirbelia rubiifolia</i>	Heathy Mirbelia		2
Plantae	Flora	Fabaceae (Faboideae)	2958	<i>Phyllota phyllicoides</i>	Heath Phyllota		11
Plantae	Flora	Fabaceae (Faboideae)	10708	<i>Podolobium scandens</i>	Netted Shaggy Pea		2
Plantae	Flora	Fabaceae (Faboideae)	11644	<i>Pultenaea maritima</i>	Coast Headland Pea	V,P	1
Plantae	Flora	Fabaceae (Faboideae)	3004	<i>Pultenaea myrtoidea</i>			1
Plantae	Flora	Fabaceae (Faboideae)	3014	<i>Pultenaea retusa</i>			1
Plantae	Flora	Fabaceae (Faboideae)	3023	<i>Pultenaea villosa</i>	Hairy Bush-pea		2
Plantae	Flora	Fabaceae (Faboideae)	3033	<i>Sphaerolobium vimineum</i>			1
Plantae	Flora	Fabaceae (Faboideae)	3105	<i>Viminaria juncea</i>	Native Broom		1
Plantae	Flora	Fabaceae (Mimosoideae)	7581	<i>Acacia aulacocarpa</i>	Salwood		12
Plantae	Flora	Fabaceae (Mimosoideae)	7060	<i>Acacia baueri subsp. baueri</i>	Tiny Wattle		1
Plantae	Flora	Fabaceae (Mimosoideae)	3744	<i>Acacia complanata</i>	Flat-stemmed Wattle		1
Plantae	Flora	Fabaceae (Mimosoideae)	3745	<i>Acacia concurrens</i>	Curracabah		5



Plantae	Flora	Fabaceae (Mimosoideae)	10786	<i>Acacia disparrima</i> subsp. <i>disparrima</i>	Brush Ironbark Wattle	12
Plantae	Flora	Fabaceae (Mimosoideae)	3769	<i>Acacia elongata</i>	Swamp Wattle	4
Plantae	Flora	Fabaceae (Mimosoideae)	3777	<i>Acacia floribunda</i>	White Sally	1
Plantae	Flora	Fabaceae (Mimosoideae)	6597	<i>Acacia leiocalyx</i> subsp. <i>leiocalyx</i>	Curracabah	3
Plantae	Flora	Fabaceae (Mimosoideae)	10791	<i>Acacia longifolia</i> subsp. <i>sophorae</i>	Coastal Wattle	8
Plantae	Flora	Fabaceae (Mimosoideae)	3821	<i>Acacia maidenii</i>	Maiden's Wattle	7
Plantae	Flora	Fabaceae (Mimosoideae)	3824	<i>Acacia melanoxylon</i>	Blackwood	1
Plantae	Flora	Fabaceae (Mimosoideae)	3834	<i>Acacia myrtifolia</i>	Red-stemmed Wattle	1
Plantae	Flora	Fabaceae (Mimosoideae)	3839	<i>Acacia obtusifolia</i>		2
Plantae	Flora	Fabaceae (Mimosoideae)	3841	<i>Acacia orites</i>	Mountain Wattle	1
Plantae	Flora	Fabaceae (Mimosoideae)	3849	<i>Acacia penninervis</i>	Mountain Hickory	1
Plantae	Flora	Fabaceae (Mimosoideae)	3881	<i>Acacia suaveolens</i>	Sweet Wattle	11
Plantae	Flora	Fabaceae (Mimosoideae)	3893	<i>Acacia ulicifolia</i>	Prickly Moses	9
Plantae	Flora	Flagellariaceae	7106	<i>Flagellaria indica</i>	Whip Vine	1
Plantae	Flora	Gentianaceae	3133	<i>Centaurium tenuiflorum</i>	* Branched Centaury, Slender centaury	2
Plantae	Flora	Gentianaceae	13834	<i>Schenkia spicata</i>	Spike Centaury	1
Plantae	Flora	Gleicheniaceae	7138	<i>Gleichenia dicarpa</i>	Pouched Coral Fern	1
Plantae	Flora	Gleicheniaceae	9167	<i>Gleichenia mendellii</i>		1
Plantae	Flora	Goodeniaceae	3174	<i>Dampiera stricta</i>		4
Plantae	Flora	Goodeniaceae	6658	<i>Dampiera sylvestris</i>		1
Plantae	Flora	Goodeniaceae	3190	<i>Goodenia heterophylla</i>		2
Plantae	Flora	Goodeniaceae	7057	<i>Goodenia paniculata</i>		1
Plantae	Flora	Goodeniaceae	3197	<i>Goodenia stelligera</i>	Spiked Goodenia	1
Plantae	Flora	Goodeniaceae	3203	<i>Scaevola calendulacea</i>		1
Plantae	Flora	Goodeniaceae	3219	<i>Velleia spathulata</i>		3
Plantae	Flora	Haemodoraceae	9310	<i>Haemodorum</i> <i>austroqueenslandicum</i>		1
Plantae	Flora	Haemodoraceae	3237	<i>Haemodorum tenuifolium</i>		4
Plantae	Flora	Haloragaceae	3243	<i>Gonocarpus micranthus</i>		4
Plantae	Flora	Haloragaceae	8649	<i>Gonocarpus micranthus</i> subsp. <i>micranthus</i>		1

Plantae	Flora	Haloragaceae	8648	<i>Gonocarpus micranthus subsp. ramosissimus</i>		3
Plantae	Flora	Haloragaceae	3247	<i>Gonocarpus tetragynus</i>	Poverty Raspwort	2
Plantae	Flora	Hymenophyllaceae	12518	<i>Crepidomanes saxifragoides</i>		3
Plantae	Flora	Hypoxidaceae	9142	<i>Curculigo ensifolia var. ensifolia</i>		1
Plantae	Flora	Iridaceae	3300	<i>Patersonia fragilis</i>	Swamp Iris	2
Plantae	Flora	Iridaceae	3301	<i>Patersonia glabrata</i>	Leafy Purple-flag	10
Plantae	Flora	Iridaceae	3303	<i>Patersonia sericea</i>	Silky Purple-Flag	6
Plantae	Flora	Juncaceae	3326	<i>Juncus continuus</i>		1
Plantae	Flora	Juncaceae	7430	<i>Juncus kraussii subsp. australiensis</i>	Sea Rush	8
Plantae	Flora	Juncaceae	3341	<i>Juncus polyanthemus</i>		2
Plantae	Flora	Juncaginaceae	3369	<i>Triglochin striata</i>	Streaked Arrowgrass	3
Plantae	Flora	Lamiaceae	6484	<i>Clerodendrum tomentosum</i>	Hairy Clerodendrum	1
Plantae	Flora	Lamiaceae	6247	<i>Gmelina leichhardtii</i>	White Beech	1
Plantae	Flora	Lamiaceae	3387	<i>Mentha satuireioides</i>	Native Pennyroyal	1
Plantae	Flora	Lamiaceae	3397	<i>Plectranthus parviflorus</i>		5
Plantae	Flora	Lauraceae	7220	<i>Cassytha filiformis</i>		4
Plantae	Flora	Lauraceae	3467	<i>Cassytha glabella</i>		1
Plantae	Flora	Lauraceae	3469	<i>Cassytha pubescens</i>	Downy Dodder-laurel	3
Plantae	Flora	Lauraceae	3471	<i>Cinnamomum camphora</i>	* Camphor Laurel	5
Plantae	Flora	Lauraceae	3479	<i>Cryptocarya glaucescens</i>	Jackwood	1
Plantae	Flora	Lauraceae	3483	<i>Cryptocarya microneura</i>	Murrogun	1
Plantae	Flora	Lauraceae	3485	<i>Cryptocarya rigida</i>	Forest Maple	3
Plantae	Flora	Lauraceae	3489	<i>Endiandra discolor</i>	Rose Walnut	3
Plantae	Flora	Lauraceae	3495	<i>Endiandra sieberi</i>	Hard Corkwood	8
Plantae	Flora	Lauraceae	8675	<i>Litsea australis</i>	Brown Bolly Gum	5
Plantae	Flora	Lentibulariaceae	6667	<i>Utricularia aurea</i>	Golden Bladderwort	1
Plantae	Flora	Lentibulariaceae	7257	<i>Utricularia uliginosa</i>	Asian Bladderwort	2
Plantae	Flora	Lentibulariaceae	9235	<i>Utricularia uniflora</i>		1
Plantae	Flora	Lindsaeaceae	8127	<i>Lindsaea dimorpha</i>		1
Plantae	Flora	Lindsaeaceae	6406	<i>Lindsaea linearis</i>	Screw Fern	1
Plantae	Flora	Lindsaeaceae	6401	<i>Lindsaea microphylla</i>	Lacy Wedge Fern	2
Plantae	Flora	Lobeliaceae	10465	<i>Lobelia anceps</i>		5
Plantae	Flora	Lobeliaceae	1925	<i>Pratia purpurascens</i>	Whiteroot	8
Plantae	Flora	Loganiaceae	3590	<i>Logania pusilla</i>		1
Plantae	Flora	Loganiaceae	3592	<i>Mitrasacme paludosa</i>		2
Plantae	Flora	Loganiaceae	3595	<i>Mitrasacme polymorpha</i>		1
Plantae	Flora	Lomandraceae	6301	<i>Lomandra elongata</i>		5
Plantae	Flora	Lomandraceae	6302	<i>Lomandra filiformis</i>	Wattle Matt-rush	7
Plantae	Flora	Lomandraceae	6511	<i>Lomandra filiformis subsp. coriacea</i>	Wattle Matt-rush	1
Plantae	Flora	Lomandraceae	6306	<i>Lomandra laxa</i>		1
Plantae	Flora	Lomandraceae	6308	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	20

Plantae	Flora	Loranthaceae	3613	<i>Dendrophthoe vitellina</i>		1	
Plantae	Flora	Loranthaceae	3619	<i>Muellerina celastroides</i>		4	
Plantae	Flora	Luzuriagaceae	6015	<i>Eustrephus latifolius</i>	Wombat Berry	8	
Plantae	Flora	Luzuriagaceae	6016	<i>Geitonoplesium cymosum</i>	Scrambling Lily	8	
Plantae	Flora	Lycopodiaceae	10641	<i>Lycopodiella cernua</i>	Scrambling Clubmoss	1	
Plantae	Flora	Lycopodiaceae	9293	<i>Lycopodiella lateralis</i>	Slender Clubmoss	5	
Plantae	Flora	Lycopodiaceae	10642	<i>Lycopodiella serpentina</i>	Bog Clubmoss	3	
Plantae	Flora	Malvaceae	3645	<i>Hibiscus splendens</i>	Pink Hibiscus	1	
Plantae	Flora	Malvaceae	3648	<i>Hibiscus trionum</i>	Flower-of-an-hour	1	
Plantae	Flora	Malvaceae	3673	<i>Sida rhombifolia</i>	*	Paddy's Lucerne	3
Plantae	Flora	Melastomataceae	3675	<i>Melastoma affine</i>	Blue Tongue	2	
Plantae	Flora	Meliaceae	11178	<i>Synoum glandulosum subsp. glandulosum</i>	Scentless Rosewood	4	
Plantae	Flora	Menispermaceae	11933	<i>Echinostephia aculeata</i>		4	
Plantae	Flora	Menispermaceae	8428	<i>Stephania japonica var. discolor</i>	Snake Vine	9	
Plantae	Flora	Menyanthaceae	3692	<i>Villarsia exaltata</i>	Yellow Marsh Flower	2	
Plantae	Flora	Monimiaceae	3918	<i>Wilkiea huegeliana</i>	Veiny Wilkiea	2	
Plantae	Flora	Moraceae	3927	<i>Ficus watkinsiana</i>	Strangling Fig	1	
Plantae	Flora	Moraceae	3928	<i>Maclura cochinchinensis</i>	Cockspur Thorn	5	
Plantae	Flora	Moraceae	3931	<i>Streblus brunonianus</i>	Whalebone Tree	1	
Plantae	Flora	Moraceae	10417	<i>Trophis scandens subsp. scandens</i>	Burny Vine	1	
Plantae	Flora	Myoporaceae	7906	<i>Myoporum acuminatum</i>	Boobialla	1	
Plantae	Flora	Myoporaceae	9043	<i>Myoporum boninense subsp. australe</i>		1	
Plantae	Flora	Myrsinaceae	7459	<i>Aegiceras corniculatum</i>	River Mangrove	2	
Plantae	Flora	Myrsinaceae	3959	<i>Embelia australiana</i>		2	
Plantae	Flora	Myrsinaceae	11948	<i>Myrsine howittiana</i>	Brush Muttonwood	1	
Plantae	Flora	Myrsinaceae	11953	<i>Myrsine variabilis</i>		8	
Plantae	Flora	Myrtaceae	3968	<i>Acmena smithii</i>	Lilly Pilly	8	
Plantae	Flora	Myrtaceae	3970	<i>Angophora costata</i>	Sydney Red Gum	3	
Plantae	Flora	Myrtaceae	8712	<i>Angophora paludosa</i>		2	
Plantae	Flora	Myrtaceae	3975	<i>Angophora woodsiana</i>		5	
Plantae	Flora	Myrtaceae	3979	<i>Austromyrtus dulcis</i>	Midgen Berry	15	
Plantae	Flora	Myrtaceae	3984	<i>Backhousia myrtifolia</i>	Grey Myrtle	2	
Plantae	Flora	Myrtaceae	9835	<i>Baeckea frutescens</i>		10	
Plantae	Flora	Myrtaceae	3995	<i>Baeckea imbricata</i>		6	
Plantae	Flora	Myrtaceae	4010	<i>Callistemon pachyphyllus</i>	Wallum Bottlebrush	11	
Plantae	Flora	Myrtaceae	4015	<i>Callistemon salignus</i>	Willow Bottlebrush	6	
Plantae	Flora	Myrtaceae	CALL	<i>Callistemon spp.</i>		1	
Plantae	Flora	Myrtaceae	4021	<i>Calytrix tetragona</i>	Common Fringe-myrtle	1	
Plantae	Flora	Myrtaceae	9687	<i>Corymbia gummifera</i>	Red Bloodwood	5	
Plantae	Flora	Myrtaceae	9601	<i>Corymbia intermedia</i>	Pink Bloodwood	16	
Plantae	Flora	Myrtaceae	9692	<i>Corymbia maculata</i>	Spotted Gum	2	

Plantae	Flora	Myrtaceae	7027	<i>Eucalyptus acmenoides</i>	White Mahogany	5
Plantae	Flora	Myrtaceae	4101	<i>Eucalyptus grandis</i>	Flooded Gum	1
Plantae	Flora	Myrtaceae	4128	<i>Eucalyptus microcorys</i>	Tallowwood	6
Plantae	Flora	Myrtaceae	4138	<i>Eucalyptus notabilis</i>	Mountain Mahogany	1
Plantae	Flora	Myrtaceae	4155	<i>Eucalyptus pilularis</i>	Blackbutt	9
Plantae	Flora	Myrtaceae	4157	<i>Eucalyptus planchoniana</i>	Bastard Tallowwood	4
Plantae	Flora	Myrtaceae	4162	<i>Eucalyptus propinqua</i>	Small-fruited Grey Gum	5
Plantae	Flora	Myrtaceae	4166	<i>Eucalyptus pyrocarpa</i>	Large-fruited Blackbutt	1
Plantae	Flora	Myrtaceae	4170	<i>Eucalyptus resinifera</i>	Red Mahogany	2
Plantae	Flora	Myrtaceae	4171	<i>Eucalyptus robusta</i>	Swamp Mahogany	6
Plantae	Flora	Myrtaceae	4179	<i>Eucalyptus seeana</i>	Narrow-leaved Red Gum	4
Plantae	Flora	Myrtaceae	4180	<i>Eucalyptus siderophloia</i>	Grey Ironbark	4
Plantae	Flora	Myrtaceae	4183	<i>Eucalyptus signata</i>	Scribbly Gum	1
Plantae	Flora	Myrtaceae	EUCA	<i>Eucalyptus spp.</i>		1
Plantae	Flora	Myrtaceae	4191	<i>Eucalyptus tereticornis</i>	Forest Red Gum	13
Plantae	Flora	Myrtaceae	6364	<i>Eucalyptus tindaliae</i>	Stringybark	3
Plantae	Flora	Myrtaceae	4203	<i>Homoranthus virgatus</i>		13
Plantae	Flora	Myrtaceae	4221	<i>Leptospermum juniperinum</i>	Prickly Tea-tree	6
Plantae	Flora	Myrtaceae	4224	<i>Leptospermum liversidgei</i>	Olive Tea-tree	21
Plantae	Flora	Myrtaceae	4234	<i>Leptospermum petersonii</i>	Lemon-scented Teatree	1
Plantae	Flora	Myrtaceae	7245	<i>Leptospermum polygalifolium</i>	Tantoon	10
Plantae	Flora	Myrtaceae	8199	<i>Leptospermum polygalifolium</i> <i>subsp. cismontanum</i>		4
Plantae	Flora	Myrtaceae	4236	<i>Leptospermum semibaccatum</i>		6
Plantae	Flora	Myrtaceae	4237	<i>Leptospermum speciosum</i>		4
Plantae	Flora	Myrtaceae	LEPT	<i>Leptospermum spp.</i>	Tea-tree	1
Plantae	Flora	Myrtaceae	8486	<i>Leptospermum trinervium</i>	Slender Tea-tree	14
Plantae	Flora	Myrtaceae	4241	<i>Leptospermum whitei</i>		12
Plantae	Flora	Myrtaceae	4242	<i>Lophostemon confertus</i>	Brush Box	8
Plantae	Flora	Myrtaceae	4243	<i>Lophostemon suaveolens</i>	Swamp Mahogany, Swamp Turpentine	15
Plantae	Flora	Myrtaceae	4245	<i>Melaleuca alternifolia</i>		1
Plantae	Flora	Myrtaceae	4258	<i>Melaleuca nodosa</i>		8
Plantae	Flora	Myrtaceae	4260	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	31
Plantae	Flora	Myrtaceae	4261	<i>Melaleuca sieberi</i>		2
Plantae	Flora	Myrtaceae	4262	<i>Melaleuca squamea</i>	Swamp Honey-myrtle	5
Plantae	Flora	Myrtaceae	4264	<i>Melaleuca styphelioides</i>	Prickly-leaved Tea Tree	8
Plantae	Flora	Myrtaceae	4266	<i>Melaleuca thymifolia</i>	Thyme Honey-myrtle	1
Plantae	Flora	Myrtaceae	6949	<i>Ochrosperma citriodorum</i>		8
Plantae	Flora	Myrtaceae	6474	<i>Ochrosperma lineare</i>		8
Plantae	Flora	Myrtaceae	4283	<i>Rhodamnia rubescens</i>	Scrub Turpentine	1
Plantae	Flora	Myrtaceae	4284	<i>Rhodomyrtus psidioides</i>	Native Guava	3
Plantae	Flora	Myrtaceae	4291	<i>Syzygium luehmannii</i>	Small-leaved Lilly Pilly	1
Plantae	Flora	Myrtaceae	7201	<i>Syzygium oleosum</i>	Blue Lilly Pilly	4

Plantae	Flora	Myrtaceae	4297	<i>Tristaniopsis laurina</i>		Kanooka		2	
Plantae	Flora	Nymphaeaceae	10779	<i>Nymphaea caerulea subsp. zanzibarensis</i>	*	Cape Waterlily		1	
Plantae	Flora	Olacaceae	4307	<i>Olax retusa</i>				4	
Plantae	Flora	Olacaceae	6407	<i>Olax stricta</i>				2	
Plantae	Flora	Oleaceae	4311	<i>Jasminum volubile</i>				2	
Plantae	Flora	Oleaceae	4313	<i>Ligustrum sinense</i>	*	Small-leaved Privet		1	
Plantae	Flora	Oleaceae	4318	<i>Notelaea longifolia</i>		Large Mock-olive		11	
Plantae	Flora	Oleaceae	4321	<i>Notelaea ovata</i>				1	
Plantae	Flora	Ophioglossaceae	8144	<i>Botrychium australe</i>		Parsley Fern		1	
Plantae	Flora	Orchidaceae	13308	<i>Acianthella amplexicaulis</i>			P	2	
Plantae	Flora	Orchidaceae	4351	<i>Acianthus caudatus</i>		Mayfly Orchid	P	1	
Plantae	Flora	Orchidaceae	4352	<i>Acianthus exsertus</i>		Mosquito Orchid	P	1	
Plantae	Flora	Orchidaceae	9014	<i>Arthrochilus prolixus</i>			P	1	
Plantae	Flora	Orchidaceae	4363	<i>Bulbophyllum exiguum</i>			P	1	
Plantae	Flora	Orchidaceae	4373	<i>Caladenia carnea</i>		Pink Fingers	P	1	
Plantae	Flora	Orchidaceae	4388	<i>Calanthe triplicata</i>		Christmas Orchid	P	3	
Plantae	Flora	Orchidaceae	4390	<i>Calochilus campestris</i>		Copper Beard Orchid	P	1	
Plantae	Flora	Orchidaceae	4392	<i>Calochilus grandiflorus</i>		Giant Beard Orchid	P	3	
Plantae	Flora	Orchidaceae	4396	<i>Cheirostylis ovata</i>			P	1	
Plantae	Flora	Orchidaceae	4402	<i>Chiloglottis reflexa</i>			P	1	
Plantae	Flora	Orchidaceae	4414	<i>Cryptostylis erecta</i>		Tartan Tongue Orchid	P	1	
Plantae	Flora	Orchidaceae	4418	<i>Cymbidium madidum</i>			P	3	
Plantae	Flora	Orchidaceae	4419	<i>Cymbidium suave</i>		Snake Orchid	P	3	
Plantae	Flora	Orchidaceae	4420	<i>Dendrobium aemulum</i>		Ironbark Orchid	P	2	
Plantae	Flora	Orchidaceae	4425	<i>Dendrobium kingianum</i>		Pink Rock Orchid	P	1	
Plantae	Flora	Orchidaceae	4426	<i>Dendrobium linguiforme</i>		Tongue Orchid	P	1	
Plantae	Flora	Orchidaceae	6630	<i>^Dendrobium melaleucaphilum</i>		Spider orchid	E1,P,2	1	
Plantae	Flora	Orchidaceae	4436	<i>Dendrobium tetragonum</i>		Tree Spider Orchid	P	3	
Plantae	Flora	Orchidaceae	7887	<i>Dipodium punctatum</i>			P	1	
Plantae	Flora	Orchidaceae	7622	<i>Microtis parviflora</i>		Slender Onion Orchid	P	3	
Plantae	Flora	Orchidaceae	6990	<i>^Oberonia complanata</i>		Yellow-flowered King of the Fairies	E1,P,2	1	
Plantae	Flora	Orchidaceae	7077	<i>^Oberonia titania</i>		Red-flowered King of the Fairies	V,P,2	4	
Plantae	Flora	Orchidaceae	4476	<i>Orthoceras strictum</i>		Bird's-mouth Orchid	P	1	
Plantae	Flora	Orchidaceae	4479	<i>^Peristeranthus hillii</i>		Brown Fairy-chain Orchid	V,P,2	1	
Plantae	Flora	Orchidaceae	4480	<i>^Phaius australis</i>		Southern Swamp Orchid	E1,P,2	E	4
Plantae	Flora	Orchidaceae	4483	<i>Plectorrhiza tridentata</i>		Tangle Orchid	P	1	
Plantae	Flora	Orchidaceae	4491	<i>Prasophyllum australe</i>		Southern Leek Orchid	P	1	
Plantae	Flora	Orchidaceae	4497	<i>Prasophyllum elatum</i>		Tall Leek Orchid	P	1	
Plantae	Flora	Orchidaceae	4562	<i>Pterostylis nutans</i>		Nodding Greenhood	P	1	
Plantae	Flora	Orchidaceae	4564	<i>Pterostylis ophioglossa</i>		Snake Tongue Greenhood	P	1	
Plantae	Flora	Orchidaceae	4568	<i>Pterostylis pedunculata</i>		Maroonhood	P	1	
Plantae	Flora	Orchidaceae	4585	<i>Sarcophilus hillii</i>			P	1	



Plantae	Flora	Orchidaceae	7144	<i>Sarcochilus spathulatus</i>	Small Butterfly Orchid	P	1
Plantae	Flora	Orchidaceae	11877	<i>Spiranthes australis</i>	Ladies' Tresses	P	2
Plantae	Flora	Orchidaceae	11449	<i>Thelymitra angustifolia</i>		P	1
Plantae	Flora	Orchidaceae	7037	<i>Thelymitra malvina</i>	Mauve-tuft Sun Orchid	P	1
Plantae	Flora	Orchidaceae	4603	<i>Thelymitra purpurata</i>	Wallum Sun Orchid	P	1
Plantae	Flora	Osmundaceae	8151	<i>Todea barbara</i>	King Fern	P	1
Plantae	Flora	Oxalidaceae	4613	<i>Oxalis corniculata</i>	* Creeping Oxalis		4
Plantae	Flora	Oxalidaceae	4621	<i>Oxalis perennans</i>			2
Plantae	Flora	Oxalidaceae	4624	<i>Oxalis radicata</i>			4
Plantae	Flora	Oxalidaceae	4625	<i>Oxalis rubens</i>			1
Plantae	Flora	Pandanaceae	9349	<i>Pandanus tectorius</i> var. <i>australianus</i>	Screw Pine	P	2
Plantae	Flora	Passifloraceae	7687	<i>Passiflora aurantia</i> var. <i>aurantia</i>	Blunt-leaved Passionfruit		1
Plantae	Flora	Passifloraceae	4646	<i>Passiflora herbertiana</i>			1
Plantae	Flora	Passifloraceae	4649	<i>Passiflora suberosa</i>	* Cork Passionfruit		3
Plantae	Flora	Passifloraceae	4650	<i>Passiflora subpeltata</i>	* White Passionflower		1
Plantae	Flora	Peperomiaceae	11131	<i>Peperomia blanda</i> var. <i>floribunda</i>			2
Plantae	Flora	Phormiaceae	3540	<i>Dianella caerulea</i>	Blue Flax-lily		18
Plantae	Flora	Phormiaceae	6811	<i>Dianella caerulea</i> var. <i>asserata</i>			1
Plantae	Flora	Phormiaceae	7783	<i>Dianella longifolia</i>	Blueberry Lily		1
Plantae	Flora	Phormiaceae	3542	<i>Dianella revoluta</i>	Blueberry Lily		4
Plantae	Flora	Phyllanthaceae	2695	<i>Breynia oblongifolia</i>	Coffee Bush		14
Plantae	Flora	Phyllanthaceae	2696	<i>Bridelia exaltata</i>	Brush Ironbark		1
Plantae	Flora	Phyllanthaceae	7866	<i>Glochidion ferdinandi</i>	Cheese Tree		13
Plantae	Flora	Phyllanthaceae	8464	<i>Glochidion sumatranum</i>	Umbrella Cheese Tree		3
Plantae	Flora	Phyllanthaceae	8216	<i>Phyllanthus hirtellus</i>	Thyme Spurge		2
Plantae	Flora	Phyllanthaceae	6751	<i>Phyllanthus virgatus</i>	Wiry Spurge		4
Plantae	Flora	Phyllanthaceae	7395	<i>Poranthera microphylla</i>	Small Poranthera		1
Plantae	Flora	Pittosporaceae	12233	<i>Billardiera rubens</i>			1
Plantae	Flora	Pittosporaceae	4671	<i>Billardiera scandens</i>	Hairy Apple Berry		2
Plantae	Flora	Pittosporaceae	11204	<i>Pittosporum multiflorum</i>	Orange Thorn		2
Plantae	Flora	Pittosporaceae	4683	<i>Pittosporum revolutum</i>	Rough Fruit Pittosporum		3
Plantae	Flora	Pittosporaceae	4685	<i>Pittosporum undulatum</i>	Sweet Pittosporum		4
Plantae	Flora	Plantaginaceae	6009	<i>Veronica plebeia</i>	Trailing Speedwell		2
Plantae	Flora	Poaceae	7289	<i>Alloteropsis semialata</i>	Cockatoo Grass		1
Plantae	Flora	Poaceae	4748	<i>Andropogon virginicus</i>	* Whisky Grass		1
Plantae	Flora	Poaceae	4756	<i>Aristida calycina</i>			1
Plantae	Flora	Poaceae	4773	<i>Aristida vagans</i>	Threeawn Speargrass		6
Plantae	Flora	Poaceae	4785	<i>Axonopus compressus</i>	* Broad-leaved Carpet Grass		2
Plantae	Flora	Poaceae	11194	<i>Axonopus fissifolius</i>	* Narrow-leaved Carpet Grass		5
Plantae	Flora	Poaceae	4841	<i>Cymbopogon refractus</i>	Barbed Wire Grass		8
Plantae	Flora	Poaceae	6540	<i>Cynodon dactylon</i>	Common Couch		1
Plantae	Flora	Poaceae	4898	<i>Dichelachne micrantha</i>	Shorthair Plumegrass		5

Plantae	Flora	Poaceae	4913	<i>Digitaria parviflora</i>	Small-flowered Finger Grass	3	
Plantae	Flora	Poaceae	4920	<i>Diplachne fusca</i>	Brown Beetle Grass	1	
Plantae	Flora	Poaceae	4929	<i>Echinopogon caespitosus</i>	Bushy Hedgehog-grass	2	
Plantae	Flora	Poaceae	4946	<i>Entolasia marginata</i>	Bordered Panic	9	
Plantae	Flora	Poaceae	4947	<i>Entolasia stricta</i>	Wiry Panic	4	
Plantae	Flora	Poaceae	4948	<i>Entolasia whiteana</i>		1	
Plantae	Flora	Poaceae	7921	<i>Eragrostis brownii</i>	Brown's Lovegrass	3	
Plantae	Flora	Poaceae	4952	<i>Eragrostis curvula</i>	*	African Lovegrass	1
Plantae	Flora	Poaceae	6659	<i>Eragrostis interrupta</i>		4	
Plantae	Flora	Poaceae	4981	<i>Eriachne pallescens</i>		2	
Plantae	Flora	Poaceae	7228	<i>Eriochloa procera</i>	Spring Grass	2	
Plantae	Flora	Poaceae	5001	<i>Hemarthria uncinata</i>	Matgrass	3	
Plantae	Flora	Poaceae	6803	<i>Imperata cylindrica</i>	Blady Grass	24	
Plantae	Flora	Poaceae	6867	<i>Ischaemum australe</i>		7	
Plantae	Flora	Poaceae	11387	<i>Lachnagrostis billardierei</i> subsp. <i>billardierei</i>		1	
Plantae	Flora	Poaceae	11388	<i>Lachnagrostis filiformis</i>		2	
Plantae	Flora	Poaceae	7707	<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Grass	3	
Plantae	Flora	Poaceae	5044	<i>Oplismenus aemulus</i>		10	
Plantae	Flora	Poaceae	5045	<i>Oplismenus imbecillis</i>		2	
Plantae	Flora	Poaceae	5048	<i>Ottochloa gracillima</i>		18	
Plantae	Flora	Poaceae	5055	<i>Panicum effusum</i>	Hairy Panic	1	
Plantae	Flora	Poaceae	5066	<i>Panicum simile</i>	Two-colour Panic	8	
Plantae	Flora	Poaceae	7172	<i>Paspalidium distans</i>		3	
Plantae	Flora	Poaceae	5086	<i>Paspalum dilatatum</i>	*	Paspalum	3
Plantae	Flora	Poaceae	5087	<i>Paspalum distichum</i>		Water Couch	1
Plantae	Flora	Poaceae	12421	<i>Paspalum mandiocanum</i>	*	Broadleaf Paspalum	2
Plantae	Flora	Poaceae	5089	<i>Paspalum orbiculare</i>		Ditch Millet	2
Plantae	Flora	Poaceae	5093	<i>Paspalum urvillei</i>	*	Vasey Grass	1
Plantae	Flora	Poaceae	6563	<i>Paspalum vaginatum</i>		Salt-water Couch	1
Plantae	Flora	Poaceae	PHAA	<i>Phalaris spp.</i>	*		1
Plantae	Flora	Poaceae	5113	<i>Phragmites australis</i>		Common Reed	1
Plantae	Flora	Poaceae	5155	<i>Sacciolepis indica</i>		Indian Cupscale Grass	2
Plantae	Flora	Poaceae	7842	<i>Setaria pumila</i>	*	Pale Pigeon Grass	2
Plantae	Flora	Poaceae	5167	<i>Setaria sphacelata</i>	*	South African Pigeon Grass	1
Plantae	Flora	Poaceae	7843	<i>Spinifex sericeus</i>		Hairy Spinifex	2
Plantae	Flora	Poaceae	5183	<i>Sporobolus pyramidalis</i>	*		1
Plantae	Flora	Poaceae	5184	<i>Sporobolus virginicus</i>			1
Plantae	Flora	Poaceae	5219	<i>Themeda australis</i>		Kangaroo Grass	17
Plantae	Flora	Poaceae	13478	<i>Whiteochloa cymbiformis</i>			3
Plantae	Flora	Poaceae	5243	<i>Zoysia macrantha</i>		Prickly Couch	11
Plantae	Flora	Podocarpaceae	5246	<i>Podocarpus elatus</i>		Plum Pine	3
Plantae	Flora	Polygalaceae	5252	<i>Comesperma defoliatum</i>			2

Plantae	Flora	Polygonaceae	5286	<i>Persicaria strigosa</i>				1	
Plantae	Flora	Polypodiaceae	8154	<i>Belvisia mucronata</i>	Needle-leaf Fern	E1,P		4	
Plantae	Flora	Polypodiaceae	8159	<i>Platynerium bifurcatum</i>	Elkhorn Fern	P		11	
Plantae	Flora	Polypodiaceae	8161	<i>Platynerium superbum</i>	Staghorn	P		2	
Plantae	Flora	Polypodiaceae	11148	<i>Pyrrosia confluens</i> var. <i>confluens</i>	Horseshoe Felt Fern			2	
Plantae	Flora	Polypodiaceae	8163	<i>Pyrrosia rupestris</i>	Rock Felt Fern			5	
Plantae	Flora	Primulaceae	5337	<i>Samolus repens</i>	Creeping Brookweed			1	
Plantae	Flora	Proteaceae	5339	<i>Banksia aemula</i>	Wallum Banksia			18	
Plantae	Flora	Proteaceae	5342	<i>Banksia ericifolia</i>	Heath-leaved Banksia			3	
Plantae	Flora	Proteaceae	11050	<i>Banksia ericifolia</i> subsp. <i>macrantha</i>				10	
Plantae	Flora	Proteaceae	5343	<i>Banksia integrifolia</i>	Coast Banksia			3	
Plantae	Flora	Proteaceae	6603	<i>Banksia integrifolia</i> subsp. <i>integrifolia</i>	Coastal Banksia			10	
Plantae	Flora	Proteaceae	5345	<i>Banksia oblongifolia</i>	Fern-leaved Banksia			8	
Plantae	Flora	Proteaceae	5348	<i>Banksia serrata</i>	Old-man Banksia			2	
Plantae	Flora	Proteaceae	7509	<i>Banksia spinulosa</i> var. <i>collina</i>		P		2	
Plantae	Flora	Proteaceae	BANK	<i>Banksia</i> spp.				1	
Plantae	Flora	Proteaceae	5352	<i>Conospermum taxifolium</i>	Variable Smoke-bush			9	
Plantae	Flora	Proteaceae	10962	<i>Grevillea humilis</i> subsp. <i>maritima</i>				1	
Plantae	Flora	Proteaceae	9760	<i>Hakea actites</i>	Mulloway Needle Bush			1	
Plantae	Flora	Proteaceae	8594	<i>Hakea florulenta</i>				2	
Plantae	Flora	Proteaceae	10806	<i>Hakea salicifolia</i> subsp. <i>salicifolia</i>				1	
Plantae	Flora	Proteaceae	5440	<i>Lambertia formosa</i>	Mountain Devil			1	
Plantae	Flora	Proteaceae	5445	<i>Lomatia silaifolia</i>	Crinkle Bush	P		2	
Plantae	Flora	Proteaceae	8769	<i>Persoonia adenantha</i>		P		4	
Plantae	Flora	Proteaceae	5455	<i>Persoonia cornifolia</i>		P		1	
Plantae	Flora	Proteaceae	8596	<i>Persoonia stradbrogensis</i>		P		6	
Plantae	Flora	Proteaceae	5475	<i>Persoonia tenuifolia</i>	Fine-leaf Geebung	P		1	
Plantae	Flora	Proteaceae	5476	<i>Persoonia virgata</i>		P		12	
Plantae	Flora	Proteaceae	5477	<i>Petrophile canescens</i>	Conesticks	P		6	
Plantae	Flora	Proteaceae	5479	<i>Petrophile pulchella</i>	Conesticks	P		1	
Plantae	Flora	Psilotaceae	8165	<i>Psilotum nudum</i>	Skeleton Fork-Fern			1	
Plantae	Flora	Pteridaceae	8171	<i>Acrostichum speciosum</i>	Mangrove Fern			2	
Plantae	Flora	Ranunculaceae	5507	<i>Ranunculus inundatus</i>	River Buttercup			1	
Plantae	Flora	Restionaceae	10609	<i>Baloskion pallens</i>				5	
Plantae	Flora	Restionaceae	10611	<i>Baloskion tenuiculme</i>				4	
Plantae	Flora	Restionaceae	10612	<i>Baloskion tetraphyllum</i>				1	
Plantae	Flora	Restionaceae	10614	<i>Baloskion tetraphyllum</i> subsp. <i>meiostachyum</i>	Plume Rush			2	
Plantae	Flora	Restionaceae	5531	<i>Coleocarya gracilis</i>				9	

Plantae	Flora	Restionaceae	5532	<i>Empodisma minus</i>		7
Plantae	Flora	Restionaceae	10615	<i>Eurychorda complanata</i>		3
Plantae	Flora	Restionaceae	5533	<i>Hypolaena fastigiata</i>		5
Plantae	Flora	Restionaceae	5534	<i>Leptocarpus tenax</i>		4
Plantae	Flora	Restionaceae	13531	<i>Lepyrodia imitans</i>		1
Plantae	Flora	Restionaceae	5541	<i>Lepyrodia scariosa</i>		2
Plantae	Flora	Restionaceae	10602	<i>Sporadanthus caudatus</i>		4
Plantae	Flora	Restionaceae	10604	<i>Sporadanthus interruptus</i>		11
Plantae	Flora	Rhamnaceae	7686	<i>Alphitonia excelsa</i>	Red Ash	23
Plantae	Flora	Ripogonaceae	6021	<i>Ripogonum fawcettianum</i>	Small Supplejack	1
Plantae	Flora	Rosaceae	11236	<i>Rubus moluccanus var. trilobus</i>	Molucca Bramble	3
Plantae	Flora	Rosaceae	5642	<i>Rubus parvifolius</i>	Native Raspberry	3
Plantae	Flora	Rubiaceae	10865	<i>Atractocarpus benthamianus</i>		1
Plantae	Flora	Rubiaceae	12109	<i>Caelospermum paniculatum</i>		1
Plantae	Flora	Rubiaceae	11599	<i>Cyclophyllum longipetalum</i>	Coast Canthium	8
Plantae	Flora	Rubiaceae	6571	<i>Duringtonia paludosa</i>		4
Plantae	Flora	Rubiaceae	5691	<i>Hodgkinsonia ovatiflora</i>		1
Plantae	Flora	Rubiaceae	5692	<i>Ixora beckleri</i>	Native Ixora	1
Plantae	Flora	Rubiaceae	6860	<i>Morinda jasminoides</i>	Sweet Morinda	18
Plantae	Flora	Rubiaceae	5698	<i>Opercularia diphylla</i>	Stinkweed	1
Plantae	Flora	Rubiaceae	5703	<i>Pomax umbellata</i>	Pomax	6
Plantae	Flora	Rubiaceae	5706	<i>Psychotria loniceroides</i>	Hairy Psychotria	5
Plantae	Flora	Rutaceae	8418	<i>Acronychia imperforata</i>	Logan Apple	5
Plantae	Flora	Rutaceae	5726	<i>Acronychia wilcoxiana</i>	Silver Aspen	1
Plantae	Flora	Rutaceae	5739	<i>Boronia falcifolia</i>	Wallum Boronia	P 16
Plantae	Flora	Rutaceae	5749	<i>Boronia parviflora</i>	Swamp Boronia	P 2
Plantae	Flora	Rutaceae	5750	<i>Boronia pinnata</i>		P 1
Plantae	Flora	Rutaceae	5758	<i>Boronia saffrolifera</i>		P 8
Plantae	Flora	Rutaceae	5776	<i>Eriostemon australasius</i>		P 7
Plantae	Flora	Rutaceae	5793	<i>Flindersia bennettiana</i>	Bennett's Ash	4
Plantae	Flora	Rutaceae	5802	<i>Halfordia kendack</i>	Saffron Heart	3
Plantae	Flora	Rutaceae	8659	<i>Melicope elleryana</i>	Pink-flowered Doughwood	1
Plantae	Flora	Rutaceae	10742	<i>Nematolepis squamea subsp. squamea</i>	Satinwood	4
Plantae	Flora	Rutaceae	5841	<i>Zieria laevigata</i>	Smooth Zieria	2
Plantae	Flora	Rutaceae	8834	<i>Zieria laxiflora</i>	Wallum Zieria	12
Plantae	Flora	Rutaceae	13586	<i>Zieria minutiflora subsp. minutiflora</i>		2
Plantae	Flora	Rutaceae	5847	<i>Zieria smithii</i>	Sandfly Zieria	1
Plantae	Flora	Santalaceae	6383	<i>Exocarpos latifolius</i>	Broad-leaved Native Cherry	4
Plantae	Flora	Santalaceae	5865	<i>Leptomeria acida</i>	Sour Currant Bush	6
Plantae	Flora	Sapindaceae	5872	<i>Alectryon coriaceus</i>	Beach Alectryon	5
Plantae	Flora	Sapindaceae	5884	<i>Cupaniopsis anacardioides</i>	Tuckeroo	13
Plantae	Flora	Sapindaceae	5911	<i>Dodonaea triquetra</i>	Large-leaf Hop-bush	2

Plantae	Flora	Sapindaceae	5917	<i>Guioa semiglauca</i>	Guioa		4
Plantae	Flora	Sapindaceae	5926	<i>Mischocarpus pyriformis</i>	Yellow Pear-fruit		3
Plantae	Flora	Schizaeaceae	8179	<i>Lygodium microphyllum</i>	Climbing Snake Fern		3
Plantae	Flora	Schizaeaceae	8181	<i>Schizaea bifida</i>	Forked Comb Fern		6
Plantae	Flora	Schizaeaceae	8182	<i>Schizaea dichotoma</i>	Branched Comb Fern		4
Plantae	Flora	Scrophulariaceae	5943	<i>Artanema fimbriatum</i>			1
Plantae	Flora	Scrophulariaceae	5945	<i>Bacopa monnieri</i>	Bacopa		4
Plantae	Flora	Scrophulariaceae	7846	<i>Buchnera gracilis</i>			1
Plantae	Flora	Selaginellaceae	8187	<i>Selaginella uliginosa</i>	Swamp Selaginella		11
Plantae	Flora	Smilacaceae	7592	<i>Smilax australis</i>	Lawyer Vine		13
Plantae	Flora	Smilacaceae	6022	<i>Smilax glycyphylla</i>	Sweet Sarsparilla		6
Plantae	Flora	Solanaceae	6036	<i>Duboisia myoporoides</i>	Corkwood		4
Plantae	Flora	Solanaceae	6072	<i>Solanum cinereum</i>	Narrawa Burr		1
Plantae	Flora	Solanaceae	6076	<i>Solanum densevestitum</i>			1
Plantae	Flora	Solanaceae	6090	<i>Solanum mauritianum</i>	* Wild Tobacco Bush		3
Plantae	Flora	Solanaceae	6100	<i>Solanum prinophyllum</i>	Forest Nightshade		1
Plantae	Flora	Solanaceae	6104	<i>Solanum seaforthianum</i>	* Climbing Nightshade		1
Plantae	Flora	Stackhousiaceae	6124	<i>Stackhousia spathulata</i>			6
Plantae	Flora	Sterculiaceae	6128	<i>Brachychiton populneus</i>	Kurrajong		2
Plantae	Flora	Sterculiaceae	6129	<i>Commersonia bartramia</i>	Brown Kurrajong		1
Plantae	Flora	Stylidiaceae	6154	<i>Stylidium debile</i>	Frail Triggerplant		5
Plantae	Flora	Stylidiaceae	6157	<i>Stylidium graminifolium</i>	Grass Triggerplant		1
Plantae	Flora	Stylidiaceae	12040	<i>Stylidium paniculatum</i>	Frail Triggerplant		2
Plantae	Flora	Thelypteridaceae	8188	<i>Christella dentata</i>	Binung		1
Plantae	Flora	Thelypteridaceae	8190	<i>Cyclosorus interruptus</i>			1
Plantae	Flora	Thymelaeaceae	6634	<i>Pimelea latifolia subsp. altior</i>			1
Plantae	Flora	Thymelaeaceae	6182	<i>Pimelea linifolia</i>	Slender Rice Flower		16
Plantae	Flora	Ulmaceae	6761	<i>Trema tomentosa var. aspera</i>	Native Peach		1
Plantae	Flora	Uvulariaceae	7346	<i>Tripladenia cunninghamii</i>			1
Plantae	Flora	Verbenaceae	6248	<i>Lantana camara</i>	* Lantana		21
Plantae	Flora	Verbenaceae	6252	<i>Phyla nodiflora</i>	* Carpet Weed		1
Plantae	Flora	Verbenaceae	6259	<i>Verbena officinalis</i>	* Common Verbena		1
Plantae	Flora	Violaceae	9769	<i>Hybanthus stellarioides</i>			7
Plantae	Flora	Violaceae	11863	<i>Viola banksii</i>			8
Plantae	Flora	Violaceae	6272	<i>Viola hederacea</i>	Ivy-leaved Violet		13
Plantae	Flora	Viscaceae	6278	<i>Notothixos incanus</i>			1
Plantae	Flora	Vitaceae	6281	<i>Cayratia clematidea</i>	Native Grape		4
Plantae	Flora	Vitaceae	6283	<i>Cissus hypoglauca</i>	Giant Water Vine		5
Plantae	Flora	Vitaceae	6286	<i>Cissus sterculiifolia</i>	Yaroong		3
Plantae	Flora	Vitaceae	14093	<i>Clematicissus opaca</i>	Pepper Vine		3
Plantae	Flora	Winteraceae	6290	<i>Tasmania insipida</i>	Brush Pepperbush		1
Plantae	Flora	Xanthorrhoeaceae	8771	<i>Xanthorrhoea fulva</i>		P	15
Plantae	Flora	Xanthorrhoeaceae	6317	<i>Xanthorrhoea johnsonii</i>	Johnson's Grass Tree	P	13
Plantae	Flora	Xanthorrhoeaceae	6321	<i>Xanthorrhoea resinosa</i>		P	3

Plantae	Flora	Xyridaceae	7247	<i>Xyris complanata</i>		1
Plantae	Flora	Xyridaceae	6322	<i>Xyris gracilis</i>		3
Plantae	Flora	Xyridaceae	6323	<i>Xyris juncea</i>	Dwarf Yellow-eye	1
Plantae	Flora	Xyridaceae	6324	<i>Xyris operculata</i>		5
Plantae	Flora	Zingiberaceae	6913	<i>Alpinia arundelliana</i>	Native Ginger	1
Plantae	Flora	Zingiberaceae	6340	<i>Alpinia caerulea</i>	Native Ginger	1