



**FLORA AND FAUNA ASSESSMENT**

**FOR THE PROPOSED SUBDIVISION  
OF LOT 2 DP 1119830  
MARSHALL WAY & ALEXANDRA DRIVE  
BELLWOOD**

**MARCH 2010**

**A REPORT PREPARED FOR GEOFF SMYTH CONSULTING**



## DOCUMENT CONTROL

### Revision History (office use only)

Issue	Version	Draft/Final	Date Sent	Distributed To	Copies	Media	Delivery
1	Rw3	Draft	7/5/09	Geoff Smyth	1	Digital	Email
2	RW4	Draft	16 <sup>th</sup> February 2010	Geoff Smyth	1	Digital	Email
3	Rw4	Draft	22/3/2010	Geoff Smyth	1	Digital	Email
4							
5							

### Client Issue

Version	Date	Author		Reviewer	
		Name	Initials	Name	Initials
DRAFT	7/5/09	Adam McArthur Kathy Owen	JW KO	James Warren	JW
DRAFT Amended	16 <sup>th</sup> February 2010	Adam McArthur Kathy Owen	JW KO	James Warren	JW
DRAFT Amended	22 <sup>th</sup> February 2010	Adam McArthur Kathy Owen	JW KO	James Warren	JW



## TABLE OF CONTENTS

1	Introduction.....	3
1.1	Background.....	3
1.2	Locality .....	3
1.2.1	Introduction.....	3
1.2.2	Conservation Reserves and ecologically significant areas in the locality ...	3
1.2.3	The Subject site .....	4
1.2.4	The Study area .....	4
1.3	Soils and Geology .....	4
1.4	Landuse zones .....	4
2	Structure of this Assessment .....	5
3	The Proposed Development .....	6
4	Director General's Environmental Assessment .....	7
4.1	Background.....	7
4.2	Compliance with Relevant Legislation.....	8
4.3	(9.1) Assess the potential direct and indirect impacts of the development on flora and fauna .....	11
4.3.1	Introduction.....	11
4.3.2	Summary of existing flora and fauna values .....	11
4.3.3	Threatened species and their habitats .....	12
4.3.4	Endangered Ecological Communities.....	17
4.3.5	Koala habitat .....	14
	State Environmental Planning Policy No. 44 - Koala Habitat Protection.....	14
4.4	(9.2) Outline measures for the conservation of existing wildlife corridor . ....	19
4.4.1	Wildlife corridors.....	19
4.5	(9.3) Assess measures to preserve and manage protect [sic] ecologically sensitive areas. ....	20
4.5.1	Introduction.....	20
4.5.2	Impacts on SEPP 14 Wetland number 362 .....	20
4.5.3	Additional impacts .....	20
4.5.4	Amelioration for SEPP 14 Wetland number 362 .....	21
4.5.5	Bellwood and Swampy Creeks.....	21
4.6	(9.4) Assess the impacts of any native vegetation clearing. ....	22
4.6.1	Introduction.....	22
4.6.2	Native vegetation .....	22
4.7	Native Vegetation Act 2003 .....	25
4.8	(9.5) Biodiversity surveys. ....	26
4.8.1	Compliance with Biodiversity Survey Guidelines (DEC 2004).....	26
4.8.2	JWA Surveys.....	26
5	Summary of impacts, mitigation & offsets.....	27
6	References .....	32
	Appendix 1.....	34
	Flora Assessment .....	35



## Flora and Fauna Assessment

---

Appendix 2.....	49
PLANT SPECIES LIST .....	49
Appendix 3.....	55
Fauna Assessment .....	56
Appendix 4.....	78
Assessment of Significance (7 part tests) .....	78



# 1 INTRODUCTION

## 1.1 Background

James Warren and Associates have been engaged by Geoff Smyth Consulting to complete a Flora and Fauna Assessment for the proposed subdivision of Lot 2 DP 1119830 Marshall Way & Alexandra Drive Bellwood. Under section 3A of the *Environmental Planning & Assessment Act 1979* (EPA Act 1979), a major projects application has been lodged with the Department of Planning. Director General's Environmental Assessment Requirements (DGEARs) have been issued dated 4<sup>th</sup> December 2009.

The Flora and Fauna Assessment has involved the following:

- Mapping and ground truthing vegetation units and determining their conservation status with reference to the Comprehensive Regional Assessment completed for NSW Forest and Non-forest ecosystems as part of the Regional Forestry Agreement (RFA) process (CRA Unit 1999), and with reference to the Tweed Vegetation Management Strategy (2004);
- Searching for and recording Threatened (*TSC Act 1995*), ROTAP (Briggs & Leigh 1996) and regionally significant plant species (Sheringham & Westaway 1995), and assessing the occurrence of Endangered Ecological Communities (EECs);
- Determining the suite of Threatened fauna (*TSC Act 1995*) that occurs in the locality and assessing their potential occurrence in the Study area;
- Assessing habitat provided by the site in relation to adjacent habitat and making an assessment of the corridor value of the site; and
- Addressing statutory requirements including *State Environmental Planning Policy No. 44* (SEPP 44 - Koala Habitat Protection), Section 5A of the *Environmental Planning & Assessment Act (1979)* (EPA Act), the *Commonwealth Environment Protection and Biodiversity Act 1999* (EPBC Act) and the *Fisheries Management and Amendment Act (1997)*.

## 1.2 Locality

### 1.2.1 Introduction

The locality is defined as the area within a 10km radius of the subject site. The locality therefore extends from Scotts Head in the south to Valla Beach in the north and from Bowraville in the west to the coastline in the east (**FIGURE 1**).

Prominent features in the locality include the townships of Nambucca Heads, Valla Beach and Macksville, and the villages of Newee Creek, Bellwood, and Valla. Prominent water bodies in the locality include the Nambucca River, Swampy Creek, Bellwood Creek, Bellwood Swamp, Taylor's Creek, Boggy Creek, Cedar Creek, Warrell Creek, Newee Creek, Deep Creek and Taylor's Arm.

Dominant habitat types are eucalypt forest, swamp sclerophyll forest and intertidal communities. Land uses within the locality include residential, forestry, tourism, grazing and agriculture.

### 1.2.2 Conservation Reserves and ecologically significant areas in the locality

There are three (3) dedicated conservation reserves in the locality:



- Bollanolla Nature Reserve;
- Jagun Nature Reserve; and
- Valla Nature Reserve.

Ecologically significant areas also include:

- Nambucca State Forest; and
- Viewmont State Forest (**FIGURE 1**).
- NSW State Environmental Planning Policy (SEPP) No. 14 - Coastal Wetlands numbers 356 - 394 (within 10kms of the site) (**FIGURE 2a**); and
- SEPP 14 Wetland number 362 (within the site boundary) (**FIGURE 2b**).
- NSW State Environmental Planning Policy (SEPP) No. 26 - Littoral rainforests numbers 86, 90, 91, 92, 93 and 94 (**FIGURE 3**).

### **1.2.3 The Subject site**

The subject site is defined as the area subject to the proposed development. The site is located on the western side of the Pacific Highway approximately 1.5km south-west of the Nambucca Heads town centre and covers approximately 55 ha (**FIGURE 4**). The site is bounded to the east by the Pacific Highway, to the south by commercial development, to the west by Nambucca State Forest and the north by rural-residential development (**FIGURE 1**).

The subject site generally slopes to the south and east towards Swampy Creek and the associated SEPP 14 Wetland number 362. The upper reaches of Swampy Creek appear to be fed by a small spring on the subject site, and from within Nambucca State Forest to the west.

### **1.2.4 The Study area**

The Study area is defined as the Subject site together with any proximate areas that may be affected by the proposed development. For this assessment, the study area includes SEPP 14 Wetland no. 362, downstream sections of Swampy Creek as well as the Nambucca River, and Nambucca State Forest to the immediate west.

## **1.3 Soils and Geology**

The development area consists of low land towards the east and steeper, elevated land towards the west adjacent to Alexandra Drive. The lower areas are classified as “Backbarrier swale swamps and closed depression overlying Pleistocene sands” (Eddie 2000). Soils are poorly drained, 50-100cm, Organosols (Peats) and Hydrosols (Humic Gleys) with Grey Kurosols (Gleyed Podzolic Soils) in drained areas (Eddie 2000). The areas are classified as “metasediments of the Nambucca Beds (Pn)” (Eddie 2000). The soils are moderately well drained, 100-180cm, red and Brown Kurosols (Red or Yellow Podzolic Soils) (Eddie 2000).

## **1.4 Landuse zones**

The majority of the Subject site is zoned 2(a) Residential (Low-Medium Density) within the Nambucca Local Environmental Plan (1995) (**FIGURE 5**) and is currently comprised predominantly of isolated patches of Tall open dry sclerophyll forest/woodland and scattered trees.

Areas surrounding the SEPP 14 Wetland No 362 and the associated creek are zoned 7(a) for Environmental Protection (**FIGURE 5**).



## **2 STRUCTURE OF THIS ASSESSMENT**

The Ecological Assessment and associated documents have been prepared in accordance with the accepted format for a Section 3A assessment report. The report format is as follows:

**SECTION 1** - Introduction, background and relevant site information

**SECTION 2** - Responses to accepted DGEARs

**SECTION 3** - Summary of Impacts, Mitigation and Offsets

**APPENDIX 1** - *Flora Assessment*

**APPENDIX 2** - *Site Species List*

**APPENDIX 3** - *Fauna Assessment*

**APPENDIX 4** - *EP&A Act 1979 Assessment of Significance Tests (7 part tests)*

**APPENDIX 5** - *EPBC Act 1999 Assessment of NES matters*



### 3 THE PROPOSED DEVELOPMENT

The Proposed development consists of approximately 357 residential lots, open space areas, conservation reserves and the construction of the link road (**FIGURE 6**). The development layout has been designed considering the following constraints:

- Residential zoned land;
- Clearing history (i.e. degraded and disturbed vegetation);
- Existing native vegetation;
- SEPP 14 Wetlands; and
- The highest predicted flood levels including the level modelled with the affect of global warming.

The balance areas of the site (i.e. outside the development envelope) will be subject to a Vegetation Management Plan (VMP).





## 4 DIRECTOR GENERAL'S ENVIRONMENTAL ASSESSMENT

### 4.1 Background

Under section 3A of the *Environmental Planning & Assessment Act 1979* (EPA Act 1979), a major projects application a major projects application has been lodged with the Department of Planning. Director General's Environmental Assessment Requirements (DGEARs) have been issued dated 4<sup>th</sup> December 2009.

- 9.1 Assess the potential direct and indirect impacts of the development on flora and fauna taking into consideration impacts on any threatened species, populations, ecological communities and/or critical habitat and any relevant recovery plan in accordance *Guidelines for Threatened Species Assessment* (July 2005).
- 9.2 Outline measures for the conservation of existing wildlife corridor values and/or connective importance of any vegetation on the subject land.
- 9.3 Assess measures to preserve and manage protect [sic] ecologically sensitive areas such as the riparian corridor and adjacent aquatic habitats including Bellwood and Swampy Creeks. The proposal should also nominate appropriate buffering to protect SEPP 14 wetlands.
- 9.4 Assess the impacts of any native vegetarian clearing including details of an offset strategy, where relevant, to ensure that there is no net loss of native vegetation. Consideration should also be given to the *Native Vegetation Act 2003*.
- 9.5 Biodiversity surveys are to be undertaken in accordance with the draft DECC Threatened Biodiversity Survey and Assessment Guidelines 2004.

Each of these requirements will be addressed in the following sections of this report.



## 4.2 Compliance with Relevant Legislation

The NSW *Threatened Species Conservation Act 1995* (TSC Act 1995) requires that the planning and development approval process for development and other activities have regard to the potential for adverse impacts on Threatened flora and fauna species and their habitats.

In July 2005 the NSW Department of Environment and Conservation (DEC) and NSW Department of Primary Industries (DPI) drafted *Guidelines for Threatened Species Assessment*. These guidelines identify factors that must be considered when assessing potential impacts on Threatened species, populations, or ecological communities, or their habitats for development applications assessed under part 3A of the EPA Act 1979.

This assessment has been completed in accordance with the DECC & DPI (2005) Draft guidelines. **APPENDIX 1** of the guidelines includes recommendations for the structure and content of the threatened species assessment. A summary of compliance with the guidelines is contained in **TABLE 1** below.

**TABLE 1**  
**COMPLIANCE WITH THE GUIDELINES FOR THREATENED SPECIES ASSESSMENT**

Section	Purpose	Compliance
Introduction	Sets the scene of the study	<ul style="list-style-type: none"><li>• The author of the study and who it was commissioned by is included in <b>SECTION 1.1</b>.</li><li>• A description of the proposal is included in <b>SECTION 1.4</b>.</li><li>• The regional context, location, geology, soils, landforms, disturbance history and other relevant information relating to stratification requirements is provided in <b>SECTIONS 1</b>.</li></ul>
Methods	Details the desktop and field survey methods employed. The technical information should be sufficiently detailed to enable the field survey to be replicated. The choice of field methods and extent of survey should be justified, and any constraints noted.	<ul style="list-style-type: none"><li>• The methods utilised in this assessment are contained in <b>APPENDICES 1 &amp; 3</b>.</li><li>• Descriptions of vegetation types in terms of structure and floristics, and a list of the dominant plant species in each growth stratum (trees, midstorey and groundcover) is included in <b>APPENDICES 1 &amp; 3</b>.</li><li>• An assessment of the suitability of the site as habitat for species, populations and ecological communities of conservation significance has been completed in <b>APPENDICES 1 &amp; 3</b>.</li><li>• Descriptions of survey techniques utilised during the flora assessment are contained in <b>APPENDIX 1</b>, and during the fauna assessment in <b>APPENDIX 3</b>.</li><li>• The type and number of traps, a description and map of their layout, details of the bait used, and the number of survey nights for each technique is included in <b>APPENDIX 3</b>.</li></ul>



## Flora and Fauna Assessment

Section	Purpose	Compliance
Results	Displays the findings of the study	<ul style="list-style-type: none"> <li>• A list of all flora species recorded from the subject site is contained in <b>APPENDIX 2</b>.</li> <li>• A list of all fauna species recorded is contained in <b>APPENDIX 3</b>.</li> <li>• A list of all Threatened species, populations, and ecological communities recorded or known to occur in the locality is provided in <b>SECTION 2</b>, <b>APPENDIX 1</b> and <b>APPENDIX 3</b>.</li> <li>• Maps of survey method locations are included in <b>APPENDIX 3</b>.</li> <li>• Maps of environmental features, vegetation types and habitat types are provided (<b>APPENDIX 1</b> and <b>3</b>).</li> <li>• Maps showing the location of Threatened species records and the extent of Endangered Ecological communities are provided (<b>APPENDIX 1</b> and <b>3</b>).</li> </ul>
Impact Evaluation	Describe context and intensity of impacts	<ul style="list-style-type: none"> <li>• The potential impacts of the proposed development on the following ecological characteristics has been discussed: <ul style="list-style-type: none"> <li>○ Wildlife corridors (<b>SECTION 4.4</b>);</li> <li>○ Koala habitat (<b>SECTION 4.3.5</b>);</li> <li>○ Endangered Ecological Communities (<b>SECTION 4.3.4</b>);</li> <li>○ Threatened fauna species and their habitats (<b>SECTION 4.3.3.2</b>); and</li> <li>○ Native vegetation communities (<b>SECTION 4.6.2.2</b>).</li> </ul> </li> </ul>
Mitigation	Discuss measures to minimise impacts	<ul style="list-style-type: none"> <li>• Amelioration measures to minimise potential impacts of the proposed development on the following ecological characteristics has been discussed: <ul style="list-style-type: none"> <li>○ Wildlife corridors (<b>SECTION 4.4</b>);</li> <li>○ Koala habitat (<b>SECTION 4.3.5</b>);</li> <li>○ Endangered Ecological Communities (<b>SECTION 4.3.4</b>);</li> <li>○ Threatened fauna species and their habitats (<b>SECTION 4.3.3.9</b>); and</li> <li>○ Native vegetation communities (<b>SECTION 4.2.6.4</b>).</li> </ul> </li> </ul>
Conclusion	Discuss the results	A summary of the information collected, including statements on the likely presence/absence of threatened biodiversity, and the general habitat value of the study area is provided in <b>SECTION 5</b> . This section also includes statements as to the likely impacts on key population thresholds.



## Flora and Fauna Assessment

Section	Purpose	Compliance
References	Cites publications used in the report	A list of references is provided on <b>Page 33</b> .
Appendices	Collates detailed information in the back of the report and allows the main body of the report to be concise	Flora assessment Flora species list Fauna assessment; TSC ACT Assessment (7 part tests); and EPBC ACT Assessment.



**4.3 (9.1) Assess the potential direct and indirect impacts of the development on flora and fauna taking into consideration impacts on any threatened species, populations, ecological communities and/or critical habitat and any relevant recovery plan in accordance *Guidelines for Threatened Species Assessment* (July 2005).**

**4.3.1 Introduction**

This section will consider the impacts (direct and indirect) of the proposed development on the existing native flora and fauna. Impacts considered will pay particular attention to Threatened species, populations, ecological communities (as listed under the *NSW Threatened Species Conservation Act 1995*) and their habitats. Impact assessment has been undertaken in accordance with *Guidelines for Threatened Species Assessment* (DECC 2005) and *Threatened species assessment guidelines. The assessment of significance* (DECC 2007) (i.e. 7 part tests).

Seven (7) part tests have been completed for all Threatened fauna species in accordance with the *Threatened Species Conservation Amendment Act 2002* (**APPENDIX 4**). An assessment in accordance with the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act) has also been completed (**APPENDIX 5**).

Assessment, under Part 3A, allows the use of avoidance and impact mitigation strategies as well as offsets, to achieve maintain-or-improve outcomes and reduce the impacts of a proposed development on Threatened Species and Endangered Ecological Communities.

This section begins with a summary of the Flora and Fauna on site and discusses the impacts of the proposed development on Threatened species and EECs with an assessment of:

- Impacts
- Avoidance of Impacts
- Mitigation
- Offsets

**4.3.2 Summary of existing flora and fauna values**

Detailed Flora and Fauna assessments were undertaken on the Subjects site (**APPENDICES 1 & 3**). A summary of existing Flora and Fauna values are as follows:

**Flora**

- The Flora assessment recorded six (6) broad communities with fifteen (15) discrete vegetation associations.
- Within these associations, 212 flora species were identified.
- Two of the broad Vegetation communities have associations that are representative of the Endangered Ecological Community EEC “Swamp Sclerophyll Forest on Coastal Floodplain” and “Swamp oak floodplain forest”.



- No Threatened or ROTAP species were recorded on the Subject site.

## Fauna

- The Fauna assessment recorded 121 fauna species including 8 amphibian, 4 reptile, 85 bird and 24 mammal species.
- Seven Threatened fauna species were recorded as follows:
  - Glossy black cockatoo (*Calyptorhynchus lathami*)
  - Osprey (*Pandion haliaetus*);
  - Grey-headed flying-fox (*Pteropus poliocephalus*);
  - Little bent-wing bat (*Miniopterus australis*);
  - Eastern free-tail bat (*Mormopterus norfolkensis*);
  - Eastern false pipistrelle (*Falsistrellus tasmaniensis*); and
  - Yellow-bellied glider (*Pteropus australis*).
- In addition a further 15 Threatened fauna species were considered either *likely* to occur or a *possible* occurrence on the Subject site.

### 4.3.3 Threatened species and their habitats

#### 4.3.3.1 Introduction

Seven species of fauna, as listed under the *Threatened Species Conservation Act* (1995), occur on the Bellwood Estate.

#### 4.3.3.2 Impacts on Threatened Fauna

Details of the fauna survey completed on the Bellwood Estate site are contained in **APPENDIX 3**. Six Threatened fauna species were recorded from the subject site including:

- Glossy black cockatoo (*Calyptorhynchus lathami*)
- Osprey (*Pandion haliaetus*);
- Grey-headed flying-fox (*Pteropus poliocephalus*);
- Little bent-wing bat (*Miniopterus australis*);
- Eastern free-tail bat (*Mormopterus norfolkensis*);
- Eastern false pipistrelle (*Falsistrellus tasmaniensis*); and
- Yellow-bellied glider (*Pteropus poliocephalus*).

In addition, a further 15 Threatened fauna species were considered to either *likely* to occur or a *possible* occurrence on the Subject site including;

A summary of impacts for each species recorded on and adjacent to the subject site is provided in **TABLE 4**.

It should be noted that Communities 6a and 6b Clumps of trees may provide some limited habitat for the following species by has not been calculated in the impacts.



**TABLE 4**  
**POTENTIAL LOSS OF THREATENED FAUNA HABITAT**

	Total Habitat (ha)	Habitat lost (ha)	Habitat lost (%)
Eastern false pipistrelle	18.7802	0.33	1.8
Eastern free tailed bat	18.7802	0.33	1.8
Glossy black-cockatoo	18.7802	0.33	1.8
Grey-headed flying-fox	18.7802	0.33	1.8
Little bent-wing bat	18.7802	0.33	1.8
Yellow bellied glider	18.7802	0.33	1.8

A discussion of amelioration measures to reduce potential impacts on Threatened fauna species is included below.

#### Glossy black-cockatoo

Two (2) species of suitable feed tree for this species occur on the Subject site - Forest oak (*Allocasuarina torulosa*) and Black she-oak (*A. littoralis*). Both of these species occur sporadically in the mid-storey of the Tall closed sclerophyll forest communities throughout the central vegetated area of the site and within the Aboriginal Reserve on the western boundary of the site. A pair of Glossy black cockatoos was observed within the central vegetated portion of the subject site and evidence was found of their feeding activities (i.e. chewed *Allocasuarina* cones) (**APPENDIX 3**).

The vegetation within areas containing food resources will not be affected by the proposed development. Vegetation to be removed consists primarily of scattered eucalypts within an essentially clear area of the site. In this community there is a lack of dead stags that might provide marginal roosting habitat. The loss of eucalypts from the development area will decrease the future recruitment of suitable nest hollows. Disturbance from the proposed development may reduce the likelihood of Glossy black-cockatoos feeding in proximate areas, although Glossy black-cockatoos are known to forage close to disturbance sources.

#### Yellow-bellied glider

This species has been recorded within the adjacent Nambucca State Forest. Vegetation to be removed consists primarily of scattered eucalypts within an essentially cleared area of the site. In this community there is a lack of hollow-bearing trees or dead stags that might provide denning opportunities. The loss of eucalypts from the development area will decrease the future recruitment of suitable hollows.

#### Grey-headed flying-fox

The proposed development will result in the loss of foraging habitat for this species and reduce the foraging efficiency of any individuals foraging in the Study area. There is no suitable roosting habitat for this species in the Study area. The Grey-headed flying-fox is likely to continue to forage in retained areas of vegetation on the site.

#### Osprey

The proposed development is unlikely to directly impact on the Osprey. An Osprey nest is located approximately 50m north of the northern boundary of the Subject site on



private property (**APPENDIX 3**). There is some potential for occupation of the proposed development to impact on the nesting Ospreys through disturbance.

#### Little bent-wing bat

The proposed development has the potential to result in the loss of foraging habitat for this species and reduce the foraging efficiency of any individuals foraging in the area. This reduction in forage opportunities is considered to be insignificant when compared to the large areas of forage habitat within the adjacent Nambucca State Forest. Trees to be removed from the subject site are not considered to represent suitable roost habitat for this species.

#### Eastern false pipistrelle

Trees to be removed from the subject site are unlikely to provide roost opportunities for this species. The proposed development has the potential to result in the loss of foraging habitat for this species and reduce the foraging efficiency of any individuals foraging in the area, however it is considered that this species will continue to forage within vegetation retained on the subject site and within the wider locality.

#### Eastern free-tail bat

The Eastern free-tail bat generally roosts in eucalypt hollows, but has also been found under loose bark on trees and in buildings. It is a solitary species and probably forages on insects. It is considered that the proposed development may result in a slight reduction in forage area for this species however it is likely to continue to forage within retained vegetation on the subject site and in the wider locality.

#### Avoidance of impacts

The proposed development has been designed to utilise existing cleared areas. With the exception of some minor incursions into the 7a vegetated land the development layout exists within land that has been previously cleared of the majority of timber.

#### Mitigation

A Vegetation Restoration and Management Plan (VMP) will be completed for the areas of retained vegetation (i.e. Land under Environmental Protection Zoning 7a and SEPP 14 Wetlands). This will enhance the site as a habitat for the threatened fauna species.

#### **4.3.4 Koala habitat**

In the absence of a shire-wide Koala Plan of Management (KPoM), State Environmental Planning Policy No. 44 (SEPP 44) applies.

#### **State Environmental Planning Policy No. 44 - Koala Habitat Protection**

In response to the state-wide decline of Koala populations the Department of Planning has enacted SEPP - 44 Koala Habitat Protection. The Policy aims to “encourage the proper conservation and management of area of natural vegetation that provide habitat for Koalas, to ensure permanent free-living populations over their present range and to reverse the current trend of population decline.”

A number of criteria in the SEPP are to be addressed:

##### **1. Does the policy apply?**

*Does the subject land occur in an LGA identified in Schedule 1?*





The Subject site occurs in the Nambucca LGA, which is listed under Schedule 1.

*Is the landholding to which the DA applies greater than 1 hectare in area?*

Yes.

***Is the land potential Koala habitat?***

*Does the site contain areas of native vegetation where the trees of 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?*

Yes. The site does contain a relatively large number of Forest red gums, Tallowwoods and Swamp mahogany, species listed on Schedule 2 of SEPP 44 as a primary Koala food trees. However, scat searches under trees on the site did not reveal the presence of Koalas on the site.

A resident adjacent to the site has not sighted a Koala in the last ten years. The closest record of a Koala to the site was approximately 9km south-west, near Macksville.

**3. *Is there core Koala habitat on the subject land?***

The site does not support core Koala habitat.

**4. *Is there a requirement for the preparation of a Plan of Management for identified core Koala habitat?***

No.

#### **4.3.4.1 Potential Impacts on Koala Habitat**

Due to the presence of preferred food tree species, vegetation communities 1b, 2a, 2b, 3a, 3b, 3c and 3d provide suitable habitat for the Koala (**FIGURE 14**). There are also scattered Koala food trees within Community 6 (**FIGURE 7**). There is no resident Koala population on the site, however, the species may occasionally utilise habitat on the subject site as it disperses through the area. The loss of potential koala habitat is presented in **TABLE 2**. In addition, potential Koala food trees, within Community 6, will also be removed (**FIGURE 7**).



**TABLE 2**  
**POTENTIAL LOSS OF KOALA HABITAT**  
**RESULTING FROM THE PROPOSED DEVELOPMENT**

Vegetation Community		Total area (ha)	Area to be lost (ha)	Area to be lost (%)
1b	Tall closed dry sclerophyll forest - Tallowwood ( <i>E. microcorys</i> ) ± Blackbutt ( <i>Eucalyptus pilularis</i> ) ± Pink bloodwood ( <i>C. intermedia</i> ) ± Red bloodwood ( <i>E. gummifera</i> ) ± Rusty gum ( <i>Angophora costata</i> ) ± Turpentine ( <i>Syncarpia glomulifera</i> ).	0.10	0.10	100
2a	Tall closed swamp sclerophyll forest - Swamp mahogany ( <i>E. robusta</i> ) +/- Tallowwood ( <i>E. microcorys</i> ) +/- Sydney blue gum ( <i>E. saligna</i> ) +/- Willow bottlebrush ( <i>Callistemon salignus</i> ) +/- Sieber's paperbark ( <i>Melaleuca sieberi</i> )	1.02	0.04	3.92
2b	Mid-high closed Paperbark forest - Broad-leaved paperbark ( <i>M. quinquenervia</i> ) +/- Sieber's paperbark ( <i>Melaleuca sieberi</i> ) +/- Willow bottlebrush ( <i>Callistemon salignus</i> ) +/- Swamp mahogany ( <i>E. robusta</i> )	10.48	0.03	0.29
3a	Tall closed wet sclerophyll forest - Swamp mahogany ( <i>E. robusta</i> ) ± Willow bottlebrush ( <i>Callistemon salignus</i> ) +/- Rusty gum ( <i>Angophora costata</i> ) +/- Turpentine ( <i>Syncarpia glomulifera</i> ) +/- Pink bloodwood ( <i>Corymbia intermedia</i> )	2.53	0.01	0.40
3b	Tall closed wet sclerophyll forest - Turpentine ( <i>Syncarpia glomulifera</i> ) +/- Red bloodwood ( <i>E. gummifera</i> ) +/- Tallowwood ( <i>E. microcorys</i> ) +/- Brushbox ( <i>Lophostemon confertus</i> ) +/- Hard corkwood ( <i>Endiandra sieberi</i> ) +/- Swamp box ( <i>Lophostemon suaveolens</i> )	2.26	0.03	0.13
3c	Tall closed wet sclerophyll forest - Swamp mahogany ( <i>E. robusta</i> ) +/- Tallowwood +/- Hard corkwood +/- Rusty gum ( <i>Angophora costata</i> ) +/- Willow bottlebrush ( <i>Callistemon salignus</i> )	0.04	0	0
<b>TOTAL</b>		<b>16.43</b>	<b>0.21</b>	<b>1.3%</b>

#### 4.3.4.2 Avoidance of Koala Habitat

The proposed development has been designed to utilise the existing cleared and disturbed area. However, this area does contain scattered trees that represent potential Koala food trees (FIGURE 7).

#### 4.3.4.3 Mitigation

Small areas of potential Koala habitat in addition to Koala food trees, within the disturbed Community 6, will be removed for the proposed development. However, over



98% (16.43ha) of suitable Koala habitat on the site will be retained. A fauna specialist should be in attendance when clearing of Koala food trees takes place.

#### 4.3.4.4 Offsets

The planting of Koala food trees should be included in the VMP and utilised, in any rehabilitation, where ever appropriate.

### 4.3.5 Endangered Ecological Communities

#### 4.3.5.1 Introduction

Two Endangered Ecological Communities (EECs) occur on the site:

- Swamp sclerophyll forest on coastal floodplain of NSW North Coast, Sydney Basin and South East Corner bioregions; and
- Swamp oak floodplain forest of NSW North Coast, Sydney Basin and South East Corner bioregions

#### 4.3.5.2 Impacts on EECs

The locations and impacts of these EECs are shown in FIGURES 9 & 10. A summary of the impacts is provided in TABLE 3.

**TABLE 3**  
**POTENTIAL LOSS OF ENDANGERED ECOLOGICAL COMMUNITIES FROM THE PROPOSED DEVELOPMENT**

Vegetation Community		Total area (ha)	Area to be lost (ha)	Area to be lost (%)
<b>Swamp sclerophyll forest on coastal floodplain</b>				
2a	Tall closed swamp sclerophyll forest - Swamp mahogany ( <i>E. robusta</i> ) +/- Tallowwood ( <i>E. microcorys</i> ) +/- Sydney blue gum ( <i>E. saligna</i> ) +/- Willow bottlebrush ( <i>Callistemon salignus</i> ) +/- Sieber's paperbark ( <i>Melaleuca sieberi</i> )	1.02	0.04	3.92
2b	Mid-high closed Paperbark forest - Broad-leaved paperbark ( <i>M. quinquenervia</i> ) +/- Sieber's paperbark ( <i>Melaleuca sieberi</i> ) +/- Willow bottlebrush ( <i>Callistemon salignus</i> ) +/- Swamp mahogany ( <i>E. robusta</i> )	10.48	0.03	0.29
3a	Tall closed wet sclerophyll forest - Swamp mahogany ( <i>E. robusta</i> ) ± Willow bottlebrush ( <i>Callistemon salignus</i> ) +/- Rusty gum ( <i>Angophora costata</i> ) +/- Turpentine ( <i>Syncarpia glomulifera</i> ) +/- Pink bloodwood ( <i>Corymbia intermedia</i> )	2.53	0.01	0.40
3c	Tall closed wet sclerophyll forest - Swamp mahogany ( <i>E. robusta</i> ) +/- Tallowwood +/- Hard corkwood +/- Rusty gum ( <i>Angophora costata</i> ) +/- Willow bottlebrush ( <i>Callistemon salignus</i> )	0.04	0	0
3d	Mid-high closed wet sclerophyll forest - Swamp mahogany ( <i>E. robusta</i> ) +/- Turpentine ( <i>Syncarpia glomulifera</i> ) +/- Rusty gum	0.55	0	0



## Flora and Fauna Assessment

	( <i>Angophora costata</i> ) +/- Forest red gum ( <i>E. tereticornis</i> ) +/- Red bloodwood ( <i>E. gummifera</i> )			
<b>TOTAL</b>		<b>14.62</b>	<b>0.08</b>	<b>0.55</b>
<b>Swamp oak flood plain forest</b>				
2c	Mid-high Swamp she-oak woodland - Swamp she-oak ( <i>Casuarina glauca</i> ) +/- Sieber's paperbark ( <i>Melaleuca sieberi</i> )	0.67	0	0
<b>TOTAL</b>		<b>0.67</b>	<b>0</b>	<b>0</b>

### Swamp sclerophyll forest on coastal floodplain

Swamp sclerophyll forest occurs as a substantial band along the southern and eastern boundaries of the Subject site. It is represented in vegetation communities 2a, 2b, 3a, 3c and 3d (**FIGURE 9**). The area is mapped as Zone 7a Environmental Protection. There will be a minor impact (i.e. less than 0.08ha) on the existing Swamp sclerophyll forest on coastal floodplain (**FIGURE 10**).

### Swamp oak flood plain forest

Swamp oak forest occurs as a pocket within Swamp sclerophyll forest in the south east portion of the site. It is represented in Community 2c and included in the mapped as 7a Environmental Protection area (**FIGURE 9**). The entire area of existing Swamp oak forest sclerophyll will be retained (**FIGURE 10**).

#### 4.3.5.3 Avoidance of impacts

The proposed development has been designed to utilise existing cleared areas and avoid areas of intact native vegetation (i.e. EECs). With the exception of some minor incursions into the 7a vegetated land, not considered to be quality native vegetation, the development layout exists within land that has been previously cleared of the majority of timber.

#### 4.3.5.4 Mitigation

A VMP will be completed for the areas of retained vegetation (i.e. Land under Environmental Protection Zoning 7a and SEPP 14 Wetlands). This will enhance the site as a habitat for the Endangered Ecological Communities Swamp Sclerophyll Forest and Swamp Oak Forest.



#### **4.4 (9.2) Outline measures for the conservation of existing wildlife corridor values and/or connective importance of any vegetation on the subject land.**

##### **4.4.1 *Wildlife corridors***

###### **4.4.1.1 Introduction**

The NPWS Key Habitats and Corridors project does not include any areas of the subject site as part of a corridor or as key habitat. The Warrell Creek regional corridor, linking Warrell Creek and Nambucca River, occurs approximately 1km east.

###### **4.4.1.2 Potential impacts**

The proposed development may contribute towards only a minor reduction in the overall effectiveness of the site as a corridor; however, the area of the proposed development is already significantly disturbed.

###### **4.4.1.3 Avoidance of impacts**

The proposed development has been designed to utilise existing cleared areas. With the exception of some minor incursions into the 7a vegetated land the development layout exists within land that has been previously cleared of the majority of timber.

###### **4.4.1.4 Mitigation**

A VMP should be completed for the area of retained vegetation occurring as a wide strip to the south and the east of the residential layout (**FIGURE 3**). Additionally, this strip connects with the habitat provided by Nambucca State Forest to the west and the vegetated reserve to the northeast adjacent to the Pacific Highway.



**4.5 (9.3) Assess measures to preserve and manage protect [sic] ecologically sensitive areas such as the riparian corridor and adjacent aquatic habitats including Bellwood and Swampy Creeks. The proposal should also nominate appropriate buffering to protect SEPP 14 wetlands.**

**4.5.1 Introduction**

This section will describe the measures to protect the ecologically sensitive SEPP 14 Wetland No 362 and the riparian zones of Bellwood and Swampy Creeks.

**4.5.2 Impacts on SEPP 14 Wetland number 362**

In response to the state-wide degradation of coastal wetlands, the Department of Planning enacted the State Environment Planning Policy (SEPP) - 14 Coastal Wetlands in 1985. The policy aims to “ensure that the coastal wetlands are preserved and protected in the environmental and economic interests of the State”.

SEPP 14 Wetland No. 362 occurs on the subject site (**FIGURE 2b**). It is considered that the proposed residential development of the subject site is unlikely to have any significant direct impacts on the ecology of the wetland area (**FIGURE 11**). However, there is potential for the wetland area to be affected indirectly by changes in water quality, alteration of the local hydrological regime, sedimentation or a combination of these factors.

**4.5.3 Additional impacts**

**4.5.3.1 Erosion**

The subject site shows some evidence of soil erosion. A number of factors contribute to the level of erosion evident on the site. These factors include:

- The steep slope on the site,
- The nature of the alluvial soil structure,
- The high rainfall and climatic conditions of the Subject site, and
- Land management practices.

Earthworks will increase the potential for soil erosion.

**4.5.3.2 Stormwater**

Due to the steep slope of the Subject site and the periods of high rainfall, stormwater runoff may potentially impact on the Subject site and Study area in a number of ways. Impacts may include:

- Increased soil erosion,
- Increased soil dispersal,
- Alteration of habitat microclimate conditions for flora and fauna, and



- Alteration of water quality of aquatic habitats down stream from the Subject site.

#### **4.5.4 Amelioration for SEPP 14 Wetland number 362**

SEPP 14 Wetland number 362 will be protected by the combination of a vegetative buffer (i.e. retained vegetation and rehabilitation; **FIGURE 11**) and strategies to maintain stormwater runoff quality through a Stormwater Management Plan.

The effectiveness of the buffer will be dependent upon:

- Buffer plantings where required (being designed by a suitably qualified ecologist and planted and maintained by a suitably qualified horticulturalist including species composition and planting density).
- Strict erosion and sedimentation controls being in place during the construction stage of the proposed development.
- A stormwater management plan being in place to ensure a limited amount of stormwater runoff from low pollutant sources is directed as sheet flow through the buffer area.

##### **4.5.4.1 Vegetative Buffer**

A vegetative buffer of varying widths (i.e. 25m to 100m) will be maintained between the residential layout and the SEPP 14 wetland. There are a number of sections of the SEPP 14 Wetland that currently have no buffer or less than 25m (i.e. the vegetation has been cleared for agriculture). These areas will be revegetated. The maintained buffer of dense vegetation will assist in sedimentation deposition and nutrient uptake for any stormwater runoff from the development area. The objectives of the VMP should incorporate any strategies necessary to provide for the effective buffering to the SEPP areas.

##### **4.5.4.2 Stormwater Management Plan**

A Stormwater Management report has been prepared (de Groot & Benson 2009) outlining two options that will result in effectively removing pollutants from the stormwater runoff. The management of stormwater will incorporate a combination of gross pollutant traps, vegetated swales, constructed wetlands, bio-retention swales and household water tanks.

#### **4.5.5 Bellwood and Swampy Creeks**

The drainage lines of Bellwood and Swampy Creeks, to the south and east of the site, are for the most part encompassed by the SEPP 14 Wetlands (**FIGURE 2b**). The buffer to the SEPP 14 areas (see above) will simultaneously provide a vegetative buffer to the creeks and their respective riparian zones. SEPP 14 wetland number 362 does not extend to the upper reaches of Swampy Creek, however the proposed development is more than 50m to the north of the creek and above the 1% AEP (Annual Exceedance Probability) flood extents.



**4.6 (9.4) Assess the impacts of any native vegetation clearing including details of an offset strategy, where relevant, to ensure that there is no net loss of native vegetation. Consideration should also be given to the *Native Vegetation Act 2003*.**

**4.6.1 Introduction**

This section details the extent of native vegetation clearing as a result of the proposed development. The possible direct and indirect impacts of the proposal are outlined, along with proposed offset strategies to ensure that there is no net loss of native vegetation values. The potential impacts on significant vegetation (i.e. remnant bushland, Threatened flora species, EEC's etc.) has been discussed in previous sections of this report.

The majority of vegetation to be removed is contained within land zoned for Residential Development.

**4.6.2 Native vegetation**

**4.6.2.1 Introduction**

This section details the extent of native vegetation clearing as a result of the proposed development. The possible direct and indirect impacts of the proposal are outlined, along with proposed strategies to ensure that there is no net loss of native vegetation values.

**4.6.2.2 Potential Impacts on Native Vegetation**

Development in accordance with the proposed layout will result in the loss of vegetation for the construction of buildings, access roads, driveways and associated infrastructure. An overlay of the proposed Stage 1 development layout on the vegetation is shown in **FIGURE 12**.

A summary of vegetation types that will be lost as a result of the proposed Stage 1 layout is shown in **TABLE 5**.





**TABLE 5**  
**VEGETATION TO BE LOST AS A RESULT OF THE PROPOSED DEVELOPMENT**

Vegetation Community		Total area (ha)	Area to be lost (ha)	Area to be lost (%)
1a	Tall closed dry sclerophyll forest - Blackbutt ( <i>Eucalyptus pilularis</i> ) ± Pink bloodwood ( <i>Corymbia intermedia</i> ) ± Red bloodwood ( <i>E. gummifera</i> ) ± Rusty gum ( <i>Angophora costata</i> ) ± Turpentine ( <i>Syncarpia glomulifera</i> ) ± <i>E. racemosa</i>	0.16	0.16	100
1b	Tall closed dry sclerophyll forest - Tallowwood ( <i>E. microcorys</i> ) ± Blackbutt ( <i>Eucalyptus pilularis</i> ) ± Pink bloodwood ( <i>C. intermedia</i> ) ± Red bloodwood ( <i>E. gummifera</i> ) ± Rusty gum ( <i>Angophora costata</i> ) ± Turpentine ( <i>Syncarpia glomulifera</i> ).	0.10	0.01	10
1c	Tall closed dry sclerophyll forest - Blackbutt ( <i>Eucalyptus pilularis</i> )	0.55	0	0
2a	Tall closed swamp sclerophyll forest - Swamp mahogany ( <i>E. robusta</i> ) +/- Tallowwood ( <i>E. microcorys</i> ) +/- Sydney blue gum ( <i>E. saligna</i> ) +/- Willow bottlebrush ( <i>Callistemon salignus</i> ) +/- Sieber's paperbark ( <i>Melaleuca sieberi</i> )	1.02	0.04	3.92
2b	Mid-high closed Paperbark forest - Broad-leaved paperbark ( <i>M. quinquenervia</i> ) +/- Sieber's paperbark ( <i>Melaleuca sieberi</i> ) +/- Willow bottlebrush ( <i>Callistemon salignus</i> ) +/- Swamp mahogany ( <i>E. robusta</i> )	10.48	0.03	0.29
2c	Mid-high Swamp she-oak woodland - Swamp she-oak ( <i>Casuarina glauca</i> ) +/- Sieber's paperbark ( <i>Melaleuca sieberi</i> )	0.67	0	0
3a	Tall closed wet sclerophyll forest - Swamp mahogany ( <i>E. robusta</i> ) ± Willow bottlebrush ( <i>Callistemon salignus</i> ) +/- Rusty gum ( <i>Angophora costata</i> ) +/- Turpentine ( <i>Syncarpia glomulifera</i> ) +/- Pink bloodwood ( <i>Corymbia intermedia</i> )	2.53	0.01	0.40
3b	Tall closed wet sclerophyll forest - Turpentine ( <i>Syncarpia glomulifera</i> ) +/- Red bloodwood ( <i>E. gummifera</i> ) +/- Tallowwood ( <i>E. microcorys</i> ) +/- Brushbox ( <i>Lophostemon confertus</i> ) +/- Hard corkwood ( <i>Endiandra sieberi</i> ) +/- Swamp box ( <i>Lophostemon suaveolens</i> )	2.26	0.03	1.32
3c	Tall closed wet sclerophyll forest - Swamp mahogany ( <i>E. robusta</i> ) +/- Tallowwood +/- Hard corkwood +/- Rusty gum ( <i>Angophora costata</i> ) +/- Willow bottlebrush ( <i>Callistemon salignus</i> )	0.04	0	0
3d	Mid-high closed wet sclerophyll forest - Swamp mahogany ( <i>E. robusta</i> ) +/- Turpentine ( <i>Syncarpia glomulifera</i> ) +/- Rusty gum ( <i>Angophora costata</i> ) +/- Forest red gum ( <i>E. tereticornis</i> ) +/- Red bloodwood ( <i>E.</i>	0.55	0	0



## Flora and Fauna Assessment

	<i>gummifera</i> )			
4	Low open Mangrove woodland - River mangrove ( <i>Aegiceras corniculatum</i> ) +/- Grey mangrove ( <i>Avicennia marina</i> )	0.02	0	0
5a	Mid-high disturbed rainforest regrowth - Red ash ( <i>Alphitonia excelsa</i> ) +/- Scrub turpentine ( <i>Rhodamnia rubescens</i> ) +/- Murrogun ( <i>Cryptocarya microneura</i> ) +/- Cheese tree ( <i>Glochidion ferdinandi</i> )	0.37	0.02	5.41
5b	Low open dry sclerophyll regrowth - Blackbutt ( <i>Eucalyptus pilularis</i> ) +/- Rusty gum ( <i>Angophora costata</i> )	0.03	0.03	100
6a	Clumps of trees/isolated patches (above the 6m contour) - Tallowwood ( <i>E. microcorys</i> ) ± <i>E. racemosa</i> Blackbutt ( <i>Eucalyptus pilularis</i> ) +/- Pink bloodwood ( <i>C. intermedia</i> ) +/- Red bloodwood ( <i>E. gummifera</i> ) +/- Rusty gum ( <i>Angophora costata</i> ) +/- Turpentine ( <i>Syncarpia glomulifera</i> ) ± Swamp mahogany ( <i>E. robusta</i> )	6.44	5.98	92.9
6b	Clumps of trees/isolated patches (below the 6m contour) - Tallowwood ( <i>E. microcorys</i> ) ± <i>E. racemosa</i> Blackbutt ( <i>Eucalyptus pilularis</i> ) +/- Pink bloodwood ( <i>C. intermedia</i> ) +/- Red bloodwood ( <i>E. gummifera</i> ) +/- Rusty gum ( <i>Angophora costata</i> ) +/- Turpentine ( <i>Syncarpia glomulifera</i> ) ± Swamp mahogany ( <i>E. robusta</i> )	0.99	0.97	98.0
7	Mid-high closed grassland - Paspalum ( <i>Paspalum dilatatum</i> ) +/- Saw-sedge ( <i>Gahnia clarkei</i> ) +/- <i>Juncus</i> sp.	29.89	27.80	93.01
<b>TOTAL</b>		<b>56.10ha</b>	<b>35.07ha</b>	<b>62.52%</b>

In total, 35.07 hectares of vegetation will be removed for the proposed development. However, it should be noted that the losses will result from:

- 27.80 ha (79%) of exotic pasture with scattered trees;
- 6.95 ha (12%) from clumps of trees occurring as isolated patches; and
- very minor losses from intact areas of Dry sclerophyll, Swamp sclerophyll, Wet sclerophyll and Rainforest communities (a total of < 0.33ha).

Additional impacts on vegetation communities include:

- Clearance of areas of the Subject site represents a loss of habitat available for dispersal for plants and will reduce visits by pollination and dispersal vectors;
- Disturbance to the Subject site creates opportunities for weeds to colonise. Weeds may be introduced to the site in construction materials or by vehicles. Occupation of the Subject site creates opportunities for weeds to become established. Landscape species may escape to retained areas of vegetation;
- The removal of vegetation from the Subject site represents the loss of organic material from the site;



- Residents may create walking tracks through bushland areas. This may result in direct loss of vegetation, change in vegetation structure and increased opportunities for weeds and disturbance-adapted animal species; and
- Occupation of the site may increase the risk of fire release into the surrounding bushland.

#### 4.6.2.3 Avoidance of impacts

The proposed development has been designed to utilise existing cleared areas. With the exception of some minor incursions into the 7a land (**see SECTION 4.7**) the development layout exists largely within land that has been previously cleared of the majority of timber.

#### 4.6.2.4 Mitigation

A VMP should be completed for the areas of retained vegetation. The only losses to intact areas of native vegetation will be minor (i.e. < 0.33ha). These will be offset by the regeneration of almost 1 hectare of grassland with scattered trees in the south of the site (**FIGURE 13**).

### **4.7 Native Vegetation Act 2003**

Land zoned 2(a) residential (low-Medium Density) is excluded from regulation under the Native Vegetation Act (NVA) 2003. However, The NVA does apply to land zoned as 7(a) Wetlands Protection Zone (see above; **FIGURE 13**).

The objects of this Act (Native Vegetation Act 2003) are:

- (a) to provide for, encourage and promote the management of native vegetation on a regional basis in the social, economic and environmental interests of the State, and
- (b) to prevent broadscale clearing unless it improves or maintains environmental outcomes, and
- (c) to protect native vegetation of high conservation value having regard to its contribution to such matters as water quality, biodiversity, or the prevention of salinity or land degradation, and
- (d) to improve the condition of existing native vegetation, particularly where it has high conservation value, and
- (e) to encourage the revegetation of land, and the rehabilitation of land, with appropriate native vegetation,

in accordance with the principles of ecologically sustainable development.

There will be some loss of land zoned 7(a) along the southern boundary of the site (**FIGURE 13**). However, it should be noted that, although the land is zoned 7(a), the vegetation is disturbed (i.e. exotic grassland with scattered trees). This loss does not conflict with the objectives of the NVA.



## **4.8 (9.5) Biodiversity surveys are to be undertaken in accordance with the draft DECC Threatened Biodiversity Survey and Assessment Guidelines 2004.**

### **4.8.1 Compliance with Biodiversity Survey Guidelines (DEC 2004)**

The NSW Department of Environment and Conservation (DEC) have prepared a set of guidelines for use by decision makers when considering a proposed development, activity or action pursuant to Parts 4 and 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), and Part 6 of the *Threatened Species Conservation Act 1995* (TSC Act).

The Guidelines aim to facilitate informed decision-making at the local scale for individual development activities with particular regard to:

- preliminary animal and plant assessments;
- Section 5A Assessments of Significance under the EP&A Act5;
- Species Impact Statements (SISs);
- licensing under Part 6 of the TSC Act;
- Local Environmental Studies (LESs), Regional Environmental Studies (RESs) and spot re-zoning;
- Development Applications (DAs); and
- Clearing Applications (CAs) under the NVC Act.

The Guidelines aim to inform the process of survey and assessment of threatened biodiversity by describing and discussing:

- the chronological steps within the threatened biodiversity assessment process;
- the strategies, policies and legislation relevant to threatened biodiversity;
- appropriate survey techniques for detecting threatened biodiversity;
- the information required for an Assessment of Significance6; and
- reporting requirements and standards.

The Guidelines aim to provide a consistent and systematic approach to survey and assessment of threatened biodiversity. In particular, the guidance provided will assist in:

- setting appropriate aims for survey and assessment of threatened biodiversity;
- the planning of suitable survey techniques and the appropriate level of effort;
- the provision of adequate reporting;
- a justifiable interpretation of results; and
- making an informed and justifiable decision.

### **4.8.2 JWA Surveys**

The surveys conducted by JWA (APPENDICES 1 & 3) follow the guidelines outlined above. In particular the methodology was adapted from Section 5 of the guidelines on Field Surveys.



## 5 SUMMARY OF IMPACTS, MITIGATION & OFFSETS

James Warren and Associates have been engaged by Geoff Smyth Consulting to complete a Flora and Fauna Assessment for the proposed subdivision of Lot 2, Marshall Way & Alexandra Drive, Bellwood.

It is proposed to develop the portions of the Subject site zoned 2(a) for residential subdivision. The site occurs within the coastal zone and within 100m of a State Significant Wetland. Therefore, the proposal is classified as a 'major project' and the Minister for Planning is the consent authority.

The Proposed development consists of 360 residential Lots and roads and will occur in 5 stages. The development layout has been designed in accordance with the following constraints: zoning requirements; land clearing history; SEPP 14 Wetlands; and predicted flood levels. The remaining areas outside the development layout should be subject to a VMP.

Six (6) broad vegetation communities were identified on the Subject site. These communities contained a total of fifteen (15) vegetation associations. Two Endangered Ecological Communities were identified - Swamp sclerophyll forest on coastal floodplain and Swamp-oak floodplain forest.

Two-hundred and twelve (212) plant species were recorded at the Subject site. No Threatened or ROTAP species were recorded on the Subject site.

Fauna surveys revealed the presence of eight (8) amphibian species, four (4) reptile species, eighty-one (85) birds and twenty four (24) mammal species including seven threatened species. Additionally a further 15 threatened species were considered to possibly occur on the site over time.

Development of the subject site will cause the loss of vegetation and habitat for the construction of buildings, access roads, driveways and associated infrastructure. The majority of this vegetation consists of scattered trees within the Tall open mixed sclerophyll woodland.

The proposed development is likely to impact on native fauna in a number of ways. However, impacts are likely to be minor due to the disturbed nature and relatively low habitat values of the cleared/logged areas of the site.

SEPP 14 Wetland No. 362 occurs on the subject site. The proposed residential development is unlikely to have any significant direct impacts on the ecology of the wetland area. However, there is potential for indirect impacts such as changes in water quality, alteration of the local hydrological regime, sedimentation or a combination of these factors. The wetland will be protected from these impacts by the combination of a vegetated buffer ranging in widths from 25m to 100m and strategies to control water quality outlined in a Stormwater Management Plan (i.e. gross pollutant traps, vegetated swales, constructed wetlands, bio-retention swales and household water tanks).

Seven part test were completed for twenty-two (22) threatened species which occur or are considered possible occurrences on the subject site. It was determined that a Species Impact Statement is not required.



## Flora and Fauna Assessment

---

It was also determined that the proposed action is unlikely to result in a significant impact on any matter. Therefore Commonwealth Assessment is not required for the Proposed development of the subject site.

A summary of impacts on threatened species and their habitats, EEC's and wildlife corridors is provided in **TABLE 6** below. Also addressed are the mitigation and offset measures proposed to ensure minimal impacts on ecologically significant areas and species.



## Flora and Fauna Assessment

**TABLE 6**  
**SUMMARY OF IMPACTS, MITIGATION AND OFFSETS**

	Potential impacts	Mitigation measures	Proposed offset	Net loss/gain
<b>Endangered Ecological Communities</b>				
Swamp Oak Forest	<ul style="list-style-type: none"> <li>There is 6701m<sup>2</sup> of Swamp Oak Forest on the Subject site</li> <li>None of this area will be removed by the proposed development</li> <li>Edge effects may impact on the retained EEC.</li> </ul>	<ul style="list-style-type: none"> <li>A Site Restoration and Management Plan should be completed for the subject site which includes measures to offset any edge effects to this EEC.</li> </ul>		Nil
Swamp Sclerophyll Forest	<ul style="list-style-type: none"> <li>There is 14.6263 ha of Swamp Sclerophyll Forest on the Subject site</li> <li>Less than 1% (1121m<sup>2</sup>) will be removed by the proposed development</li> <li>Edge effects may impact on retained EEC's.</li> </ul>	<ul style="list-style-type: none"> <li>A Site Restoration and Management Plan should be completed for the subject site which includes measures to offset any edge effects to this EEC.</li> </ul>		Loss of 1% or 1121m <sup>2</sup>
<b>Threatened fauna</b>				
<ul style="list-style-type: none"> <li>Grey-headed flying-fox</li> <li>Eastern free tailed bat</li> <li>Glossy black-cockatoo</li> </ul>	<ul style="list-style-type: none"> <li>Approximately 35.07 hectares (62.5%) of potential habitat for these species will be removed from the subject site.</li> </ul>	<ul style="list-style-type: none"> <li>The Grey-headed flying-fox is considered likely to continue foraging within retained areas of vegetation on the site.</li> <li>A Site Restoration and Management Plan should be</li> </ul>		Loss of 63.7% or 35.7343 ha



## Flora and Fauna Assessment

	Potential impacts	Mitigation measures	Proposed offset	Net loss/gain
<ul style="list-style-type: none"> <li>Osprey</li> </ul>	<ul style="list-style-type: none"> <li>Suitable habitat will be retained in the southern portion of the subject site (i.e. 7a Environmental Protection and SEPP 14 areas).</li> </ul>	<ul style="list-style-type: none"> <li>completed for the subject site. This would improve the retained areas as habitat for this species.</li> </ul>		
<ul style="list-style-type: none"> <li>Eastern false pipistrelle</li> <li>Little bent-wing bat</li> <li>Yellow bellied glider</li> </ul>	<ul style="list-style-type: none"> <li>Approximately 3300m<sup>2</sup> of potential habitat will be removed from the subject site.</li> <li>Suitable habitat will be retained in the southern portion of the subject site (i.e. 7a Environmental Protection and SEPP 14 areas).</li> </ul>	<ul style="list-style-type: none"> <li>A Site Restoration and Management Plan should be completed for the subject site. This would improve the retained areas as habitat for this species.</li> </ul>		Loss of 1.9% or 3610m <sup>2</sup>
<b>Koala Habitat</b>				
	<ul style="list-style-type: none"> <li>Koalas were not recorded on the site however, several species of Koala food trees are present</li> <li>The proposed development will result in the removal of 0.21ha (1.3%) of potential Koala habitat in addition to scattered Koala food trees within the expanse of cleared and disturbed land (i.e. Community 6).</li> </ul>	<ul style="list-style-type: none"> <li>A Site Restoration and Management Plan should be completed for the subject site.</li> <li>Koala food trees should be utilised, in any rehabilitation, where ever appropriate.</li> </ul>		
<b>SEPP 14 Wetlands</b>				





## Flora and Fauna Assessment

	Potential impacts	Mitigation measures	Proposed offset	Net loss/gain
	<ul style="list-style-type: none"> <li>No areas of SEPP 14 Wetland (i.e. Wetland No 362) will be removed by the proposed development</li> <li>Edge effects may impact on the retained EEC.</li> </ul>	<ul style="list-style-type: none"> <li>Retained vegetation (i.e. a vegetated buffer of between 25m and 100m) and storm water management strategies to control water quality will ensure that the development does not negatively impact on this significant wetland.</li> </ul>		
<b>7a Environmental Protection areas</b>				
	<ul style="list-style-type: none"> <li>The proposed will Development has a minor impact on Land zoned as 7a Environmental Protection (&lt;0.33ha). This will be offset by the regeneration of at least 1ha of land adjacent to the wetland in the southern area of the site.</li> </ul>	<ul style="list-style-type: none"> <li>A VMP will be completed for the land designated for Environmental Protection.</li> </ul>	<ul style="list-style-type: none"> <li>Land zoned as 2a residential but not included in the residential layout should be revegetated and included in the Environmental Protection Areas.</li> </ul>	At least 1ha of land will be replanted. It is current degraded exotic grassland with scattered trees.



## 6 REFERENCES

- Connelly, S. and Specht, A (1988) Big Scrub Conservation Strategy, NSW NPWS.
- Crome, F. H. J. and Richards, G. C. (1988) Bats and gaps: Microchiropteran community structure in a Queensland rainforest. Ecology 69, 1960-1969.
- Date, E.M. & Recher, H.F and Ford, H (1992) Status of rainforest pigeons in Northern New South Wales. Unpublished Report to NPWS.
- Eddie, M. W. 2000 Soil Landscapes of the Macksville & Nambucca. NSW Department of Land and Water Conservation
- Edwards, K. (1979) Rainfall in NSW with special reference to soil conservation. Soil Conservation Service Sydney. Tech. Handbook No. 3.
- Fitzpatrick, E.A. and Nix H.A. (1973). The Climatic Factor in Australian Grassland Ecology. In R.M. Moore (Ed.) Australian Grasslands A.N.U. Press, Canberra.
- Forshaw, J.M (1981) Australian Parrots. Second (revised) Edition. Lansdowne Press, Melbourne.
- Gravatt, D. (1974) Birds that eat plant products in coastal south Queensland. Inst. For Aust. Seventh Triennial conference. Caloundra, Qld. Vol. 1. Working Papers pp. 339-348.
- Hall, L. S. (1981) The Biogeography of Australian bats. In Ecological biogeography of Australia /9. (Ed. A. Keast) Pp. 1555-1583. W Junk, The Hague.
- Holmes, G. (1987). Avifauna of the Big Scrub Region. Australasian and New South Wales National Parks & Wildlife Service.
- Howe, R.W, Howe, T.D and Ford, H.A (1981) Bird Distribution on Small Rainforest Remnants in New South Wales Australian Wildlife Research (8).
- Hoye, G.A. and Richards, G.C. (1995). Greater Broad-nosed bat *Scoteanax rueppellii* (Peters 1866) In Strahan, R (Ed.). The Mammals of Australia. The Australian Museum and Reed Books, Sydney.
- Keast, (1968) Seasonal movements of the Australian Honeyeaters (*Meliphagidae*), and there ecological significance. EMU 89: 140-154.
- Lott & Duigan 1993. Conservation Significance and Long Term Viability of Sub-tropical Rainforest Remnants of the Big Scrub - North Eastern NSW. Department of Ecosystem Management, University of New England.
- Marchant, S & Higgins, P. J. (eds) (1993) Handbook of Australian, New Zealand and Antarctic Birds. Vol. 2. Raptors to Lapwings. Oxford University Press, Melbourne.
- NSC (2005) Nambucca Shire council Development Control Plan No 16 Rural Buffers. <http://www.nambucca.nsw.gov.au/content/uploads/DCP16.pdf> accessed 1/04/09
- Nix, H. S. (1982) Environmental determinants of biogeography and evolution in Terra Australis. In 'Evolution of the Flora and Fauna of Arid Australia' (eds) Barker, W.R. and Greenslade, P.J.M. pp. 47-66 Peacock Pubs. Frewville, S. Aust.
- NSW National Parks and Wildlife Service (1996) Warrell Creek Nature Reserve Proposal Reference Statement. Unpublished document.



## Flora and Fauna Assessment

---

NSW National Parks & Wildlife Service (1999) Forest Ecosystem Classification and Mapping for the Upper and Lower North East CRA Regions for Joint Commonwealth NSW Regional Forest Agreement Steering Committee.

NSW National Park & Wildlife Service (2003) Atlas of NSW Wildlife. [www.npws.nsw.gov.au](http://www.npws.nsw.gov.au)

NSW National Park & Wildlife Service (2002) Threatened Species of the Upper North Coast of New South Wales - Fauna. Threatened Species Unit, Conservation Programs & Planning Division, Northern Directorate, Coffs Harbour.

NSW National Park & Wildlife Service (2002) Threatened Species of the Upper North Coast of New South Wales - Flora. Threatened Species Unit, Conservation Programs & Planning Division, Northern Directorate, Coffs Harbour.

Porter, J.W. (1982) Terrestrial birds of the coastal lowlands of south east Queensland. Dept. of Forestry Queensland Tech. Pap. No. 30.

Readers Digest (1993) Birds of Australia Readers Digest Association. Far East Limited: Sydney.

Robertson, J.S. (1973) Winter Area Behaviour of Drongos and Forest Kingfishers. Aust. Bird Bander 11 (1);3-4.

Robertson, J.S. & Woodall, P.F. (1983) The status and movements of Honeyeaters at Wellington Point, south-east Queensland. Sunbird 13(1) 1-4

Smith, A.P & Lindenmeyer, D. (1988) Tree hollow requirements of Leadbeater's possums and gliders in timber production ash forests of the Victorian central highlands. Aust. Wildl. Res. 15:347-362

Smith, A.P. Hines, H. B. Pugh, D and Webber, P. (1989) Mammals, Reptiles and Amphibians of the Focal Peak Region. Unpublished Report. University of New England, Armidale.

Smith, A.P. Hines, H.B. and Webber, P. (1989b) Mammals, Reptiles and Amphibians of the rainforest of the Mount Warning Caldera Region. Unpublished report Department of Ecosystem Management, University of New England, Armidale.

Smith, A.P., Andrews and Moore, D.M. (1994) Terrestrial Fauna of the Grafton and Casino State Forest Management Areas - Description and Assessment of Forestry Impacts. In EIS for proposed forestry operations in the Casino Management Area. (1995) Supporting Document No 6. State Forests of New South Wales, Sydney. 135 pp.

Specht, R.L (1981) Foliage - Projective Cover And Standing Biomass. In Gillison, A.N. and Anderson, D.J (eds) Vegetation Classification of Australia. CSIRO. ANU Press Canberra.



## **APPENDIX 1**

### **FLORA ASSESSMENT**



# 1 FLORA ASSESSMENT

## 1.1 Introduction

This section discusses the methods used in the vegetation assessment and presents the results of the assessment.

## 1.2 Methods

### 1.2.1 Database searches

Searches of the NPWS and EPBC databases were conducted (12<sup>th</sup> February 2010) to find records of State and Commonwealth Threatened species<sup>1</sup> within 10km of the Subject site.

### 1.2.2 Site survey

An initial site survey was completed at the Subject site between the 25<sup>th</sup> and 29<sup>th</sup> of October 2004 by two (2) scientists utilising random meander searches (Cropper 1993) and a general plant species list was compiled. A total of over fifteen (15) hours flora survey was undertaken.

Mapping of vegetation communities was achieved using 1:1000 (2005) aerial photography, GPS and cadastral bases with relevant survey points.

During subsequent site surveys (2009 and 2010) all areas of vegetation were traversed and previous vegetation mapping verified.

## 1.3 Results

### 1.3.1 Database searches

The EPBC Protected Matter Search Tool indicates that nine (9) Commonwealth Threatened flora species, or their habitat, are likely to occur in the locality. A search of the NPWS Database revealed three (3) Threatened Flora species within 10km of the Subject site.

These species are shown in TABLE 7. Status is in accordance with the Commonwealth EPBC Act and the *Threatened Species Conservation Act 1995* (TSC Act).

TABLE 7  
DATABASE RECORDS OF THREATENED FLORA SPECIES  
WITHIN 10 KM OF THE SUBJECT SITE

Common name	Specific Name	Status	
		EPBC	TSC
Sand spurge	<i>Chamaesyce psammogeton</i>	E	E1
Scented acronychia	<i>Acronychia littoralis</i>	E	E
Hairy-joint grass	<i>Arthraxon hispidus</i>	V	V
Sand spurge	<i>Chamaesyce psammogeton</i>		E
Leafless tongue-orchid	<i>Cryptostylis hunteriana</i>	V	V

<sup>1</sup> As listed within schedules of the TSC Act (1995) and EPBC Act (1999).



## Flora and Fauna Assessment

White-flowered wax plant	<i>Cynanchum elegans</i>	E	E
Red bopple nut	<i>Hicksbeachia pinnatifolia</i>	V	V
Clear milkvine	<i>Marsdenia longiloba</i>	V	E
Milky silkpod	<i>Parsonia dorrigoensis</i>	E	V
Moonee quassia	<i>Quassia sp. Moonee Creek</i>	E	E
Austral toadflax	<i>Thesium australe</i>	V	V

V = Vulnerable; E = Endangered

### 1.3.2 Site survey

Six (6) broad vegetation communities were identified on the Subject site. These communities contained a total of fifteen (15) vegetation associations. These communities and associations are described in Section 2.3.3 and are shown in **FIGURE 14**.

Two-hundred and twelve (212) plant species were recorded at the Subject site. A full list of species recorded at the site is included as **APPENDIX 2**. No Threatened or ROTAP species were recorded on the Subject site.

### 1.3.3 Community descriptions

#### 1.3.3.1 Introduction

Six (7) broad vegetation communities were identified on the Subject site. Within these communities fifteen (15) vegetation associations were recorded (**TABLE 8**). The conservation status of these communities is discussed with reference to the Comprehensive Regional Assessment completed for NSW Forest and Non-forest ecosystems as part of the Regional Forestry Agreement (RFA) process (CRA Unit 1999). The RFA establishes the framework for the management of the forests of upper north-east and lower north-east regions. The RFA document sets out percentage reservation status of forest and non-forest Ecosystems in the CAR Reserve System based on vegetation modelling to establish the pre-1750 extent of forest ecosystems in the region.

**TABLE 8**  
**VEGETATION COMMUNITIES PRESENT ON THE SUBJECT SITE**

1	Dry sclerophyll forests
1(a)	Tall closed dry sclerophyll forest - Blackbutt ( <i>Eucalyptus pilularis</i> ) ± Pink bloodwood ( <i>Corymbia intermedia</i> ) ± Red bloodwood ( <i>E. gummifera</i> ) ± Rusty gum ( <i>Angophora costata</i> ) ± Turpentine ( <i>Syncarpia glomulifera</i> ) ± <i>E. racemosa</i>
1(b)	Tall closed dry sclerophyll forest - Tallowwood ( <i>E. microcorys</i> ) ± Blackbutt ( <i>Eucalyptus pilularis</i> ) ± Pink bloodwood ( <i>C. intermedia</i> ) ± Red bloodwood ( <i>E. gummifera</i> ) ± Rusty gum ( <i>Angophora costata</i> ) ± Turpentine ( <i>Syncarpia glomulifera</i> ).
1(c)	Tall closed dry sclerophyll forest - Blackbutt ( <i>Eucalyptus pilularis</i> )
2	Swamp sclerophyll forests
2(a)	Tall closed swamp sclerophyll forest - Swamp mahogany ( <i>E. robusta</i> ) +/- Tallowwood ( <i>E. microcorys</i> ) +/- Sydney blue gum ( <i>E. saligna</i> ) +/- Willow bottlebrush ( <i>Callistemon salignus</i> ) +/- Sieber's paperbark ( <i>Melaleuca sieberi</i> )
2(b)	Mid-high closed Paperbark forest - Broad-leaved paperbark ( <i>M. quinquenervia</i> ) +/- Sieber's paperbark ( <i>Melaleuca sieberi</i> ) +/- Willow bottlebrush ( <i>Callistemon salignus</i> ) +/- Swamp mahogany ( <i>E. robusta</i> )



## Flora and Fauna Assessment

2(c)	Mid-high Swamp she-oak woodland - Swamp she-oak ( <i>Casuarina glauca</i> ) +/- Sieber's paperbark ( <i>Melaleuca sieberi</i> )
<b>3</b>	<b>Wet sclerophyll forests</b>
3(a)	Tall closed wet sclerophyll forest - Swamp mahogany ( <i>E. robusta</i> ) ± Willow bottlebrush ( <i>Callistemon salignus</i> ) +/- Rusty gum ( <i>Angophora costata</i> ) +/- Turpentine ( <i>Syncarpia glomulifera</i> ) +/- Pink bloodwood ( <i>Corymbia intermedia</i> )
3(b)	Tall closed wet sclerophyll forest - Turpentine ( <i>Syncarpia glomulifera</i> ) +/- Red bloodwood ( <i>E. gummifera</i> ) +/- Tallowwood ( <i>E. microcorys</i> ) +/- Brushbox ( <i>Lophostemon confertus</i> ) +/- Hard corkwood ( <i>Endiandra sieberi</i> ) +/- Swamp box ( <i>Lophostemon suaveolens</i> )
3(c)	Tall closed wet sclerophyll forest - Swamp mahogany ( <i>E. robusta</i> ) +/- Tallowwood +/- Hard corkwood +/- Rusty gum ( <i>Angophora costata</i> ) +/- Willow bottlebrush ( <i>Callistemon salignus</i> )
3(d)	Mid-high closed wet sclerophyll forest - Swamp mahogany ( <i>E. robusta</i> ) +/- Turpentine ( <i>Syncarpia glomulifera</i> ) +/- Rusty gum ( <i>Angophora costata</i> ) +/- Forest red gum ( <i>E. tereticornis</i> ) +/- Red bloodwood ( <i>E. gummifera</i> )
<b>4</b>	<b>Mangroves</b>
4(a)	Low open Mangrove woodland - River mangrove ( <i>Aegiceras corniculatum</i> ) +/- Grey mangrove ( <i>Avicennia marina</i> )
<b>5</b>	<b>Disturbed regrowth</b>
5(a)	Mid-high disturbed rainforest regrowth - Red ash ( <i>Alphitonia excelsa</i> ) +/- Scrub turpentine ( <i>Rhodamnia rubescens</i> ) +/- Murrogun ( <i>Cryptocarya microneura</i> ) +/- Cheese tree ( <i>Glochidion ferdinandi</i> )
5(b)	Low open dry sclerophyll regrowth - Blackbutt ( <i>Eucalyptus pilularis</i> ) +/- Rusty gum ( <i>Angophora costata</i> )
<b>6</b>	
6(a)	Clumps of trees/isolated patches (above the 6m contour) - Tallowwood ( <i>E. microcorys</i> ) ± <i>E. racemosa</i> Blackbutt ( <i>Eucalyptus pilularis</i> ) +/- Pink bloodwood ( <i>C. intermedia</i> ) +/- Red bloodwood ( <i>E. gummifera</i> ) +/- Rusty gum ( <i>Angophora costata</i> ) +/- Turpentine ( <i>Syncarpia glomulifera</i> ) ± Swamp mahogany ( <i>E. robusta</i> )
6(b)	Clumps of trees/isolated patches (below the 6m contour) - Tallowwood ( <i>E. microcorys</i> ) ± <i>E. racemosa</i> Blackbutt ( <i>Eucalyptus pilularis</i> ) +/- Pink bloodwood ( <i>C. intermedia</i> ) +/- Red bloodwood ( <i>E. gummifera</i> ) +/- Rusty gum ( <i>Angophora costata</i> ) +/- Turpentine ( <i>Syncarpia glomulifera</i> ) ± Swamp mahogany ( <i>E. robusta</i> )
<b>7</b>	<b>Grasslands</b>
6(a)	Mid-high closed grassland - Paspalum ( <i>Paspalum dilatatum</i> ) +/- Saw-sedge ( <i>Gahnia clarkei</i> ) +/- <i>Juncus sp.</i>

### 1.3.3.2 Dry sclerophyll forests

#### **Community 1(a) - Tall closed dry sclerophyll forest (Blackbutt/ Pink bloodwood/ Red bloodwood/ Rusty gum/ Turpentine/ Forest red gum)**

##### Location

Blackbutt dominated Dry Sclerophyll forests occurs on the higher slopes of the Subject site within and surrounding the Aboriginal reserve located on the western boundary of the Subject site.

##### Composition

Blackbutt is clearly dominant in this community, but other Eucalypts occur at low densities, including Pink bloodwood (*Corymbia intermedia*), Red bloodwood, Turpentine (*Syncarpia glomulifera*), Tallowwood, Rusty gum (*Angophora costata*) and a few Forest red gums. The mid-storey within the Aboriginal reserve is comprised of dense Forest oak groves, Green wattle (*Acacia irrorata*), Blackwood wattle, Two-veined



hickory wattle (*Acacia binervata*), and the under-storey consists of Blady grass (*Impertia cylindrica*) and Bracken fern.

On the lower slopes within this community, to the south of the Aboriginal reserve, the mid-storey is comprised of regenerating and rainforest species such as: Scentless rosewood (*Synoum glandulosum*), Cheese tree, Narrow-leaved palm lily (*Cordyline stricta*), Geebung (*Persoonia aadenantha*) and Hopbush (*Dodonaea triquetra*). The understorey in this area is comprised of Kangaroo grass, Basket grass and Tall saw-sedge (*Gahnia clarkei*).

#### Conservation Status

The closest analogues to this community considered in the Regional Forestry Agreement report are Forest Ecosystem 155 (Wet Foothills Blackbutt - Turpentine) and Forest Ecosystem 32 (Dry Foothills Blackbutt - Turpentine).

The Regional Forestry Agreement data on Blackbutt communities has been discussed for Community 1(a).

This community contains relatively high numbers of old growth trees and also has Aboriginal heritage values attached. The conservation status of this community is therefore considered to be moderate - high.

#### **Community 1(b) - Tall closed dry sclerophyll forest (Tallowwood/ Pink bloodwood/ Rusty gum/ Turpentine/ Blackbutt)**

#### Location

This community occurs in a small patch in the central western section of the Subject site.

#### Composition

Tallowwood is dominant in this community, but other Eucalypts occur at low densities, including Pink bloodwood, Turpentine, Rusty gum and a few Blackbutts. The mid-storey within this community is dominated dense Teatree (*Leptospermum polygalifolium*). Other mid-storey species include scattered Forest oak and Green wattle as well as some clumps of Lantana (*Lantana camara*).

The ground cover in this community is quite sparse and comprised of scattered Tall saw-sedge, Blady grass and Long-leaved matrush (*Lomandra longifolia*).

#### Conservation Status

The closest analogue to this community discussed in the Regional Forestry Agreement report is Forest Ecosystem 153 (Wet Coastal Tallowwood - Brushbox). The Regional Forestry Agreement document provides the following data on this ecosystem:

- Pre 1750 there was 12,436 hectares of this ecosystem type in the upper north-east section of the NSW North Coast Bioregion. 6,581 hectares (52.9%) remains.
- The ecosystem is not considered to be Vulnerable, Rare or Endangered.
- 2.9% of the total forest ecosystem area is within the Comprehensive, Adequate & Representative (CAR) reserve system, including 0.7% in dedicated reserves and 0.6% in informal reserves. A further 1.6% is protected by tabulated prescriptions.





This community forms part of the large vegetated corridor along the southern boundary of the subject site and provides a buffer to the SEPP 14 wetland. However Lantana occurs as a common weed and the conservation status of this community is therefore considered to be moderate.

**Community 1(c) - Tall open dry sclerophyll forest (Blackbutt)**

Location

This community is located adjacent to the eastern boundary of the Subject site, on the southern side of Swampy Creek.

Composition

The canopy of this community is dominated by several large, old growth Blackbutts up to 20m tall. A dense heathy mid-storey occurs and is dominated by Prickly tea-tree (*Leptospermum juniperinum*) and Lemon-scented tea-tree (*Leptospermum petersonii*). The groundcover is comprised of Long-leaved matrush, Bracken fern and Tassel cord rush (*Restio tetraphyllus*).

Conservation status

This community is analogous to Forest Ecosystem 72 (Low Relief Coastal Blackbutt) (NPWS 1999). The Regional Forestry Agreement document provides the following data on this ecosystem:

The Regional Forestry Agreement data on Blackbutt communities has been discussed for Community 1(a).

This community is comprised of old growth trees which contain numerous hollows and also acts as a buffer to Swampy Creek. The conservation status of this community is therefore considered to be high.

**1.3.3.3 Swamp sclerophyll forests**

**Community 2(a) - Tall Closed Swamp Sclerophyll Forest (Swamp mahogany/ Tallowwood/ Sydney blue gum/ Willow bottlebrush/ Sieber's paperbark)**

Location

This community is located in a small patch in the north-western section of the Subject site and occurs in association with the upper reaches of the wetland area. Standing pools of water occur throughout this area.

Composition

The emergent canopy of this community is dominated by Swamp mahogany with secondary occurrences of Tallowwood and Sydney blue gum (*E. saligna*). A second canopy layer exists and is comprised of Willow bottlebrush (*Callistemon salignus*) and Sieber's paperbark (*Melaleuca sieberi*) which occur within and adjacent to standing pools of water in this area.

Mid-storey species include Lilly pilly (*Acmena smithii*), Murrogun (*Cryptocarya microneura*), Brittlewood (*Claoxylon australe*), Narrow-leaved palm lilly and the occasional Cabbage tree palm (*Livistona australis*). In some areas the mid-storey consists exclusively of Narrow-leaved palm lily. The groundcover is quite dense and mainly comprised of Tall saw-sedge, Long-leaved matrush and some Native ginger



(*Alpinia caerulea*). Climbers are present and common throughout including Prickly smilax (*Smilax australis*), Morinda (*Morinda jasminoides*), Small-leaved supplejack (*Ripogonum brevifolium*) and Water vine (*Cissus antarctica*).

This community is in good condition and is relatively weed free.

#### Conservation Status

This community is analogous to Forest Ecosystem 142 (Swamp Mahogany) (NPWS 1999). The Regional Forestry Agreement document provides the following data on this ecosystem:

- Pre 1750 there was 695 hectares of this ecosystem type in the upper north-east section of the NSW North Coast Bioregion. 578 hectares (83.2%) remains.
- The ecosystem is considered to be **Rare**.
- 39.5% of the total forest ecosystem area is within the Comprehensive, Adequate & Representative (CAR) reserve system, including 25.7% in dedicated reserves and 12.3% in informal reserves. A further 1.4% is protected by tabulated prescriptions.
- Swamp mahogany communities have been identified as a priority for conservation on private land.

On the 17<sup>th</sup> December 2004 the NSW Scientific Committee made its Final Determination listing Swamp sclerophyll forest on coastal floodplain (including FE 142) as an Endangered Ecological Community (EEC). The conservation status of this community is therefore considered to be high.

#### ***Community 2(b) - Mid-high closed Paperbark forest (Broad-leaved paperbark/ Sieber's paperbark/ Willow bottlebrush/ Swamp mahogany)***

##### Location

This community occurs extensively throughout the low lying portions of the subject site associated with the SEPP 14 Wetland and Swampy Creek.

##### Composition

This community is comprised of Paperbark forest characterised by varying abundance of Broad-leaved paperbark (*Melaleuca quinquenervia*) and Sieber's paperbark. An old access track bisects this community.

The western end of this community is dominated by dense stands of Broad-leaved paperbark with sporadic occurrences of Sieber's paperbark, Willow bottlebrush and emergent Swamp mahogany. This portion of the Subject site occurs within the boundaries of SEPP 14 Wetland no. 362 and contains pools of standing water up to 30cm deep and one large pool up to 1m deep. The mid-storey in this area is very sparse and comprised of Narrow-leaved palm lily, Callicoma (*Callicoma serratifolia*) and Lilly pilly. The ground cover is quite dense and comprised entirely of Tall saw-sedge.

Immediately east of the access track more emergent Swamp mahogany occurs as well as occasional Swamp turpentine (*Lophostemon suaveolens*). Broad-leaved paperbark and Willow bottlebrush occur as a sub-canopy and there is a complete lack of mid-storey apart from scattered Callicoma. The groundcover is still quite dense and becomes more diverse including Narrow-leaved palm lily, Tall saw-sedge, *Juncus sp* and Swamp water fern (*Blechnum indicum*).



Still further east, emergent Swamp mahogany no longer occurs and the canopy becomes more open and is completely dominated by Broad-leaved paperbark. Some dense Groundsel bush (*Baccharis halimifolia*) infestations occur as the mid-storey and the groundcover is comprised of dense Tall saw-sedge and *Juncus sp.* Large areas of the mid-storey and groundcover have died in this area, most likely due to spraying to control the Groundsel bush.

Along the eastern boundary of the Subject site Sieber's paperbark is prevalent, particularly north of Swampy Creek.

#### Conservation Status

The closest analogue to this community discussed in the Regional Forestry Agreement report is Forest Ecosystem 112 (Paperbark Forest). The Regional Forestry Agreement document provides the following data on this ecosystem:

##### *Paperbark forest*

- 28577 hectares of this ecosystem type remains within the upper north east section of the NSW North Coast Bioregion. The original extent (*i.e.* Pre 1750) has not been calculated.
- The ecosystem is considered to be **Vulnerable**.
- The extent present in the Comprehensive, Adequate and Representative (CAR) reserve system has not been determined. However, NPWS (1995) note that analogous communities have been reserved in a number of conservation areas in upper North East NSW.
- Paperbark communities have been identified as a priority for conservation on private land.

On the 17<sup>th</sup> December 2004 the NSW Scientific Committee made its Final Determination listing Swamp sclerophyll forest on coastal floodplain (including FE 112) as an Endangered Ecological Community (EEC). The conservation status of this community is therefore considered to be high. This is also the largest and most well developed vegetation community on the Subject site.

#### ***Community 2(c) - Mid-high Swamp she-oak woodland (Swamp she-oak/ Sieber's paperbark)***

##### Location

One stand of this community occurs in the central eastern section of the Subject site, in association with the SEPP 14 Wetland.

##### Composition

This community is dominated by Swamp she-oak, largely to the exclusion of other canopy tree species apart from some scattered Sieber's paperbark. The mid-storey is quite sparse in the northern section of this community however, in the southern section a dense infestation of Groundsel bush occurs. Some of this Groundsel bush infested area appears to have been recently sprayed.

Ground cover is somewhat inhibited by the dense cover of she-oak cladodes however, dense clumps of *Juncus sp* occur in some areas. This ground cover appears to have been affected by spraying activities also.

#### Conservation Status



The closest analogue to this community discussed in the Regional Forestry Agreement report is Forest Ecosystem 143 (Swamp Oak Forest). The Regional Forestry Agreement document provides the following data on this ecosystem:

*Swamp oak forest*

- Pre 1750 there was 11165 hectares of this ecosystem type in the upper north-east section of the NSW North Coast Bioregion. 2883 hectares (25.8%) remains.
- The ecosystem is considered to be **Rare**.
- 7.6% of the total forest ecosystem area is within the Comprehensive, Adequate & Representative (CAR) reserve system, including 0.2% in dedicated reserves and 0.5% in informal reserves. A further 8.3% is protected by tabulated prescriptions.
- Swamp oak communities have been identified as a priority for conservation on private land.

On the 17<sup>th</sup> December 2004 the NSW Scientific Committee made its Final Determination listing Swamp oak forest floodplain forest as an Endangered Ecological Community (EEC). The conservation status of this community is therefore considered to be high.

1.3.3.4 Wet sclerophyll forests

***Community 3(a) - Tall closed wet sclerophyll forest (Swamp mahogany/ Willow bottlebrush/ Rusty gum/ Turpentine/ Pink bloodwood)***

Location

This community is situated on the northern section of the western boundary of the Subject site and occurs adjacent to community 2(a).

Composition

Swamp mahogany dominates the canopy of this community with secondary occurrences of Rusty gum, Turpentine and Pink bloodwood, as well as Willow bottlebrush in wetter areas. Shrub layers are typically diverse, consisting of rainforest species such as Lilly pilly, Murrogon, Narrow-leaved palm lily, Scentless rosewood, Blueberry ash (*Elaeocarpus reticulatus*) and Cheese tree, as well as occasional thickets of Lantana.

Groundcovers are quite dense in areas and are comprised of Tall saw-sedge, Bracken fern and regenerating Cheese tree. Vine species present include Common silkpod (*Parsonsia straminea*), Water vine, Burny vine (*Malaisia scandens*) and Climbing guinea flower (*Hibbertia scandens*).

Conservation Status

This community is analogous to Forest Ecosystem 142 (Swamp Mahogany) (NPWS 1999). The conservation status of Swamp mahogany communities has been discussed for Community 2(a).

On the 17<sup>th</sup> December 2004 the NSW Scientific Committee made its Final Determination listing Swamp sclerophyll forest on coastal floodplain (including FE 142) as an Endangered Ecological Community (EEC). The conservation status of this community is therefore considered to be high. However, it should be noted that this community is quite weedy in some areas, particularly along the northern edge and along the track that runs through its centre.



**Community 3(b) - Tall closed wet sclerophyll forest (Turpentine/ Red bloodwood/ Tallowwood/ Hard corkwood/ Swamp box)**

Location

This community occurs in a narrow band along the northern and southern edges of the swamp communities occurring within SEPP 14 Wetland.

Composition

This community is relatively variable in composition. It occurs as a narrow band of vegetation and acts as a buffer to the SEPP 14 Wetland.

Turpentine generally dominates the canopy of this community with Red bloodwood, Tallowwood and the occasional Brushbox (*Lophostemon confertus*), Hard corkwood (*Endiandra sieberi*) and Swamp mahogany as secondary occurrences. The mid-storey is dominated by dense thickets of regrowth Callicoma, particularly along the northern edge and parts of the southern edge. Rainforest and regenerating species also occur including Brittlewood, Canthium (*Canthium coprosmoides*), Lilly pilly, Blueberry ash and Satinwood (*Nematolepis squamea*).

Some exotic plant species occur along the southern edge of this community including Impatiens (*Impatiens walleriana*), Fishbone fern (*Nephrolepis cordifolia*), Canna lily (*Canna indica*), Hibiscus, Monstera (*Monstera deliciosa*), Bromeliads etc. and are most likely garden escapees or occur as a result of dumping.

The groundcover in this community is comprised almost entirely of Tall saw-sedge, with occasional patches of *Juncus* sp. in the wetter areas. Vines are common throughout this community the majority of which are Prickly smilax and Smooth smilax (*Smilax glycyphylla*).

Conservation Status

This community is analogous to Forest Ecosystem 147 (Turpentine) and Forest Ecosystem 142 (Swamp Mahogany) (NPWS 1999). The Regional Forestry Agreement document provides the following data on this ecosystem:

**FE 147 (Turpentine)**

- Pre 1750 there was 6784 hectares of this ecosystem type in the upper north-east section of the NSW North Coast Bioregion. 2943 hectares (43.4%) remains.
- The ecosystem is not considered to be vulnerable, rare or endangered.
- 16.4% of the total forest ecosystem area is within the Comprehensive, Adequate & Representative (CAR) reserve system, including 15.2% in dedicated reserves and 0.6% in informal reserves. A further 0.6% is protected by tabulated prescriptions.

The conservation status of Swamp mahogany communities has been discussed for Community 2(a). It should be noted however that this community is not considered to represent the EEC Swamp sclerophyll forest on coastal floodplain.

Due to the thin, linear nature of this community it is quite susceptible to edge effects. It does, however, act as a buffer to the SEPP 14 Wetland. The conservation status of this community is therefore considered to be moderate.

**Community 3(c) - Tall closed wet sclerophyll forest (Swamp mahogany/ Tallowwood/ Hard corkwood/ Rusty gum/ Willow bottlebrush)**

Location



This community occurs in two patches to the west of the SEPP 14 Wetland.

#### Composition

Swamp mahogany generally dominates the canopy of this community with Tallowwood, Hard corkwood and Rusty gum as secondary occurrences. The mid-storey is dominated by dense thickets of regrowth Callicoma, Narrow-leaved palm lily and regrowth Hard corkwood. Rainforest and regenerating species also occur including Brittlewood, Canthium, Lilly pilly, Blueberry ash and Satinwood. The eastern section of this community contains some Willow bottlebrush as it grades into the Paperbark communities associated with the SEPP 14 Wetland.

The groundcover in this community is comprised almost entirely of dense Tall saw-sedge, with occasional patches of Native ginger. Vines are common throughout this community particularly Prickly smilax along with Cockspur (*Maclura cochinchinensis*) and Burny vine.

#### Conservation Status

This community is analogous to Forest Ecosystem 142 (Swamp Mahogany) (NPWS 1999). The conservation status of Swamp mahogany communities has been discussed for Community 2(a).

This section of the Subject site is in good condition and is relatively weed free. It also acts as a buffer to the SEPP 14 Wetland. On the 17<sup>th</sup> December 2004 the NSW Scientific Committee made its Final Determination listing Swamp sclerophyll forest on coastal floodplain (including FE 142) as an Endangered Ecological Community (EEC). The conservation status of this community is therefore considered to be high.

- **Community 3(d) - Mid-high closed wet sclerophyll forest (Swamp mahogany/ Turpentine/ Rusty gum/ Forest red gum +/- Red bloodwood)**

#### Location

This community occurs in a narrow band along the eastern edge of the Subject site between the cleared area and the Paperbark communities associated with Swampy Creek.

#### Composition

The canopy of this community is comprised of Swamp mahogany, Turpentine, Rusty gum, Forest red gum and Red bloodwood. The mid-storey is dominated by occasional dense thickets of regrowth Callicoma, particularly along the eastern edge. Regrowth species also occur including Geebung, Hopbush, Murrogun and Satinwood.

The groundcover in this community is comprised almost entirely of Tall saw-sedge, with occasional patches of *Juncus sp.*, Long-leaved matrush and Bracken fern. Vines are common throughout this community the majority of which is Smooth smilax.

#### Conservation Status

This community is analogous to Forest Ecosystem 147 (Turpentine) and Forest Ecosystem 142 (Swamp Mahogany) (NPWS 1999) which have been described previously. Due to the thin, linear nature of this community it is quite susceptible to edge effects. It does, however, act as a buffer to the Paperbark communities associated with Swampy Creek. Furthermore, on the 17<sup>th</sup> December 2004 the NSW Scientific Committee made its Final Determination listing Swamp sclerophyll forest on coastal floodplain



(including FE 142) as an Endangered Ecological Community (EEC). The conservation status of this community is therefore considered to be high.

#### 1.3.3.5 Mangroves

##### ***Community 4(a) - Low open Mangrove woodland (River mangrove/ Grey mangrove)***

###### Location

This community occurs in a thin band along the edges of Swampy Creek, in the eastern section of the Subject site.

###### Composition

There are two co-dominant species in the canopy of this community - River mangrove (*Aegiceras corniculatum*) and Grey mangrove (*Avicennia marina* var. *australasica*). These trees are quite sparse at the beginning of the creek within the SEPP 14 Wetland, but as the creek moves eastwards and widens, the canopy becomes almost closed in some areas and the number of pneumatophores increases correspondingly.

There is no mid-storey in this community and the ground cover is represented by some areas of Saltwater couch (*Sporobolus virginicus*) which occurs as a thin strip along the creek banks.

###### Conservation Status

The closest analogue to this community discussed in the Regional Forestry Agreement report is Forest Ecosystem 77 (Mangroves). The Regional Forestry Agreement document provides the following data on this ecosystem:

###### Mangroves

- 734 hectares of this ecosystem type remains within the upper north east section of the NSW North Coast Bioregion. The original extent (*i.e.* Pre 1750) has not been calculated.
- The ecosystem is considered to be **Rare**.
- The extent present in the Comprehensive, Adequate and Representative (CAR) reserve system has not been determined. However, NPWS (1995) note that analogous communities have been reserved in a number of conservation areas in upper North East NSW.

It is worth noting that Coastal Saltmarsh (including Saltwater couch) has been recently determined to be an Endangered Ecological Community (EEC) by the NSW Scientific Committee (2004).

The conservation value of this community is considered to be high.

#### 1.3.3.6 Disturbed regrowth

##### ***Community 5(a) - Mid-high rainforest regrowth (Red ash/ Scrub turpentine/ Murrogun/ Cheese tree)***

###### Location



This community occurs in two small patches. The largest occurs near the western boundary of the Subject site, adjacent to Nambucca State Forest. A second patch of this community occurs around a fresh water spring approximately 200m north.

#### Composition

These areas of vegetation have been disturbed by logging activities and as a result have been invaded by weeds. The canopy consists of typical rainforest regrowth species including Red ash (*Alphitonia excelsa*), Scrub turpentine (*Rhodamnia rubescens*), Murrogun and Cheese tree.

The mid-storey is comprised of regrowth Cheese tree, Blackwood wattle, Green wattle and large patches of Lantana. There is an abundance of vines and climbers including Morinda, Water vine, Whip vine (*Flagellaria indica*) and Prickly smilax.

The ground cover in this community is comprised almost entirely of annual weeds such as Thickhead (*Crassocephalum crepidioides*), Blue billygoat weed (*Ageratum houstonianum*) etc.

#### Conservation Status

The closest analogue to this community discussed in the Regional Forestry Agreement report is Forest Ecosystem 168 (Rainforest). The Regional Forestry Agreement document provides the following data on this ecosystem:

##### Rainforest

- 15,9211 hectares of this ecosystem type remains within the upper north east section of the NSW North Coast Bioregion. The original extent (*i.e.* Pre 1750) has not been calculated.
- The ecosystem is considered to be **Endangered**.
- The extent present in the Comprehensive, Adequate and Representative (CAR) reserve system has not been determined. However, NPWS (1995) note that analogous communities have been reserved in a number of conservation areas in upper North East NSW.
- Rainforest communities have been identified as a priority for conservation on private land.

It should be noted that the Rainforest regrowth community on the Subject site is a very disturbed and poorly developed example of FE 168 (Rainforest) and its conservation value is therefore severely reduced and considered to be low-moderate.

#### ***Community 5(b) - Low open dry sclerophyll regrowth (Blackbutt/ Rusty gum)***

##### Location

This community occurs in a thin band along the northern edge of the playing fields, in the western section of the Subject site. This community occurs as regrowth on a previously cleared bank approximately 5m in height.

##### Composition

Regrowth Blackbutt generally dominates the canopy of this community to a height of approximately 4m, with Rusty gum as a secondary occurrence. Several Willow bottlebrush also occur in wetter areas. The mid-storey is comprised of common regrowth species such as Blackwood wattle, Green wattle and Hopbush, as well as some Forest oak and patchy Lantana.





The groundcover in this community is dominated by Whiskey grass (*Andropogon virginicus*), with some secondary occurrences of Blady grass and some Tall saw-sedge and *Juncus sp.* in wetter areas.

#### Conservation Status

This community is analogous to Forest Ecosystem 72 (Low Relief Coastal Blackbutt) (NPWS 1999). The Regional Forestry Agreement data on Blackbutt communities has been discussed for Community 1(a).

It should be noted that due to the small size, disturbed nature and regrowth status of this community, that the conservation value of this community is significantly lower than that of FE 72 (Low Relief Coastal Blackbutt) and is considered to be low-moderate.

#### ***Community 6 - Clumps of Trees and Isolated Trees (Forest red gum/ Blackbutt/ Tallowwood /Pink bloodwood/ Red bloodwood/ Rusty gum/ Turpentine/ Swamp mahogany)***

#### Location

This community occurs over the majority of the site.

#### Composition

The canopy of this community is quite sparse as illustrated by the aerial photo (FIGURE 3). A scattering of mixed eucalypt species occur the most common of which are: Forest red gum (*Eucalyptus tereticornis*), Tallowwood (*E. microcorys*), Red bloodwood (*Corymbia gummifera*) and Swamp mahogany (*E. robusta*).

Scattered mid-storey species include regenerating Cheese tree (*Glochidion ferdinandi* var. *ferdinandi*) and Blackwood wattle (*Acacia melanoxylon*), and some Forest oak (*Allocasuarina torulosa*) occurs along the northern and western boundaries of the site. Groundcover includes seeded oats, Kangaroo grass (*Themeda triandra*) and Bracken fern (*Pteridium esculentum*).

#### Conservation Status

As part of the Regional Forest Agreement (RFA) process in NSW, a Comprehensive Regional Assessment (CRA) of forest ecosystems was completed. Previous to clearing activities on the Subject site the closest Forest Ecosystem types to this community considered in the CRA report (1999) would most likely have been Forest Ecosystem 72 (Low Relief Coastal Blackbutt); Forest Ecosystem 155 (Wet Foothills Blackbutt - Turpentine); and Forest Ecosystem 32 (Dry Foothills Blackbutt - Turpentine) (CRA Unit 1999). The Regional Forestry Agreement document provides the following data on these ecosystems:

#### **FE 155 (Wet foothills Blackbutt - Turpentine)**

- Pre 1750 there was 8219 hectares of this ecosystem type in the upper north-east section of the NSW North Coast Bioregion. 7437 hectares (90.5%) remains.
- The ecosystem is not considered to be Vulnerable, Rare or Endangered.
- 25.6% of the total forest ecosystem area is within the Comprehensive, Adequate & Representative (CAR) reserve system, including 16% in dedicated reserves and 4.6% in informal reserves. A further 4.9% is protected by tabulated prescriptions.

#### **FE 72 (Low relief coastal Blackbutt)**



- Pre 1750 there was 1574 hectares of this ecosystem type in the upper north-east section of the NSW North Coast Bioregion. 859 hectares (54.6%) remains.
- The ecosystem is considered to be **Rare**.
- 10.3% of the total forest ecosystem area is within the Comprehensive, Adequate & Representative (CAR) reserve system, including 9.1% in dedicated reserves and 0.6% in informal reserves. A further 0.6% is protected by tabulated prescriptions.

**FE 32 (Dry foothills Blackbutt - Turpentine)**

- Pre 1750 there was 9370 hectares of this ecosystem type in the upper north-east section of the NSW North Coast Bioregion. 7364 hectares (78.6%) remains.
- The ecosystem is considered not considered to be Vulnerable, Rare or Endangered.
- 12.9% of the total forest ecosystem area is within the Comprehensive, Adequate & Representative (CAR) reserve system, including 8.1% in dedicated reserves and 1.8% in informal reserves. A further 3.1% is protected by tabulated prescriptions.

The current composition of this community is not analogous with any of these Forest Ecosystems due to disturbance from logging activities which have resulted in the creation of a highly modified sclerophyll ecosystem.

The conservation status of this community has therefore been highly compromised and is considered to be low-moderate.

1.3.3.7 Grasslands

***Community 7 - Mid-high closed grassland (Paspalum/ Saw sedge/ Juncus sp.)***

Location

This community occurs over a majority of the site and is found around the scattered tree clumps as described in Community 6.

Composition

This community is comprised of an area of grassland dominated by *Paspalum* (*Paspalum dilatatum*) up to 1.5m high. Scattered shrubs include Red ash, Sandpaper fig (*Ficus fraseri*) and Native lasiandra (*Melastoma affine*). Wetter areas are comprised of Tall saw-sedge and *Juncus* sp.

Conservation Status

This community is not considered to be analogous with any of the Forest Ecosystems described within the RFA document. The conservation value of this community is considered to be low.



## **APPENDIX 2**

# **PLANT SPECIES LIST**



## Flora and Fauna Assessment

Grouping	Family	Botanical Name	Common Name
Ferns & Fern Allies	Blechnaceae	<i>Blechnum nudum</i>	Fishbone water fern
Ferns & Fern Allies	Blechnaceae	<i>Doodia aspera</i>	Prickly rasp fern
Ferns & Fern Allies	Cyatheaceae	<i>Culcita dubia</i>	Soft bracken
Ferns & Fern Allies	Davalliaceae	<i>Nephrolepis cordifolia</i> *	Fishbone fern
Ferns & Fern Allies	Dennstaedtiaceae	<i>Pteridium esculentum</i>	Bracken fern
Ferns & Fern Allies	Dicksoniaceae	<i>Dicksonia antarctica</i>	Common ground fern
Ferns & Fern Allies	Gleicheniaceae	<i>Gleichenia dicarpa</i>	Coral fern
Ferns & Fern Allies	Polypodiaceae	<i>Platyserium bifurcatum</i>	Elkhorn fern
Dicotyledons	Acanthaceae	<i>Pseuderanthemum variabile</i>	Pastel flower
Dicotyledons	Apiaceae	<i>Centella asiatica</i>	Pennywort (Gotu kola)
Dicotyledons	Apocynaceae	<i>Parsonsia induplicata</i>	Thin-leaved silkpod
Dicotyledons	Apocynaceae	<i>Parsonsia straminea</i>	Common silkpod
Dicotyledons	Araliaceae	<i>Cephalalaria cephalobotrys</i>	Climbing panax
Dicotyledons	Araliaceae	<i>Polyscias sambucifolia</i>	Elderberry panax
Dicotyledons	Araliaceae	<i>Schefflera actinophylla</i> *	Umbrella tree
Dicotyledons	Asclepiadaceae	<i>Gomphocarpus physocarpus</i> *	Balloon cotton bush
Dicotyledons	Asclepiadaceae	<i>Marsdenia longiloba</i>	Clear milkvine
Dicotyledons	Asteraceae	<i>Ageratina adenophora</i> *	Crofton weed
Dicotyledons	Asteraceae	<i>Ageratum houstonianum</i> *	Blue billygoat weed
Dicotyledons	Asteraceae	<i>Aster</i> spp.	Daisy
Dicotyledons	Asteraceae	<i>Baccharis halimifolia</i> *	Groundsel
Dicotyledons	Asteraceae	<i>Bidens pilosa</i> *	Cobblers pegs
Dicotyledons	Asteraceae	<i>Crassocephalum crepidioides</i>	Thickhead
Dicotyledons	Asteraceae	<i>Onopordum acanthium</i>	Scotch thistle
Dicotyledons	Asteraceae	<i>Senecio madagascariensis</i> *	Fireweed
Dicotyledons	Asteraceae	<i>Taraxacum officinale</i>	Dandelion
Dicotyledons	Avicenniaceae	<i>Avicennia marina</i> var <i>australasica</i>	Grey mangrove
Dicotyledons	Balsaminaceae	<i>Impatiens</i> sp.	Balsam
Dicotyledons	Basellaceae	<i>Anredera cordifolia</i>	Madeira vine
Dicotyledons	Bignoniaceae	<i>Pandorea pandorana</i>	Wonga wonga vine
Dicotyledons	Caesalpinoideae	<i>Senna coluteoides</i> *	Winter senna
Dicotyledons	Cannabaceae	<i>Cannabis sativa</i>	Indian hemp
Dicotyledons	Casuarinaceae	<i>Allocasuarina littoralis</i>	Black she-oak
Dicotyledons	Casuarinaceae	<i>Allocasuarina torulosa</i>	Forest oak
Dicotyledons	Casuarinaceae	<i>Casuarina glauca</i>	Swamp oak
Dicotyledons	Celastraceae	<i>Denhamia celastroides</i>	Denhamia
Dicotyledons	Convolvulaceae	<i>Cuscuta australis</i>	Australian Dodder
Dicotyledons	Convolvulaceae	<i>Ipomoea cairica</i> *	Coastal morning glory
Dicotyledons	Cunoniaceae	<i>Callicoma serratifolia</i>	Callicoma
Dicotyledons	Dilleniaceae	<i>Adraeta salicifolia</i>	
Dicotyledons	Dilleniaceae	<i>Hibbertia dentata</i>	Twining guinea flower
Dicotyledons	Dilleniaceae	<i>Hibbertia linearis</i>	
Dicotyledons	Dilleniaceae	<i>Hibbertia obtusifolia</i>	
Dicotyledons	Dilleniaceae	<i>Hibbertia scandens</i>	Climbing guinea flower
Dicotyledons	Dilleniaceae	<i>Hibbertia vestita</i>	
Dicotyledons	Droseraceae	<i>Drosera spatulata</i>	
Dicotyledons	Ebenaceae	<i>Diospyros pentamera</i>	Myrtle ebony
Dicotyledons	Elaeocarpaceae	<i>Elaeocarpus reticulatus</i>	Blueberry ash
Dicotyledons	Epacridaceae	<i>Trochocarpa laurina</i>	Tree heath
Dicotyledons	Ericaceae	<i>Epacris microphylla</i>	
	Styphelioideae		



## Flora and Fauna Assessment

Grouping	Family	Botanical Name	Common Name
Dicotyledons	Ericaceae Styphelioideae	<i>Leucopogon lanceolatus</i> var. <i>gracilis</i>	
Dicotyledons	Ericaceae Styphelioideae	<i>Sprengelia sprengelioides</i>	
Dicotyledons	Euphorbiaceae	<i>Breynia oblongifolia</i>	Coffee bush
Dicotyledons	Euphorbiaceae	<i>Claoxylon australe</i>	Brittlewood
Dicotyledons	Euphorbiaceae	<i>Glochidion ferdinandi</i> var. <i>ferdinandi</i>	Cheese tree
Dicotyledons	Euphorbiaceae	<i>Omalanthus populifolius</i>	Bleeding heart
Dicotyledons	Eupomatiaceae	<i>Eupomatia laurina</i>	Bolwarra
Dicotyledons	Fabaceae	<i>Dillwynia retorta</i>	Eggs & bacon pea
Dicotyledons	Fabaceae	<i>Hovea purpurea</i>	
Dicotyledons	Fabaceae	<i>Hovea</i> sp.	
Dicotyledons	Fabaceae	<i>Jacksonia scorparia</i>	Dogwood
Dicotyledons	Fabaceae	<i>Kennedia rubicunda</i>	Red coral pea
Dicotyledons	Fabaceae	<i>Pultenaea linophylla</i>	
Dicotyledons	Fabaceae	<i>Trifolium repens</i>	White clover
Dicotyledons	Geraniaceae	<i>Pelargonium</i> sp.	Geranium
Dicotyledons	Goodeniaceae	<i>Goodenia bellidifolia</i>	
Dicotyledons	Lamiaceae	<i>Salvia</i> spp.	
Dicotyledons	Lauraceae	<i>Cassytha glabella</i>	Devil's twine
Dicotyledons	Lauraceae	<i>Cinnamomum camphora</i> *	Camphor laurel
Dicotyledons	Lauraceae	<i>Cryptocarya erythroxylan</i>	Pigeonberry ash
Dicotyledons	Lauraceae	<i>Cryptocarya glaucescens</i>	Jackwood
Dicotyledons	Lauraceae	<i>Cryptocarya microneura</i>	Murrogun
Dicotyledons	Lauraceae	<i>Cryptocarya obovata</i>	Pepperberry tree
Dicotyledons	Lauraceae	<i>Endiandra discolor</i>	Rose walnut
Dicotyledons	Lauraceae	<i>Endiandra sieberi</i>	Hard corkwood
Dicotyledons	Lobeliaceae	<i>Pratia purpurascens</i>	Whiteroot
Dicotyledons	Malvaceae	<i>Hibiscus splendens</i>	Pink hibiscus
Dicotyledons	Malvaceae	<i>Hibiscus</i> spp.	
Dicotyledons	Malvaceae	<i>Sida cordifolia</i>	Flannel weed
Dicotyledons	Melastomataceae	<i>Melastoma affine</i>	Native lasiandra
Dicotyledons	Meliaceae	<i>Dysoxylum fraserianum</i>	Rosewood
Dicotyledons	Meliaceae	<i>Melia azedarach</i>	White cedar
Dicotyledons	Meliaceae	<i>Synoum glandulosum</i> subsp. <i>Glandulosum</i>	Scentless rosewood
Dicotyledons	Menispermaceae	<i>Sarcopetalum harveyanum</i>	Pearl vine
Dicotyledons	Menispermaceae	<i>Stephania japonica</i>	Snake vine
Dicotyledons	Mimosaceae	<i>Acacia bineruata</i>	Two-veined hickory
Dicotyledons	Mimosaceae	<i>Acacia floribunda</i>	Gossamer wattle
Dicotyledons	Mimosaceae	<i>Acacia irrorata</i>	
Dicotyledons	Mimosaceae	<i>Acacia irrorata</i> subsp. <i>irrorata</i>	Green wattle
Dicotyledons	Mimosaceae	<i>Acacia longifolia</i>	Sydney golden wattle
Dicotyledons	Mimosaceae	<i>Acacia melanoxylon</i>	Blackwood wattle
Dicotyledons	Monimiaceae	<i>Wilkiea huegeliana</i>	Veiny wilkiea
Dicotyledons	Monimiaceae	<i>Wilkiea macrophylla</i>	Large-leaved wilkiea
Dicotyledons	Moraceae	<i>Ficus coronata</i>	Creek sandpaper fig
Dicotyledons	Moraceae	<i>Ficus watkinsiana</i>	Strangler fig
Dicotyledons	Moraceae	<i>Maclura cochinchinensis</i>	Cockspur
Dicotyledons	Moraceae	<i>Malaisia scandens</i>	Burny vine
Dicotyledons	Musaceae	<i>Musa paradisiaca</i>	Banana
Dicotyledons	Myrsinaceae	<i>Aegiceras corniculatum</i>	River mangrove
Dicotyledons	Myrsinaceae	<i>Ardisia crispa</i>	



## Flora and Fauna Assessment

Grouping	Family	Botanical Name	Common Name
Dicotyledons	Myrsinaceae	<i>Embelia australiana</i>	Embelia
Dicotyledons	Myrsinaceae	<i>Rapanea howittiana</i>	Brush muttonwood
Dicotyledons	Myrsinaceae	<i>Rapanea variabilis</i>	Muttonwood
Dicotyledons	Myrtaceae	<i>Acmena smithii</i>	Lilly pilly
Dicotyledons	Myrtaceae	<i>Angophora costata</i>	Rusty gum
Dicotyledons	Myrtaceae	<i>Archirhodomyrtus beckleri</i>	Rose myrtle
Dicotyledons	Myrtaceae	<i>Callistemon rigidus</i>	
Dicotyledons	Myrtaceae	<i>Callistemon salignus</i>	Willow bottlebrush
Dicotyledons	Myrtaceae	<i>Corymbia gummifera</i>	Red bloodwood
Dicotyledons	Myrtaceae	<i>Corymbia intermedia</i>	Pink bloodwood
Dicotyledons	Myrtaceae	<i>Eucalyptus acmenoides</i>	White mahogany
Dicotyledons	Myrtaceae	<i>Eucalyptus biturbinata</i>	Grey gum
Dicotyledons	Myrtaceae	<i>Eucalyptus microcorys</i> <sup>k</sup>	Tallowwood
Dicotyledons	Myrtaceae	<i>Eucalyptus pilularis</i>	Blackbutt
Dicotyledons	Myrtaceae	<i>Eucalyptus propinqua</i>	Small fruited grey gum
Dicotyledons	Myrtaceae	<i>Eucalyptus robusta</i> <sup>k</sup>	Swamp mahogany
Dicotyledons	Myrtaceae	<i>Eucalyptus saligna</i>	Sydney Blue Gum
Dicotyledons	Myrtaceae	<i>Eucalyptus siderophloia</i>	Northern grey ironbark
Dicotyledons	Myrtaceae	<i>Eucalyptus signata</i> <sup>k</sup>	Scribbly gum
Dicotyledons	Myrtaceae	<i>Eucalyptus tereticornis</i> <sup>k</sup>	Forest red gum
Dicotyledons	Myrtaceae	<i>Leptospermum juniperinum</i>	Prickly tea-tree
Dicotyledons	Myrtaceae	<i>Leptospermum liversidgei</i>	
Dicotyledons	Myrtaceae	<i>Leptospermum petersonii</i>	Lemon-scented teatree
Dicotyledons	Myrtaceae	<i>Leptospermum polygalifolium</i>	Teatree
Dicotyledons	Myrtaceae	<i>Leptospermum</i> sp.	
Dicotyledons	Myrtaceae	<i>Lophostemon suaveolens</i>	Swamp turpentine
Dicotyledons	Myrtaceae	<i>Lophostemon confertus</i>	Brushbox
Dicotyledons	Myrtaceae	<i>Melaleuca alternifolia</i>	
Dicotyledons	Myrtaceae	<i>Melaleuca quinquenervia</i>	Broad-leaved paperbark
Dicotyledons	Myrtaceae	<i>Melaleuca sieberi</i>	
Dicotyledons	Myrtaceae	<i>Melaleuca styphelioides</i>	Prickly-leaved teatree
Dicotyledons	Myrtaceae	<i>Pilidiostigma glabrum</i>	Plum myrtle
Dicotyledons	Myrtaceae	<i>Rhodamnia rubescens</i>	Scrub turpentine
Dicotyledons	Myrtaceae	<i>Rhodomyrtus psidiodes</i>	Native guava
Dicotyledons	Myrtaceae	<i>Syncarpia glomulifera</i>	Turpentine
Dicotyledons	Myrtaceae	<i>Syzygium oleosum</i>	Blue lilly pilly
Dicotyledons	Myrtaceae	<i>Tristaniopsis laurina</i>	Water gum
Dicotyledons	Ochanceae	<i>Jasminum</i> sp.	Jasmine
Dicotyledons	Ochnaceae	<i>Ochna</i> sp.	
Dicotyledons	Oleaceae	<i>Notelaea longifolia</i>	Large mock olive
Dicotyledons	Oleaceae	<i>Notelaea venosa</i>	Smooth mock olive
Dicotyledons	Passifloraceae	<i>Passiflora herbertiana</i> subsp. <i>herbertiana</i>	Native passionfruit
Dicotyledons	Phytolacaceae	<i>Phytolacca octandra</i> <sup>*</sup>	Inkweed
Dicotyledons	Pittosporaceae	<i>Citriobatus pauciflorus</i>	Orange thorn
Dicotyledons	Pittosporaceae	<i>Pittosporum revolutum</i>	Hairy pittosporum
Dicotyledons	Pittosporaceae	<i>Pittosporum undulatum</i>	Sweet pittosporum
Dicotyledons	Polygalaceae	<i>Comesperma defoliatum</i>	
Dicotyledons	Proteaceae	<i>Banksia integrifolia</i>	Coast banksia
Dicotyledons	Proteaceae	<i>Banksia spinulosa</i> var. <i>collina</i>	
Dicotyledons	Proteaceae	<i>Lomatia silaifolia</i>	Crinkle bush
Dicotyledons	Proteaceae	<i>Persoonia stradbrokeensis</i>	Geebung
Dicotyledons	Proteaceae	<i>Persoonia virgata</i>	
Dicotyledons	Rhamnaceae	<i>Alphitonia excelsa</i>	Red ash



## Flora and Fauna Assessment

Grouping	Family	Botanical Name	Common Name
Dicotyledons	Rosaceae	<i>Rubus parvifolius</i>	Native raspberry
Dicotyledons	Rosaceae	<i>Rubus sp. Aff moorei</i>	Green-leaved bramble
Dicotyledons	Rubiaceae	<i>Canthium coprosmoides</i>	Coast canthium
Dicotyledons	Rubiaceae	<i>Morinda jasminoides</i>	Morinda
Dicotyledons	Rubiaceae	<i>Psychotria loniceroides</i>	Hairy psychotria
Dicotyledons	Rubiaceae	<i>Randia benthamiana</i>	Native gardenia
Dicotyledons	Rutaceae	<i>Acronychia oblongifolia</i>	Common acronychia
Dicotyledons	Rutaceae	<i>Citris limon</i>	Lemon bush
Dicotyledons	Rutaceae	<i>Nematolepis squamea subsp. squamea</i>	Satinwood
Dicotyledons	Rutaceae	<i>Boronia falcifolia</i>	
Dicotyledons	Sapindaceae	<i>Dodonaea triquetra</i>	Hopbush
Dicotyledons	Sapindaceae	<i>Guioa semiglauc</i>	Guioa
Dicotyledons	Solanaceae	<i>Duboisia myoporoides</i>	Duboisia
Dicotyledons	Solanaceae	<i>Solanum mauritianum*</i>	Wild tobacco tree
Dicotyledons	Solanaceae	<i>Solanum nigrum*</i>	Black-berry nightshade
Dicotyledons	Sterculiaceae	<i>Brachychiton acerifolius</i>	Flame tree
Dicotyledons	Sterculiaceae	<i>Commersonia bartramia</i>	Brown kurrajong
Dicotyledons	Sterculiaceae	<i>Commersonia fraseri</i>	Brush kurrajong
Dicotyledons	Stylidiaceae	<i>Stylidium graminifolium</i>	
Dicotyledons	Stylidiaceae	<i>Stylidium sp.</i>	
Dicotyledons	Symplocaceae	<i>Symplocos stawellii</i>	White hazelwood
Dicotyledons	Thymelaeaceae	<i>Pimelea sp.</i>	
Dicotyledons	Tremandraceae	<i>Tetradlea thymifolia</i>	Black-eyed susan (native)
Dicotyledons	Verbenaceae	<i>Clerodendrum floribundum</i>	Smooth clerodendrum
Dicotyledons	Verbenaceae	<i>Lantana camara*</i>	Lantana
Dicotyledons	Verbenaceae	<i>Verbena sp.</i>	
Dicotyledons	Violaceae	<i>Viola hederacea subsp. Hederacea</i>	Native violet
Dicotyledons	Vitaceae	<i>Cayratia clematidea</i>	Slender grape
Dicotyledons	Vitaceae	<i>Cissus antarctica</i>	Water vine
Dicotyledons	Vitaceae	<i>Cissus hypoglauca</i>	Five-leaf water vine
Monocotyledons	Araceae	<i>Monstera deliciosa</i>	
Monocotyledons	Arecaceae	<i>Archontophoenix cunninghamiana</i>	Bangalow palm
Monocotyledons	Arecaceae	<i>Livistona australis</i>	Cabbage palm
Monocotyledons	Asparagaceae	<i>Asparagus densiflorus</i>	Ground asparagus
Monocotyledons	Asteliaceae	<i>Cordyline stricta</i>	Narrow-leaved palm lily
Monocotyledons	Bromeliaceae	<i>Tillandsia sp.</i>	Bromeliad
Monocotyledons	Cannaceae	<i>Canna indica</i>	Canna lily
Monocotyledons	Commelinaceae	<i>Commelina cyanea</i>	Native wandering jew
Monocotyledons	Cyperaceae	<i>Baumea sp.</i>	Jointed twig rush
Monocotyledons	Cyperaceae	<i>Baumea sp.</i>	
Monocotyledons	Cyperaceae	<i>Caustis flexuosa</i>	
Monocotyledons	Cyperaceae	<i>Cyperus difformis</i>	Rice sedge
Monocotyledons	Cyperaceae	<i>Eleocharis sp.</i>	
Monocotyledons	Cyperaceae	<i>Gahnia clarkei</i>	Tall saw sedge
Monocotyledons	Dioscoraceae	<i>Dioscorea transversa</i>	Native yam
Monocotyledons	Flagellariaceae	<i>Flagellaria indica</i>	Whip vine
Monocotyledons	Juncaceae	<i>Juncus kraussii</i>	Salt rush
Monocotyledons	Juncaceae	<i>Juncus sp.</i>	
Monocotyledons	Lomandraceae	<i>Lomandra hystrix</i>	Matrush
Monocotyledons	Lomandraceae	<i>Lomandra longifolia</i>	Long-leaved matrush
Monocotyledons	Luzuriagaceae	<i>Eustrephus latifolius</i>	Wombat berry



## Flora and Fauna Assessment

Grouping	Family	Botanical Name	Common Name
Monocotyledons	Luzuriagaceae	<i>Geitonoplesium cymosum</i>	Scrambling lily
Monocotyledons	Orchidaceae	<i>Dendrobium</i> spp.	Orchid
Monocotyledons	Philydraceae	<i>Philydrum lanuginosum</i>	Frogsmouth
Monocotyledons	Phormiaceae	<i>Dianella</i> sp.	
Monocotyledons	Poaceae	<i>Andropogon virginicus</i> *	Whiskey grass
Monocotyledons	Poaceae	<i>Avena</i> spp.	Wild oats
Monocotyledons	Poaceae	<i>Chloris gayana</i> *	Rhodes grass
Monocotyledons	Poaceae	<i>Entolasia</i> sp.	
Monocotyledons	Poaceae	<i>Entolasia stricta</i>	
Monocotyledons	Poaceae	<i>Imperata cylindrica</i>	Blady grass
Monocotyledons	Poaceae	<i>Lolium</i> sp.	Rye grass
Monocotyledons	Poaceae	<i>Opismenus imbecillis</i>	Basket grass
Monocotyledons	Poaceae	<i>Paspalum dilatatum</i> *	Paspalum
Monocotyledons	Poaceae	<i>Paspalum virginatum</i>	Salt couch
Monocotyledons	Poaceae	<i>Phragmites australis</i>	Phragmites
Monocotyledons	Poaceae	<i>Setaria</i> sp.*	Pigeon grass
Monocotyledons	Poaceae	<i>Themeda australis</i>	Kangaroo grass
Monocotyledons	Restionaceae	<i>Empodisma minus</i>	
Monocotyledons	Restionaceae	<i>Restio tetraphyllus</i>	Tassel cord rush
Monocotyledons	Ripogonaceae	<i>Ripogonum brevifolium</i>	Small-leaved supplejack
Monocotyledons	Smilacaceae	<i>Smilax australis</i>	Prickly smilax
Monocotyledons	Smilacaceae	<i>Smilax glyciphylla</i>	Smooth smilax
Monocotyledons	Uvulariaceae	<i>Tripladenia cunninghamii</i>	
Monocotyledons	Xanthorrhoeaceae	<i>Xanthorrhoea</i> sp.	Grass tree
Monocotyledons	Xyridaceae	<i>Xyris</i> sp.	
Monocotyledons	Zingiberaceae	<i>Alpinia caerulea</i>	Native ginger
Monocotyledons	Zosteraceae	<i>Zostera capricorni</i>	Eel grass

\* Introduced Species

<sup>k</sup> Koala feed trees as listed in Schedule 2 of SEPP 44 Policy





## **APPENDIX 3**

### **Fauna Assessment**



## 2 FAUNA ASSESSMENT

### 2.1 Introduction

This section includes a description of the methods used in determining which fauna species use the Study area and a discussion of the results of the Fauna assessment. The fauna assessment involved detailed fauna surveys (i.e. specialised bird, bat and amphibian survey, spotlighting, hair sampling and trapping).

### 2.2 Methods

#### 2.2.1 Database searches

Searches of the NPWS and the EPBC (Protected Matters) databases were completed (12th February 2010) to find records of State and Commonwealth Threatened species<sup>2</sup> within 5km of the Subject site.

#### 2.2.2 Fauna surveys

A detailed fauna survey was carried out between the 25<sup>th</sup> and the 29<sup>th</sup> of October 2004. The weather was generally fine and warm during the survey period with a number of windy afternoons. The moon was full on the night of the 28<sup>th</sup>.

An additional detailed fauna survey was carried out between the 19<sup>th</sup> and 23<sup>rd</sup> of February 2007. The weather was generally fine and warm during the survey period.

##### 2.2.2.1 Survey Techniques

Detailed fauna surveys were designed to target identified threatened species. The following survey techniques were utilised in this assessment. **FIGURES 15a and 15b** show the location of trap sites. A summary of trapping effort is shown in **TABLE 3**.

### Opportunistic Sightings

Many species of fauna recorded at the site were opportunistically sighted while walking or checking trap lines or generally traversing the site. Fauna observed during all survey work were recorded.

### Terrestrial Elliott Traps

Elliott traps sample locally significant species such as the Grassland melomys and provide an insight into the prey availability of predatory nocturnal birds such as the Eastern grass owl and the Masked owl. This sampling technique also indicates the extent of invasion by exotic species such as the Black rat and the House mouse which allows an assessment of the 'naturalness' of the area to be made.

#### 2004 Survey

Ten (10) Type A Elliott traps were set in five (5) transects totalling fifty (50) Type A Elliott traps. The traps were baited with a mixture of rolled oats, honey, peanut butter and pistachio essence and left in place for four (4) nights. A total of two hundred (200) trap nights were achieved in this component of the Study.

---

<sup>2</sup> As listed within schedules of the TSC Act (1995) and EPBC Act (1999).



Three (3) Type B Elliott traps were also set throughout the site. These traps were also baited with a mixture of rolled oats, honey, peanut butter and pistachio essence and left in place for four (4) nights. A total of two hundred (12) trap nights were achieved in this component of the Study.

#### 2007 Survey

Twenty-five Type A Elliott traps were set in two (2) transects totalling fifty (50) Type A Elliott traps. The traps were baited with a mixture of rolled oats, honey, peanut butter and pistachio essence and left in place for four (4) nights. A total of two hundred (200) trap nights were achieved in this component of the Study.

#### **Arboreal Elliott traps**

#### 2004 Survey

Two (2) transects of five (5) 'type A' Elliott traps were set on platforms attached to the trunks of trees, at least 2m above the ground, for a period of four (4) nights. Traps were baited with a mixture of Peanut butter, rolled oats, honey and pistachio essence. A total of forty (40) trap nights were achieved in this component of the Study.

#### 2007 Survey

Four (4) transects of five (5) 'type A' Elliott traps were set on platforms attached to the trunks of trees, at least 2m above the ground, for a period of four (4) nights. Traps were baited with a mixture of Peanut butter, rolled oats, honey and pistachio essence. A total of forty (80) trap nights were achieved in this component of the Study.

#### **Cage Trapping**

#### 2004 Survey

Six (6) cage traps (30x40x60cm) were baited with a mix of rolled oats, peanut butter, honey, Pistachio essence, chicken necks and fruit in an attempt to capture medium sized marsupials such as the Long-nosed potoroo, Bandicoots, the Spotted tail quoll and Possums. The cage traps were set and left in place for four (4) nights. A total of thirty two (32) trap nights were achieved in this component of the Study.

#### 2007 Survey

Six (6) cage traps (30x40x60cm) were baited with a mix of rolled oats, peanut butter, honey, Pistachio essence, chicken necks and fruit in an attempt to capture medium sized marsupials such as the Long-nosed potoroo, Bandicoots, the Spotted tail quoll and Possums. The cage traps were set and left in place for four (4) nights. A total of thirty two (32) trap nights were achieved in this component of the Study.

#### **Pitfall Trapping**

#### 2004 Survey

Four (4) pitfall lines of five (5) buckets spaced five (5) metres apart (incorporating drift fencing) were set for a period of four nights. A total of 80 bucket nights were achieved during this component of the Study.

#### 2007 Survey



Four (4) pitfall lines of five (5) buckets spaced five (5) metres apart (incorporating drift fencing) were set for a period of four nights. A total of 80 bucket nights were achieved during this component of the Study.

### **Hair Tubes**

#### 2004 Survey

Twenty-five (25) hair tubes were baited with rolled oats, honey, peanut butter and pistachio essence and set in five transects at 10m intervals (i.e. five transects of five hair tubes) for a period of ten (10) nights. Two hundred and fifty (250) sample nights were achieved in this component of the Study.

#### 2007 Survey

Fifty (50) hair tubes were baited with rolled oats, honey, peanut butter and pistachio essence and set in two transects at 5m intervals (two transects of twenty-five hair tubes) for a period of fourteen (14) nights. Seven hundred (700) sample nights were achieved in this component of the Study.

### **Specialist avian survey**

#### 2004 Survey

A survey was carried out by Stephen Debus to sample diurnal bird species. A census of bird occurrence was carried out to sample both diurnal and nocturnal birds.

Diurnal birds were surveyed visually and aurally by habitat search from 1515 h to dusk (1745 h) on the 23rd, 0645 to 1115 h and 1400 to 1700 h on the 24th, and 0630 to 0900 h on the 25th, for a total of 12.5 hours. More time was spent in the larger northern section of the site (55 ha, 8 h) than in the southern section (14 ha, 4.5 h). Searches included mangroves of the Bellwood Creek estuary adjoining the SEPP 14 wetland section of the subject site.

Nocturnal birds were surveyed by means of listening, call-playback and spotlighting at one site in each section on each of two evenings (23 and 24 September), starting at dusk, with the site order reversed on the second night. Conditions were fine, calm and mild with a half moon on the 23rd, and overcast, cool and breezy to calm on the 24th.

#### 2007 Survey

Diurnal birds were surveyed visually and aurally by habitat search for an hour before dusk on the 19th, an hour after dawn and an hour before dusk on the 20th, an hour after dawn and an hour before dusk on the 21st, an hour after dawn and an hour before dusk on the 22<sup>nd</sup> and an hour after dawn on the 23<sup>rd</sup>, for a total of 8 hours.

### **Nocturnal bird and Mammal playback**

#### 23<sup>rd</sup> & 24<sup>th</sup> October 2004

Owl (Masked, Sooty, Barking and Powerful) playback was undertaken at two (2) selected sites, one in the southern section and one in the northern section (Debus 2004). A half hour listening period was followed by 2 minutes of call playback for each species with 1 minute of stationary spotlighting after each species. A total of 30 minutes was spent at each site on two consecutive nights. A total of two (2) hours of call playback were achieved in this component of the Study.



#### 25<sup>th</sup> - 28<sup>th</sup> October 2004

Call playback was undertaken at two (2) selected sites over three (3) nights. Calls of the Yellow-bellied glider, Koala and Squirrel glider were broadcast for two (2) minutes and a ten (10) minute listening period followed. Spotlighting was undertaken for 10 minutes at each of the sites following call broadcast to determine whether arboreal mammals had moved in to the broadcast site. A total of 30 minutes was spent at each site on two consecutive nights. A total of three (3) hours of call playback were achieved in this component of the Study.

#### 2007 Survey

Call playback was undertaken at two (2) selected sites over four (4) nights. Calls of the Yellow-bellied glider, Koala, Squirrel glider and Masked, Sooty, Barking and Powerful owls were broadcast for two (2) minutes and a ten (10) minute listening period followed. Spotlighting was undertaken for 10 minutes at each of the sites following call broadcast to determine whether animals had moved in to the broadcast site. A total of 30 minutes was spent at each site on four (4) consecutive nights. A total of eight (8) hours of call playback were achieved in this component of the Study.

#### **Harp Netting**

##### 2004 Survey

Two (2) Harp traps were set in potential flyways over three (3) nights. Flyways were chosen on the basis of adequate cover on both sides of the trap, and screening was incorporated to enhance capture success. Due to the open nature of the majority of the vegetation on the site, the available trap locations were considered to be sub-optimal.

An overall total of six (6) trap nights was achieved in this component of the Study.

##### 2007 Survey

One (1) harp trap was set in a potential flyway over four (4) nights. The flyway was chosen on the basis of adequate cover on both sides of the trap, and screening was incorporated to enhance capture success. Due to the open nature of the majority of the vegetation on the site, the available trap locations were considered to be sub-optimal.

An overall total of four (4) trap nights was achieved in this component of the Study.

#### **Ultrasonic call recording**

##### 2004 Survey

An Anabat II sonar detector (Titley Electronics, Ballina) was used to down-load the ultrasonic calls of Microchiropteran bats.

Recording was undertaken for twelve (12) hours per night over four (4) nights. A total of forty-eight (48) hours of recording was undertaken. Recording times commenced from slightly before dusk and concluded slightly before dawn. Stationary recording was undertaken in positions along the edges of vegetation or where possible flyways were located.

##### 2007 Survey



An Anabat II sonar detector (Titley Electronics, Ballina) was used to down-load the ultrasonic calls of Microchiropteran bats.

Recording was undertaken for twelve (12) hours per night over four (4) nights. A total of forty-eight (48) hours of recording was undertaken. Recording times commenced from slightly before dusk and concluded slightly before dawn. Stationary recording was undertaken in positions along the edges of vegetation or where possible flyways were located.

### **Spotlighting**

#### 23<sup>rd</sup> & 24<sup>th</sup> October 2004

Approximately two (2) hours of spotlighting was carried out on the Subject site by Steve Debus (30 minutes at two sites for two nights). The edges of the SEPP 14 Wetland and the Nambucca State Forest were traversed on foot. Spotlighting was carried out using 35 and 50W spotlights powered by 12V batteries and walking at approximately 1km/h allowing intensive listening as an adjunct to visual detection.

#### 26<sup>th</sup> - 28<sup>th</sup> October 2004

Approximately twelve (12) hours of spotlighting was carried out on the Subject site by two observers (2hrs/night for three nights). The edges of the SEPP 14 Wetland and the Nambucca State Forest were traversed on foot and the central cleared sections were also randomly searched. Spotlighting was carried out using 50W spotlights powered by 12V batteries and walking at approximately 1km/h allowing intensive listening as an adjunct to visual detection.

#### 2007 Survey

Approximately eight (8) hours of spotlighting was carried out on the Subject site by two observers (2hrs/night for two nights). The edges of the SEPP 14 Wetland and the Nambucca State Forest were traversed on foot and the central cleared sections were also randomly searched. Spotlighting was carried out using 50W spotlights powered by 12V batteries and walking at approximately 1km/h allowing intensive listening as an adjunct to visual detection.

### **Scat, tracks and den/nest survey**

Scat, track and den/nest searches were regularly undertaken during trap servicing and general site work, targeting the bases of trees, any fallen timber and along tracks. At least ten (10) hours were spent in this activity during the 2004 survey, and at least eight (8) hours during the 2007 survey.

During the survey period, searches were conducted for:

- Possible nest and roost sites of large forest owls;
- Pellets of large forest owls;
- Nests and dens of threatened hollow dependent fauna;
- Distinctive scats (e.g. Koala);
- Distinctive, readily identifiable tracks; and
- Accessible basal tree hollows in likely bat roost trees (> 100cm dbh dead stags or large trees with accessible base hollows).

### **Active Searches - Black she-oaks**



Searches for chewed cones on the ground underneath *Allocasuarina* sp. were regularly undertaken during trap servicing and general site work. At least five (5) hours were spent in this activity during the 2004 survey and at least three (3) hours during the 2007 survey in order to assess the feeding activity of Glossy black cockatoos in the Study area. Each tree identified as an active feed site was surveyed utilising GPS.

**TABLE 9**  
**SUMMARY OF TRAPPING EFFORT**

	<b>2004 Survey</b>	<b>2007 Survey</b>	<b>TOTAL</b>
Elliott trapping	Type A: 200 trap nights Type B: 12 trap nights	Type A: 200 trap nights	Type A: 400 trap nights Type B: 12 trap nights
Arboreal Elliott trapping	40 trap nights	80 trap nights	120 trap nights
Cage traps	32 trap nights	32 trap nights	64 trap nights
Pitfall traps	80 trap nights	80 trap nights	160 trap nights
Hair tubes	250 trap nights	700 trap nights	950 trap nights
Diurnal bird survey	12.5 hours	8 hours	20.5 hours
Call playback	5 hours	8 hours	13 hours
Harp traps	6 trap nights	4 trap nights	10 trap nights
Anabat (bat calls)	48 hours	48 hours	96 hours
Spotlighting	14 hours	8 hours	22 hours
Track, scat & den search	10 hours	8 hours	18 hours
<i>Allocasuarina</i> searches	5 hours	3 hours	8 hours

### **2.2.3 Habitat Suitability Assessment for Significant Fauna**

Site habitats were assessed to determine their value for native fauna species. This assessment was completed in conjunction with the flora survey. The assessment focused on identifying habitat features typically associated with Threatened species as well as other native fauna groups. Particular attention was paid to habitat features such as:

- The presence of mature trees with hollows, fissures and/or other suitable roosting/nesting places;
- The presence of Koala food trees;
- The presence of preferred Glossy black cockatoo feed trees (Forest oak and/or Black she-oak);
- The presence of characteristic signs of foraging (e.g. Yellow-bellied glider feeding scars);
- Condition, flow and water quality of drainage lines and bodies of water;
- Areas of dense vegetation;
- Presence of hollow logs/debris and areas of dense leaf litter;



- Presence of fruiting flora species;
- Presence of blossoming flora species, particularly winter-flowering species;
- Vegetation connectivity and proximity to neighbouring areas of intact vegetation; and
- Presence of caves and man-made structures suitable as microchiropteran bat roost sites.

Each Threatened species known from the locality was regarded as *Likely*, *Possible* or *Unlikely* to occur on the Subject site based on the occurrence of suitable habitat characteristics (Section 3.3.4). A rating of *Likely* was given for those species where breeding or high quality habitat is present on the site; a rating of *Possible* was given for those species where suitable foraging or roosting habitat is present on the site; and a rating of *Unlikely* was given for species where no suitable habitat occurs on the site.

## 2.3 Results and Discussion

### 2.3.1 Database searches

The EPBC Protected Matter Search Tool indicates that thirty-five (35) Commonwealth Threatened fauna species, or their habitat, is likely to occur in the locality. A search of the NPWS Database revealed records of thirty-eight (38) Threatened fauna species within 10km of the Subject site.

These species are shown in **TABLE 10**. Status is in accordance with the Commonwealth EPBC Act and the *Threatened Species Conservation Act 1995* (TSC Act).

**TABLE 10**  
**DATABASE RECORDS OF THREATENED FAUNA SPECIES**  
**WITHIN 10 KM OF THE SUBJECT SITE**

Scientific Name	Common Name	STATUS	
		EPBC	TSC
<i>Diomedea amsterdamensis</i>	Amsterdam albatross	E	
<i>Diomedea antipodensis</i>	Antipodean albatross	V	V
<i>Arctocephalus pusillus doriferus</i>	Australian fur-seal		V
<i>Rostratula benghalensis</i>	Painted snipe	V	E
<i>Coracina lineata</i>	Barred cuckoo-shrike		V
<i>Esacus neglectus</i>	Beach stone-curlew		E
<i>Emydura signata</i>	Bellinger River emydura	V	
<i>Ixobrychus flavicollis</i>	Black bittern		V
<i>Ephippiorhynchus asiaticus</i>	Black-necked stork		E
<i>Balaenoptera musculus</i>	Blue whale	E	
<i>Grus rubicunda</i>	Brolga		V
<i>Thalassarche bulleri</i>	Buller's albatross	V	
<i>Thalassarche impavida</i>	Campbell albatross	V	
<i>Syconycteris australis</i>	Common blossom-bat		V
<i>Miniopterus schreibersii oceanensis</i>	Eastern bent-wing bat		V
<i>Mormopterus norfolkensis</i>	Eastern free-tail bat		V





## Flora and Fauna Assessment

Scientific Name	Common Name	STATUS	
		EPBC	TSC
<i>Mixophyes iteratus</i>	Giant barred frog	E	E
<i>Diomedea gibsoni</i>	Gibson's albatross	V	V
<i>Calyptorhynchus lathamii</i>	Glossy black-cockatoo		V
<i>Pterodroma leucoptera leucoptera</i>	Gould's petrel	E	E
<i>Carcharodon carcharias</i>	Great white shark	V	
<i>Scoteanax ruepellii</i>	Greater broad-nosed bat		V
<i>Litoria aurea</i>	Green and golden bell frog	V	E
<i>Litoria brevipalmata</i>	Green-thighed frog		V
<i>Chelonia mydas</i>	Green turtle	V	V
<i>Pteropus poliocephalus</i>	Grey-headed flying-fox	V	V
<i>Carcharias taurus</i>	Grey nurse shark	CCE	E
<i>Megaptera novaeangliae</i>	Humpback whale	V	V
<i>Phyllodes imperialis</i>	Imperial moth	E	E
<i>Pterodroma neglecta neglecta</i>	Kermadec petrel	V	V
<i>Phascolarctos cinereus</i>	Koala		V
<i>Chalinolobus dwyeri</i>	Large-eared pied bat	V	V
<i>Myotis macropus</i>	Large-footed myotis		V
<i>Dermochelys coriacea</i>	Leathery turtle	V	V
<i>Miniopterus australis</i>	Little bent-wing bat		V
<i>Sterna albifrons</i>	Little tern		E
<i>Caretta caretta</i>	Loggerhead turtle	E	E
<i>Potorous tridactylus</i>	Long-nosed potoroo	V	V
<i>Tyto novaehollandiae</i>	Masked owl		V
<i>Arctocephalus forsteri</i>	New Zealand fur-seal		V
<i>Macronectes halli</i>	Northern giant petrel	V	
<i>Pandion haliaetus</i>	Osprey		V
<i>Haematopus longirostris</i>	Pied oystercatcher		V
<i>Pterodroma solandri</i>	Providence petrel		V
<i>Calyptorhynchus banksii</i>	Red-tailed black-cockatoo		V
<i>Xanthomyza phrygia</i>	Regent honeyeater	E	E
<i>Calidris alba</i>	Sanderling		V
<i>Thalassarche cauta</i>	Shy albatross	V	V
<i>Dasyurus maculatus</i>	Spotted-tail quoll	E	V
<i>Tyto tenebricosa</i>	Sooty owl		V
<i>Haematopus fuliginosus</i>	Sooty oystercatcher		V
<i>Mixophyes balbus</i>	Southern barred frog	V	E
<i>Macronectes giganteus</i>	Southern giant-petrel	E	E
<i>Eubalaena australis</i>	Southern right whale	E	V
<i>Lophoictinia isura</i>	Square-tailed kite		V
<i>Ptilinopus superbus</i>	Superb fruit-dove		V
<i>Lathamus discolor</i>	Swift parrot	E	E
<i>Xenus cinereus</i>	Terek sandpiper		V
<i>Diomedea dabbenena</i>	Tristan albatross	E	
<i>Diomedea exulans</i>	Wandering albatross	V	E
<i>Rhincodon typus</i>	Whale shark	V	
<i>Thalassarche steadi</i>	White-capped albatross	V	
<i>Ptilinopus magnificus</i>	Wompoo fruit-dove		V



## Flora and Fauna Assessment

Scientific Name	Common Name	STATUS	
		EPBC	TSC
<i>Petaurus australis</i>	Yellow-bellied glider		V

CE = Endangered; E = Endangered and V = Vulnerable

### 2.3.2 Habitat assessment

#### 2.3.2.1 Amphibians

Amphibians occurring in the region are poikilothermic, predominantly insectivorous and generally require free water for reproduction, with the exception of two highland genera (*Assa darlingtoni* and *Philoria* spp.) The habitat requirements of most species are unlikely to be determined by forest cover or floristics, but are more strongly influenced by factors such as climate, distance to water bodies, riparian vegetation, hydrological and morphological characteristics of water bodies and the availability of suitable micro-habitat for aestivation and shelter.

The majority of species that occur within the region lay eggs in or near temporary or permanent water bodies and rely on free water for larval development and metamorphosis. Of these species, only a few are dependent on forested habitats beyond the riparian zone or beyond areas of temporary inundation. These species include the Red-eyed tree frog (*Litoria chloris*), Leseuer's frog (*Litoria leseueri*), Fletchers frog (*Lechriodus fletcheri*) and the Barred frogs of the *Mixophyes* genus.

The SEPP 14 Wetland occurring on the Subject site is likely to provide good quality habitat for a range of frogs. Although intermittent, the main drainage line provides a dense groundcover, large woody debris and a moderately deep leaf litter for shelter. The Paperbark forest communities are likely to provide habitat for a range of species.

Grasslands provide suitable habitat for a range of Amphibian species, particularly along drainage depressions and soaks. Species commonly encountered in grassland communities include the Common eastern froglet, Eastern sign bearing froglet, Striped marsh frog, Spotted grass frog, Eastern dwarf tree frog, Rocket frog, Whistling tree frog and Cane toad. Large areas of *Gahnia* sp on the site are likely to provide habitat for a range of species.

Species typically encountered in or adjacent to Closed Forests include the Eastern dwarf tree frog, Red-eyed tree frog, Striped marsh frog, Cane toad and Dainty green tree frog. Relatively few species occur in conjunction with Closed Forest types when permanent water is absent. Species which typically occur in low elevation Rainforest and permanent streams such as the Giant barred frog (*Mixophyes iteratus*) are unlikely to occur at the study site due to the disturbed nature.

#### 2.3.2.2 Reptiles

As reptiles are poikilothermic, and predominantly insectivorous or carnivorous, their habitat requirements are less directly determined by vegetation species composition than other taxa which feed directly on plants. Reptile distributions are strongly influenced by structural characteristics of the vegetation, climate and other factors affecting thermoregulation such as shade and availability of shelter and basking sites (Smith *et al* 1994).



In a survey of the moist forest herpetofauna of North-eastern NSW, Smith *et al* (1989) found that few species discriminated between rainforest and wet sclerophyll forest, however, most species exhibited a response to differences in elevation and the availability of microhabitat components and other substrates.

The availability of microhabitats, of varying thermal properties is particularly important for most reptile species, as behavioural thermoregulation (regulation of body heat) is important in controlling critical body functions such as digestion, foraging activity and reproduction.

Reptile diversity and abundance is often (but not always) significantly higher in drier habitat types, particularly those with a wide variety of ground substrate microhabitats. This contrasts markedly with the distribution patterns of birds, and most mammals.

The single limiting factor in terms of species diversity in coastal vegetation is the lack of shelter sites (e.g. logs, tree hollows and decorticated bark). Such habitat components characterise eucalypt forests and woodlands, where species diversity may be much higher, depending on disturbance factors.

The SEPP 14 Wetland occurring on the Subject site is considered to provide good quality habitat for reptiles due to the presence of: the combination of shelter and basking sites; fallen logs for shelter; closed forest areas with good canopy and leaf litter development; dense groundcover; availability of water in drainage lines and reliable sources of prey.

The cleared areas of the site may provide good quality 'temporary' habitat for some species of reptile, particularly due to the large piles of woody debris which may be utilised as shelter sites.

#### 2.3.2.3 Birds

The significance of near coastal environments of the N.S.W. Far North Coast and South-East Queensland as over-wintering habitat for migratory birds has been established by many observers and bird banders including Keast (1968), Robertson (1973), Gravatt (1974), Porter (1982) and Robertson and Woodall (1983). These patterns may be attributable to the relatively high winter temperatures and long growing season of this region compared with the rest of south-eastern Australia (Fitzpatrick and Nix 1973; Edwards 1979; Nix 1982; Specht *et al* 1981).

Many insectivorous birds from higher latitudes and elevation over-winter in the locality. These include species such as the Fantail cuckoo, Sacred kingfisher, Rainbow bee-eater, Noisy pitta, Tree martin, Black-faced cuckoo-shrike, Cicada bird, Golden whistler, Rufous whistler, Rose robin, Grey fantail, White-throated gerygone, Silvereye, Olive-backed oriole and Spangled drongo.

Birds such as honeyeaters and lorikeets are Blossom nomads (*ibid.*). These birds move locally in response to variation in the availability of nectar and or pollen, important components in their diet. Porter (1982) highlights the importance of Forest red gum, Broad-leaved paperbark and Coast banksia for Scaly-breasted and Rainbow lorikeets as these species flower during the lorikeet's winter breeding period. A sequence of important nectar bearing plants in the genera Eucalyptus, Banksia, Melaleuca and Callistemon provide a continuity of food for nectarivorous birds.



Studies of bird usage in rainforest remnants by Holmes (1987), Connelly and Specht (1988) and Lott & Duigan (1993) indicate that the diversity and abundance of birds is related to the size of the Rainforest patches and their degree of isolation from major areas of native forest. Lott & Duigan (1993) and Howe *et al* (1981) also note that sites with a higher diversity of vegetation and those which are closer to water generally support a greater diversity of birds. Locally nomadic and migratory rainforest species such as the Wompoo, Rose-crowned and Superb fruit-doves, Common koel and Black-faced cuckoo-shrike are known to use scattered areas of habitat as “stepping-stones” between more intact areas of forest (Date *et al* 1992; Lott & Duigan 1993).

The variety of habitats present in the Study area is likely to result in a high diversity of resident and nomadic birds occurring on the site over the year. Dense vegetation associated with the SEPP 14 wetland on the subject site provides good habitat for forest interior bird species whilst cleared areas of the subject site provide habitat for disturbance adapted species.

#### 2.3.2.4 Mammals

Small terrestrial mammals generally occur in highest densities in association with a complex vegetation structure. A dense groundcover layer, which provides shelter from predators and provides nesting opportunities, is particularly important.

In general medium-large terrestrial mammals such as macropods select habitats which provide a dense cover for shelter and refuge and open areas for feeding. The larger species tend to occupy drier more open habitats: the smaller species, moister and more densely vegetated habitats.

All Arboreal mammals that occur in the region (with the exception of the Koala) utilise tree hollows for nesting and shelter (although the Common ringtail possum is not dependent on hollows). Smith & Lindenmeyer (1988) consider that shortage of nest hollows is likely to limit arboreal mammal populations where density of hollow bearing trees is less than 2 to 8 trees per hectare.

Arboreal folivores (*e.g.* Common ringtail possum, Greater glider) are widespread and abundant but exhibit local variation in response to such factors as tree species composition, foliage protein and fibre levels, leaf toughness, toxins, forest structure and the availability of shelter sites. Arboreal folivores are expected to be most abundant in areas of high productivity, high soil fertility and moderate climate, in conjunction with adequate shelter and suitable foraging substrate.

Arboreal nectarivore/insectivores feed on a wide variety of plant and insect exudates including the nectar of flowering eucalypts, and shrubs such as Banksia and Acacia sp. These species also feed extensively on insects, particularly under the shedding bark of eucalypts. The distribution of nectarivore/insectivores is considered to be related to the abundance of nectar and pollen producing plants, the abundance of bark shedding eucalypts which harbour insect prey, and the occurrence of sap and gum exudate producing trees (Sap feed trees) and shrubs (*e.g.* Acacia sp.). Arboreal nectarivores and insectivores are generally hollow dependent species.

There is a general lack of trees with hollows necessary for hollow-dependent mammals, however, as with the birds, the Study area may represent important forage habitat for



hollow-dependent mammals resident in Blackbutt forests in the locality. Several primary Koala feed trees were recorded on the subject site.

The structural complexity and habitat diversity of the SEPP 14 Wetland on the Subject site is likely to support a relatively high diversity and abundance of ground dwelling mammals. The cleared areas, in contrast, are unlikely to support ground-dwelling mammal but may be utilised as forage habitat by arboreal mammals present in the area.

Insectivorous bats like insectivorous birds overlap considerably in diet and broad vegetation preferences (Hall 1981), but specialise in foraging in specific layers or substrates within the forest (Crome and Richards 1988). The Study area is likely to provide forage habitat for a relatively high diversity and abundance of insectivorous bats, due to the combination of open, forested and denser areas of vegetation. The site provides a relatively high diversity and abundance of flowering species and represents high quality foraging habitat for nectarivorous bats, particularly within the SEPP 14 Wetland.

Areas of vegetation within the SEPP 14 Wetland may provide roost sites for bat species that roost in dense vegetation or under the bark of Paperbarks. There is a general lack of old-growth trees for hollow-dependant bats.

### 2.3.3 Results of fauna surveys

#### 2.3.3.1 Amphibians

Eight (8) amphibians were recorded during site surveys. These are shown in **TABLE 11** below. No Threatened amphibians were recorded.

**TABLE 11**  
**AMPHIBIAN SPECIES RECORDED ON THE SUBJECT SITE**

Common name	Scientific name	Method*
Tusked frog	<i>Adelotus brevis</i>	Pf, S, C
Southern laughing tree frog	<i>Litoria tyleri</i>	C
Striped marsh frog	<i>Limnodynastes peronii</i>	Pf, S, C
Common eastern froglet	<i>Crinia signifera</i>	C
Brown toadlet	<i>Pseudophryne bibrionii</i>	C
Bleating tree frog	<i>Litoria dentata</i>	C
Dwarf tree frog	<i>Litoria fallax</i>	C
Common green tree frog	<i>Litoria caerulea</i>	C

\* Pf = Pitfall trap  
S = Spotlighting  
C = Call recognition.

#### 2.3.3.2 Reptiles

Four (4) reptile species were recorded during the fauna survey. These are shown in **TABLE 12** below. No Threatened reptiles were recorded.



**TABLE 12**  
**REPTILE SPECIES RECORDED ON THE SUBJECT SITE**

Common name	Scientific name	Method*
Common garden skink	<i>Lampropholis delicata</i>	Pf, Obs.
Lace monitor	<i>Varanus varius</i>	Cg, Obs.
Common brown snake	<i>Pseudonaja textilis</i>	Obs.
Blue-tongue lizard	<i>Tiliqua scincoides</i>	Cg.

\* Pf = Pitfall trap

Obs = Incidental observation

Cg = Cage trap

### 2.3.3.3 Birds

Seventy-eight (78) bird species were recorded during the specific bird survey conducted by Steve Debus, and a further six (6) species were recorded by incidental observation during the completion of this Flora and Fauna Assessment. Eighty-one (84) bird species were recorded from the Subject site in total. One Threatened species was recorded, the Osprey (*Pandion haliaetus*). TABLE 13 shows the bird species recorded at the Subject site.

**TABLE 13**  
**BIRD SPECIES RECORDED AT THE SUBJECT SITE**

Common name	Scientific name
Australian King-Parrot	<i>Alisterus scapularis</i>
Australian Magpie	<i>Gymnorhina tibicen</i>
Australian white ibis	<i>Threskiornis molucca</i>
Australian wood duck	<i>Chenonetta jubata</i>
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>
Black-faced Monarch	<i>Monarcha melanopsis</i>
Brahminy kite	<i>Haliaster indus</i>
Brown Gerygone#	<i>Gerygone mouki</i>
Brown Goshawk	<i>Accipiter fasciatus</i>
Brown Honeyeater#	<i>Lichmera indistincta</i>
Brown Thornbill#	<i>Acanthiza pusilla</i>
Brown treecreeper	<i>Climacteris picumnus</i>
Channel-billed Cuckoo	<i>Scythrops novaehollandiae</i>
Common koel	<i>Eudynamys scolopacea</i>
Crested Pigeon	<i>Ocyphaps lophotes</i>
Dollarbird	<i>Eurystomus orientalis</i>
Eastern Rosella	<i>Platycercus eximius</i>
Eastern Spinebill	<i>Acanthorhynchus tenuirostris</i>
Eastern Whipbird#	<i>Psophodes olivaceus</i>
Eastern Yellow Robin#	<i>Eopsaltria australis</i>
Fan-tailed Cuckoo	<i>Cacomantis flabelliformis</i>
Figbird	<i>Sphecotheres viridis</i>
Forest kingfisher	<i>Todiramphus macleayii</i>
Forest Raven#	<i>Corvus tasmanicus</i>
Galah	<i>Cacatua roseicapilla</i>
Glossy black-cockatoo	<i>Calyptorhynchus lathami</i>
Golden Whistler	<i>Pachycephala pectoralis</i>
Great cormorant	<i>Phalacrocorax carbo</i>



## Flora and Fauna Assessment

Common name	Scientific name
Great egret#	<i>Ardea alba</i>
Grey Butcherbird	<i>Cracticus torquatus</i>
Grey Fantail	<i>Rhipidura fuliginosa</i>
Grey Shrike-thrush	<i>Colluricincla harmonica</i>
Jacky Winter	<i>Microeca fascinans</i>
King quail	<i>Coturnix chinensis</i>
Laughing Kookaburra	<i>Dacelo novaeguineae</i>
Leaden Flycatcher	<i>Myiagra rubecula</i>
Lewin's Honeyeater#	<i>Meliphaga lewinii</i>
Little Lorikeet	<i>Glossopsitta pusilla</i>
Little Wattlebird	<i>Anthochaera chrysoptera</i>
Logrunner #	<i>Orthonyx temminckii</i>
Magpie-lark	<i>Grallina cyanoleuca</i>
Masked lap-wing	<i>Vanellus miles</i>
Mistletoebird	<i>Dicaeum hirundinaceum</i>
Noisy Friarbird	<i>Philemon corniculatus</i>
Noisy Miner	<i>Manorina melanocephala</i>
Olive-backed Oriole	<i>Oriolus sagittatus</i>
<b>Osprey</b>	<b><i>Pandion haliaetus</i></b>
Pacific baza	<i>Aviceda subcristata</i>
Peregrine falcon	<i>Falco peregrinus</i>
Pied Butcherbird	<i>Cracticus nigrogularis</i>
Pied Currawong	<i>Strepera graculina</i>
Rainbow lorikeet	<i>Trichoglossus haematodus</i>
Red Wattlebird	<i>Anthochaera carunculata</i>
Red-browed Finch #	<i>Neochmia temporalis</i>
Rufous Fantail #	<i>Rhipidura rufifrons</i>
Rufous Whistler	<i>Pachycephala rufiventris</i>
Sacred Kingfisher	<i>Todiramphus sanctus</i>
Satin Bowerbird	<i>Ptilonorhynchus violaceus</i>
Scaly-breasted Lorikeet	<i>Trichoglossus chlorolepidotus</i>
Scarlet Honeyeater	<i>Myzomela sanguinolenta</i>
Shining Bronze-Cuckoo	<i>Chrysococcyx lucidus</i>
Silvereye #	<i>Zosterops lateralis</i>
Southern Boobook	<i>Ninox novaeseelandiae</i>
Spangled Drongo	<i>Dicrurus bracteatus</i>
Spectacled monarch	<i>Monarcha trivirgatus</i>
Spotted Pardalote	<i>Pardalotus punctatus</i>
Spotted Turtle-Dove *	<i>Streptopelia chinensis</i>
Striated Pardalote	<i>Pardalotus striatus</i>
Striated Thornbill	<i>Acanthiza lineata</i>
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>
Superb Fairy-wren	<i>Malurus cyaneus</i>
Tawny Frogmouth	<i>Podargus strigoides</i>
Torresian Crow	<i>Corvus orru</i>
Varied Sittella	<i>Daphoenositta chrysoptera</i>
Variegated Fairy-wren #	<i>Malurus lamberti</i>
White-bellied sea-eagle	<i>Haliaeetus leucogaster</i>
White-browed Scrubwren	<i>Sericornis frontalis</i>
White-cheeked Honeyeater	<i>Phylidonyris nigra</i>



Common name	Scientific name
White-headed pigeon#	<i>Columba leucomela</i>
White-throated Gerygone	<i>Gerygone olivacea</i>
White-throated Treecreeper	<i>Cormobates leucophaeus</i>
Willie Wagtail	<i>Rhipidura leucophrys</i>
Yellow Thornbill	<i>Acanthiza nana</i>
Yellow-faced Honeyeater	<i>Lichenostomus chrysops</i>
Yellow-throated Scrubwren #	<i>Sericornis citreogularis</i>

# Restricted to gully vegetation associated with the SEPP 14 Wetland.

\* Denotes an introduced species.

**Threatened species are shown in bold.**

The locations of evidence of threatened bird species is shown in **FIGURE 16**.

#### 2.3.3.4 Mammals

Twenty four (24) mammal species were recorded, including five (5) Threatened species:

- Eastern free-tail bat (*Mormopterus norfolkensis*);
- Little bent-wing bat (*Miniopterus australis*);
- Eastern false pipistrelle (*Falsistrellus tasmaniensis*);
- Yellow-bellied glider (*Petaurus australis*); and
- Grey-headed flying-fox (*Pteropus poliocephalus*).

**TABLE 14** shows the mammal species recorded at the Subject site.

**TABLE 14**  
**MAMMALS RECORDED DURING THE FIELD SURVEY**

Common Name	Scientific name	Method of Identification
Yellow-footed antechinus	<i>Antechinus flavipes</i>	Elliot trap
*Dog	<i>Canis sp.</i>	Observation
*Cat	<i>Felis catus</i>	Observation
Gould's wattled bat	<i>Chalinolobus gouldii</i>	ANABAT
Chocolate wattled bat	<i>Chalinolobus morio</i>	ANABAT
<b>Eastern false pipistrelle</b>	<b><i>Falsistrellus tasmaniensis</i></b>	ANABAT
Northern brown bandicoot	<i>Isodon macrourus</i>	Cage trap, Observation
Fawn-footed melomys	<i>Melomys cervinipes</i>	Elliot trap
<b>Little bent-wing bat</b>	<b><i>Miniopterus australis</i></b>	ANABAT
<b>Eastern free-tail bat</b>	<b><i>Mormopterus norfolkensis</i></b>	ANABAT
*House mouse	<i>Mus musculus</i>	Elliot trap
White-striped free-tail bat	<i>Nyctinomus australis</i>	ANABAT
A long-eared bat	<i>Nyctophilus sp.</i>	ANABAT
Greater glider	<i>Petauroides volans</i>	Spotlight
<b>Yellow-bellied glider</b>	<b><i>Petaurus australis</i></b>	Spotlight, Call recognition
Sugar glider	<i>Petaurus breviceps</i>	Spotlight
<b>Grey-headed flying-fox</b>	<b><i>Pteropus poliocephalus</i></b>	Spotlight
Bush rat	<i>Rattus fuscipes</i>	Elliot trap
Swamp rat	<i>Rattus luteolus</i>	Elliot trap





## Flora and Fauna Assessment

Common Name	Scientific name	Method of Identification
Eastern broad-nosed bat	<i>Scotorepens orion</i>	ANABAT
Common brushtail possum	<i>Trichosurus vulpecular</i>	Spotlight, Cage trap
Eastern forest bat	<i>Vespadelus pumilus</i>	Harp trap, ANABAT
Little forest bat	<i>Vespadelus vulturnus</i>	Harp trap, ANABAT
Swamp wallaby	<i>Wallabia bicolour</i>	Observation

\* Denotes introduced species

Threatened species shown in bold

The locations of evidence of threatened mammals are shown in **FIGURE 16**.

### 2.3.4 Threatened species considered possible occurrences in the Study area

Based on the assessment of habitats on the Subject site, Threatened fauna species known from the locality were assessed for the likelihood of their occurrence on the Subject site (**TABLE 15**). A rating of *Likely* was given for those species where breeding or high quality habitat is present on the site; a rating of *Possible* was given for those species where suitable foraging or roosting habitat is present on the site; and a rating of *Unlikely* was given for species where no suitable habitat occurs on the site.

The following oceanic and coastal species will not occur on the Subject site and are not considered in the table:

Amsterdam albatross; Antipodean albatross; Australian fur-seal; Bellinger River emydura; Blue whale; Buller's albatross; Campbell albatross; New Zealand fur-seal; Beach stone-curlew; Gibson's albatross; Gould's petrel; Great white shark; Humpback whale; Little tern; Loggerhead turtle; Tristan albatross; Wandering albatross; Whale shark; White-capped albatross; Green turtle; Grey nurse shark; Kermadec petrel; Leathery turtle; Northern giant petrel; Providence petrel; Sooty and Pied oystercatchers; Sanderling; Shy albatross; Southern giant petrel; Southern right whale; and Terek sandpiper.

**TABLE 15**  
**LIKELIHOOD OF OCCURRENCE OF THREATENED FAUNA SPECIES IN THE STUDY AREA**

Species	Likelihood of occurrence in the Study area	Notes
Barred cuckoo-shrike	Unlikely	This species occurs in rainforest, eucalypt forest and woodlands, clearings in secondary growth, swamp woodlands and timber along watercourses. This species is generally uncommon, and is rare in NSW (NPWS 2002). The general lack of fruiting species on the Subject site is likely to preclude the occurrence of this species.
Black bittern	Possible	This species is usually found in dense vegetation fringing streams, swamps, tidal creeks and mudflats (NPWS 2002). Vegetation within the SEPP 14 Wetland may provide suitable forage habitat.
Black-necked stork	Possible	The Black-necked stork occurs in swamps, mangroves, mudflats, dry floodplains and irrigated land (NPWS 2002). The Black-necked stork may utilise areas of the Subject during periods of inundation.



## Flora and Fauna Assessment

Species	Likelihood of occurrence in the Study area	Notes
Brolga	Unlikely	This species occurs in shallow wetlands and open grassland habitats. The dense vegetation within the SEPP 14 Wetland is likely to prevent its use by this species.
Common blossom bat	Possible	This species often roosts in the foliage of the sub-canopy of littoral rainforests. They feed on flowers in adjacent heathland and paperbark swamps (NPWS 2002). Possible forage and roost habitat exists within the uncleared areas and the SEPP 14 Wetland on the Subject site.
Eastern bent-wing bat	Possible	Caves are the primary roosting habitat for this species, but it will also use derelict mines, storm-water tunnels, buildings and other man-made structures. The Eastern bent-wing bat forages in forested areas, catching moths and other flying insects above the tree tops.
Eastern false pipistrelle	Recorded on site	The Eastern false pipistrelle prefers moist habitats, with trees taller than 20 m, and generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. It forages for flying insects above or just below the tree canopy.
Eastern free-tail bat	Recorded on site	The Eastern free-tail bat generally roosts in eucalypt hollows, but has also been found under loose bark on trees and in buildings. It is a solitary species and probably forages on insects.
Giant barred frog	Unlikely	This species forages and lives amongst deep, damp leaf-litter of rainforest, moist eucalypt forests, and nearby dry eucalypt forest. They breed around shallow, flowing, rocky streams, the absence of which on the Subject site is likely to preclude the presence of this species.
Glossy black cockatoo	Recorded on site	Found in coastal forests and open inland woodland in eastern Australia. The Glossy black-cockatoos distribution is limited to habitat which contains sufficient seed reserves of their three favoured species of food trees: <i>Allocasuarina littoralis</i> , <i>A. torulosa</i> and <i>A. verticillata</i> (Forshaw 1981) and suitable large hollow bearing trees for nesting. Both <i>A. littoralis</i> and <i>A. torulosa</i> occur on the Subject site, and evidence of Glossy black-cockatoo feeding activity was recorded. Suitable nest sites do not exist on the Subject site.



## Flora and Fauna Assessment

Species	Likelihood of occurrence in the Study area	Notes
Greater broad-nosed bat	Possible	This species utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings. It forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m. Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects.
Green and golden bell frog	Unlikely	This species is found amongst vegetation in and around permanent swamps, lagoons and farm dams and on flood-prone river flats, particularly where there are bulrushes and spikerushes (NPWS 2002). Although the site may contain some suitable habitat, this species is unlikely occur as only a few populations remain north of the Hunter River.
Green-thighed frog	Possible	Green-thighed Frogs occur in a range of habitats from rainforest and moist eucalypt forest to dry eucalypt forest and heath, typically in areas where surface water gathers after rain. The frogs are thought to forage in leaf-litter. Suitable habitat occurs on the subject site.
Grey-headed flying fox	Recorded on site	This species travels along the east coast of Australia, foraging on fruiting and blossoming species. This species was recorded flying over the site and is likely to feed on flowering Eucalypt and Paperbark species throughout the Subject site.
Imperial moth	Unlikely	The Imperial moth is found in undisturbed subtropical rainforest below 600 m. Breeding habitat is restricted to areas where the caterpillar's food plant, a native rainforest vine, <i>Carronia multiseptata</i> , grows in a collapsed shrub-like form. Adult moths require the darkness supplied by the vine and other rainforest vegetation in order to breed. Suitable habitat does not occur on the subject site.
Large-eared pied bat	Unlikely	This species roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin ( <i>Hirundo ariel</i> ), frequenting low to mid-elevation dry open forest and woodland close to these features, in well-timbered areas containing gullies. This species probably forages for small, flying insects below the forest canopy. Suitable forage habitat occurs on the subject site, however no records of this species occur within the Nambucca LGA.



## Flora and Fauna Assessment

Species	Likelihood of occurrence in the Study area	Notes
Large-footed myotis	Likely	This species generally roosts in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Large-footed myotis forage over streams and pools catching insects and small fish by raking their feet across the water surface. High quality forage habitat and potential roost habitat occurs on the subject site.
Little bent-wing bat	Recorded on site	This species inhabits moist eucalypt forest, rainforest or dense coastal banksia scrub and roosts in caves, tunnels and sometimes tree hollows during the day. At night it forages for small insects beneath the canopy of densely vegetated habitats.
Koala	Possible	There are several preferred Koala feed trees on the Subject site including: Forest red gum, Tallowwood, Swamp mahogany etc. It is considered that Koalas may possibly utilise the site for foraging and dispersal.
Long-nosed potoroo	Unlikely	This species inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature. Potential habitat occurs on the subject site for this species however, no records occur within the Nambucca LGA.
Masked owl	Possible	This species occurs in dry eucalypt forest and woodland and often hunts along forest edges. Its typical diet consists of tree-dwelling and ground mammals, especially rats. It has a large home range covering forested and partly open country. The Subject site may occasionally be utilised as forage habitat, but the general lack of hollow bearing trees eliminates nesting opportunities.
Osprey	Recorded adjacent to the site	This raptor is thinly distributed in coastal Australia. It nests in singularly overtopping, generally dead trees. The Osprey hunts in coastal rivers, estuaries and streams and may gather nesting material from nearby forests. An Osprey nest has been identified approximately 50m north of the Subject site on private land.



## Flora and Fauna Assessment

Species	Likelihood of occurrence in the Study area	Notes
Painted snipe	Unlikely	This species prefers the fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber, and nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. Painted snipes forage nocturnally on mud-flats and in shallow water for worms, molluscs, insects and some plant-matter. Swampy Creek and the SEPP 14 Wetland No. 362 provide potential habitat for this species however, no records occur within the Nambucca LGA.
Powerful owl	Possible	This species has a large home range and occupies a variety of habitat types, from woodland and open forest to tall moist forest and rainforest. They roost by day in dense vegetation, commonly along drainage lines, and nest in large tree hollows (NPWS 2002). The Subject site may occasionally be utilised as forage habitat, but the general lack of hollow bearing trees eliminates nesting opportunities.
Red-tailed black-cockatoo	Possible	Red-tailed black-cockatoos are found in a wide variety of habitats. They have been recorded in dry open forest and areas of mixed rainforest - eucalypt forest. The Subject site may occasionally be utilised as forage habitat.
Regent honeyeater	Unlikely	This species is found in dry open forest and woodland with an abundance of nectar-producing eucalypts, particularly Swamp mahogany forest on the coast (NPWS 2002). Although numerous Swamp mahogany occur on the Subject site, this species is considered unlikely to occur due to the fact that it is very rarely recorded in the locality.
Sooty owl	Possible	This species inhabits rainforest (dry, subtropical & warm temperate) and moist eucalypt forest. The Subject site may occasionally be utilised as forage habitat, but the general lack of hollow bearing trees eliminates roosting and nesting opportunities.
Southern barred frog	Unlikely	This species inhabits rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor and breed in streams during summer after heavy rain. It is possible that this species occurs within the adjacent Nambucca State Forest, however the subject site is not considered to represent suitable habitat.



## Flora and Fauna Assessment

Species	Likelihood of occurrence in the Study area	Notes
Spotted-tail quoll	Possible	This species has been recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites. Females occupy home ranges up to about 750 hectares and males up to 3500 hectares. Animals usually traverse their ranges along densely vegetated creeklines. The subject site may occur within the home range of Spotted-tail quolls in the locality.
Square-tailed kite	Possible	This species is thinly distributed through open forests, woodland and sandplains, both coastal and sub-coastal. Pairs of Square-tailed kites occupy very large home ranges and the Subject site may be occasionally utilised as forage habitat.
Squirrel glider	Possible	The Squirrel glider occupies wet and dry sclerophyll forests with open dry sclerophyll forests regarded as optimum habitat. This species is more likely to inhabit mature or old-growth forest because of the abundance of hollows but may utilise the site as forage habitat.
Superb fruit-dove	Unlikely	This species occurs mainly in subtropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest where fruit is plentiful. The disturbance associated with the closed forest communities on the Subject site and the general lack of fruiting species is likely to preclude the occurrence of this species.
Swift parrot	Unlikely	This species migrates to the Australian south-east mainland from Tasmania between March and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany <i>Eucalyptus robusta</i> , Spotted Gum <i>Corymbia maculata</i> , Red Bloodwood <i>C. gummifera</i> , Mugga Ironbark <i>E. sideroxylon</i> , and White Box <i>E. albens</i> . Whilst Swamp mahogany and Red Bloodwood occur on the subject site, no records of this species exist for the Nambucca LGA.



## Flora and Fauna Assessment

Species	Likelihood of occurrence in the Study area	Notes
Wompoo fruit dove	Unlikely	This species is primarily associated with large undisturbed patches of tropical or subtropical evergreen rainforest. They feed on fruits from a diverse range of trees and vines and move locally following ripening of fruits (NPWS 2002). As with the Superb fruit-dove the general lack of fruiting species on the Subject site is likely to preclude the occurrence of this species.
Yellow-bellied glider	<b>Recorded adjacent to site</b>	This species occurs in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. They feed primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein. They den, often in family groups, in hollows of large trees. Yellow-bellied gliders are very mobile and occupy large home ranges between 20 and 85 ha to encompass dispersed and seasonally variable food resources. This species has been recorded within the adjacent Nambucca State Forest, however due to past disturbance and open structure of site vegetation, is considered unlikely to utilise the site.



## **APPENDIX 4**

### **ASSESSMENT OF SIGNIFICANCE**

### **7 POINT TESTS**





### **3 ASSESSMENT OF SIGNIFICANCE (SEVEN PART TEST)**

#### **3.1 Background**

Under the *Threatened Species Conservation Amendment Act 2002*, the factors to be considered when determining whether an action, development or activity is likely to significantly affect threatened species, populations or ecological communities, or their habitats (known previously as the "8-part test"), have been revised. This affects s5A *EP&A Act*, s94 *Threatened Species Conservation Act 1995* (*TSC Act*) and s220ZZ *Fisheries Management Act 1994* (*FM Act*).

The revised factors maintain the same intent but focus consideration of likely impacts in the context of the local rather than the regional environment as the long-term loss of biodiversity at all levels arises primarily from the accumulation of losses and depletions of populations at a local level. This is the broad principle underpinning the *TSC Act*, State and Federal biodiversity strategies and international agreements. The consideration of impacts at a local level is designed to make it easier for local government to assess, and easier for applicants and consultants to undertake the Assessment of Significance because there is no longer a need to research regional and state-wide information. The Assessment of Significance is only the first step in considering potential impacts. Further consideration is required when a significant effect is likely and is more appropriately considered when preparing a Species Impact Statement.

The Assessment of Significance should not be considered a "pass or fail" test as such, but a system allowing proponents to undertake a qualitative analysis of the likely impacts and ultimately whether further assessment needs to be undertaken via a Species Impact Statement. All factors must be considered and an overall conclusion must be drawn from all factors in combination. Where there is any doubt regarding the likely impacts, or where detailed information is not available, a Species Impact Statement should be prepared.

#### **3.2 Flora**

No Threatened flora species were recorded from the Subject site.

#### **3.3 Endangered Ecological Communities (EECs)**

Two (2) EECs were recorded on the site:

- Swamp sclerophyll forest on coastal floodplain; and
- Swamp oak floodplain forest.

An Assessment of Significance will be completed for these EECs.

##### **3.3.1 Swamp sclerophyll forest on coastal floodplain**

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



Not applicable.

- (b) *In the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.*

Not applicable.

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

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Within the Nambucca LGA Swamp Sclerophyll forest (Paperbark) covers large areas of low-lying land. It should be noted that other associations within Swamp sclerophyll communities within the Shire (e.g. Swamp Mahogany, Swamp box) contribute further to this community within LGA. The Subject site is not considered to constitute a significant area of the EEC Swamp sclerophyll floodplain forest in relation to the regional distribution of this community.

Swamp sclerophyll forest dominates low-lying areas of the subject site and occurs in association with SEPP 14 Wetland no. 362 which is protected by State Environmental Planning Policy No. 14 - Coastal Wetlands (SEPP 14). Under the proposed development Swamp sclerophyll communities are unlikely to be directly affected. No clearing will occur in areas of the site comprising the EEC Swamp sclerophyll forest on coastal floodplain. Furthermore, buffers may be created as part of the Stormwater management plan for the site which will provide protection to this community.

(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.*



Swamp sclerophyll forest on coastal floodplains is associated with humic clay-loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines, associated with coastal floodplains (NSW Scientific Committee 2004). Floodplains are level landform patterns on which there may be active erosion and aggradation by channelled and overbank stream flow with an average recurrence interval of 100 years or less (NSW Scientific Committee 2004).

All urban development of the site will occur within the previously cleared portions of the subject site. Whilst development will occur in some low-lying areas of the site, historical and current land management practices (i.e. slashing and grazing) would preclude the establishment of this EEC in these areas. It is considered that no suitable habitat for this EEC will be removed or modified as a result of the proposed development.

The EEC Swamp sclerophyll forest on coastal floodplain on the site occurs as a contiguous corridor along the southern boundary of the subject site however, this corridor is bisected in the western portion of the subject site by a 15-20m wide cleared road reserve. The proposed development may make use of this existing cleared road reserve but will not further isolate this community on the site.

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

Not applicable. Critical habitat areas listed under the *Threatened Species Conservation Act (2002)* currently consist of habitat for Mitchell's rainforest snail in Stott's Island Nature Reserve, and habitat for the Little penguin population in Sydney's North Harbour.

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

No Recovery plan has been prepared for the EEC Swamp sclerophyll forest on Coastal floodplain.

A Draft Threat Abatement Plan has been prepared to address the invasion of native plant communities by Bitou bush and Boneseed - a Key Threatening Process (KTP). Bitou bush does not occur within this EEC on the Subject site.

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

A "threatening process" means a process that threatens, or may have the capability to threaten, the survival or evolutionary development of a species, population or ecological community. Key Threatening Processes have been listed in Schedule 3 of the *TSC Act (2002)*.

*Key Threatening Processes (Schedule 3):*

- *Lantana camara*;
- Exotic vines and scramblers;
- *Bufo marinus*;



- Invasion of the yellow crazy ant;
- Feral pigs;
- Competition and habitat destruction by feral goats;
- Entanglement in, or digestion of anthropogenic debris in marine and estuarine environments;
- Introduction of the large earth Bumble bee, *Bombus terrestris*;
- Removal of dead wood and dead trees;
- Death or injury to marine species following capture in shark control programs on ocean beaches;
- Invasion of native plant communities by exotic perennial grasses;
- Infection of frogs by amphibian chytrid, causing the disease chytridiomycosis
- Competition from feral honeybees;
- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands;
- Clearing of native vegetation;
- Bushrock removal;
- Ecological consequences of high frequency fires;
- Human-caused climate change;
- Invasion of native plant communities by Bitou Bush and Boneseed;
- Loss and/or degradation of sites used for hilltopping by butterflies;
- Predation by the European red fox;
- Predation by feral cats;
- Predation by the ship rat on Lord Howe Island;
- Predation by the Plague minnow (*Gambusia holbrooki*);
- Infection of native plants by *Phytophthora cinnamomi*;
- Infection by Psittacine circoviral (beak and feather) disease affecting endangered psittacine species and populations;
- Importation of red imported fire ants into NSW; and
- Competition and grazing by the feral European rabbit.

The Proposed development will contribute towards the clearing of native vegetation, a key threatening process listed on Schedule 3 of the *TSC Act (2002)*. The final determination of the NSW Scientific Committee notes that clearing of native vegetation is recognised as a major factor contributing to loss of biological diversity, with impacts such as: destruction of habitat; fragmentation of habitat; riparian zone degradation; increased greenhouse gas emissions; increased habitat for invasive species; loss of leaf litter layer; loss or disruption of ecological function (e.g. loss of populations of pollinators or seed dispersers) and changes to soil biota.

The proposed development will not result in the loss of Swamp sclerophyll forest on the site. Rehabilitation of the subject community should occur including control of weed species (particularly Groundsel bush), and will reduce the likelihood of any future weed invasion.

### **3.3.2 Swamp oak floodplain forest**

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



Not applicable.

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

Not applicable.

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

- (iii) 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*
- (iv) 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.*

The Subject site is not considered to constitute a significant area of the EEC Swamp oak floodplain forest in relation to the regional distribution of this community. The Proposed development will not result in the removal of this community on the site.

It should be noted that the subject community on the site is species poor, with additional tree species to Swamp she-oak (*Casuarina glauca*) limited to Sieber's paperbark (*Melaleuca sieberi*).

The community is degraded by weed species, particularly the noxious weed Groundsel bush. Lantana and White passionfruit also occur to lesser degrees. Other weed species present include various annual weed species such as Farmers friends, Blackberry nightshade, Purple top and Ragweed.

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

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

Swamp oak floodplain forest is associated with grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline, on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains (NSW Scientific Committee 2004). Floodplains are level landform patterns on which there may be active erosion and aggradation



by channelled and overbank stream flow with an average recurrence interval of 100 years or less (NSW Scientific Committee 2004).

All urban development of the site will occur within the previously cleared portions of the subject site. Whilst development will occur in some low-lying areas, current land management practices on the site (i.e. slashing and grazing) preclude the occurrence of this EEC. It is considered that no suitable habitat for this EEC will be removed or modified as a result of the proposed development.

The EEC Swamp oak floodplain forest on the site is already isolated, and does not retain any connectivity with other nearby similar communities. The proposed development will not further isolate this community on the site.

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

Not applicable. Critical habitat areas listed under the *Threatened Species Conservation Act (2002)* currently consist of habitat for Mitchell's rainforest snail in Stott's Island Nature Reserve, and habitat for the Little penguin population in Sydney's North Harbour.

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

No Recovery plan has been prepared for the EEC Swamp oak forest floodplain forest.

A Draft Threat Abatement Plan has been prepared to address the invasion of native plant communities by Bitou bush and Boneseed - a Key Threatening Process (KTP). Bitou bush does not within this EEC on the Subject site.

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

A "threatening process" means a process that threatens, or may have the capability to threaten, the survival or evolutionary development of a species, population or ecological community. Key Threatening Processes have been listed in Schedule 3 of the *TSC Act (2002)*.

*Key Threatening Processes (Schedule 3):*

- *Lantana camara*;
- Exotic vines and scramblers;
- *Bufo marinus*;
- Invasion of the yellow crazy ant;
- Feral pigs;
- Competition and habitat destruction by feral goats;
- Entanglement in, or digestion of anthropogenic debris in marine and estuarine environments;
- Introduction of the large earth Bumble bee, *Bombus terrestris*;
- Removal of dead wood and dead trees;



- Death or injury to marine species following capture in shark control programs on ocean beaches;
- Invasion of native plant communities by exotic perennial grasses;
- Infection of frogs by amphibian chytrid, causing the disease chytridiomycosis
- Competition from feral honeybees;
- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands;
- Clearing of native vegetation;
- Bushrock removal;
- Ecological consequences of high frequency fires;
- Human-caused climate change;
- Invasion of native plant communities by Bitou Bush and Boneseed;
- Loss and/or degradation of sites used for hilltopping by butterflies;
- Predation by the European red fox;
- Predation by feral cats;
- Predation by the ship rat on Lord Howe Island;
- Predation by the Plague minnow (*Gambusia holbrooki*);
- Infection of native plants by *Phytophthora cinnamomi*;
- Infection by Psittacine circoviral (beak and feather) disease affecting endangered psittacine species and populations;
- Importation of red imported fire ants into NSW; and
- Competition and grazing by the feral European rabbit.

The Proposed development will contribute towards the clearing of native vegetation, a key threatening process listed on Schedule 3 of the *TSC Act (2002)*. The final determination of the NSW Scientific Committee notes that clearing of native vegetation is recognised as a major factor contributing to loss of biological diversity, with impacts such as: destruction of habitat; fragmentation of habitat; riparian zone degradation; increased greenhouse gas emissions; increased habitat for invasive species; loss of leaf litter layer; loss or disruption of ecological function (e.g. loss of populations of pollinators or seed dispersers) and changes to soil biota.

The proposed development will not result in the removal of any Swamp she-oak community on the site. Rehabilitation of the subject community should occur including control of weed species (particularly Groundsel bush), and will reduce the likelihood of any future weed invasion.

### 3.4 Fauna

A Section 5A assessment has been undertaken for each species considered a possible occurrence at the Subject site.

*(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.*

#### 3.4.1 Black bittern

##### *Extent of the local population*

The NPWS online database contained five (5) sightings of this species within 10 kilometres of the Study area.



The NPWS online database contains six (6) sightings of this species in the Nambucca LGA the nearest of which occurred approximately 5km north of the Subject site near Valla Beach.

*Stages of the life-cycle affected by the proposed development*

Black bitterns forage secretively and mostly crepuscularly along closely forested streams and wetlands, on fish, molluscs and insects (Marchant and Higgins 1990). Required streams are small to moderate, rarely broad in size and have a mix of clear pools and clear running water. They are generally well sheltered and protected by a partly or wholly overhanging tree canopy (CSIRO 1995).

Breeding occurs between September and December and nests are constructed of sticks on a sheltered branch overhanging water. The Black bittern is a solitary species that roosts in trees overhanging water. Bitterns are very secretive and partly nocturnal. They spend much of the day roosting in low leafy trees near water or in dense reeds, emerging at dusk to forage (Lindsey 1992).

The NPWS Threatened Species Unit (NPWS 2002) discusses the following threats for the Black bittern:

- Loss of habitat from clearing and grazing;
- Reduced water quality from siltation and pollution;
- Predation by foxes and feral cats; and
- Disturbance of nesting birds by watercraft.

This species may forage in suitable habitats on and adjacent to the Subject site, particularly in the SEPP 14 wetland and the mangrove and mudflat communities associated with Swampy Creek.

*Likelihood of local extinction*

Potential habitat for this species on the subject site is unlikely to be affected by the proposed development with the adoption of amelioration measures suggested in this report. The Proposed development is considered unlikely to result in the local extinction of this species.

### **3.4.2 Black-necked stork**

*Extent of the local population*

The NPWS online database contained thirty-seven (37) sightings of this species within 10 kilometres of the Study area.

The NPWS online database contains forty-three (43) sightings of this species in the Nambucca LGA the nearest of which occurred approximately 1km south-east of the Subject site on Stuarts Island.

*Stages of the life cycle affected by the proposed development*

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Black-necked stork, with the following results:





1 <sup>st</sup> order disturbances	Drainage of wetlands Dams
2 <sup>nd</sup> order disturbances	Power lines Intensive horticulture (tea trees)
3 <sup>rd</sup> order disturbances	Pesticide contamination of wetlands Urban development Loss of nest trees
4 <sup>th</sup> order disturbances	Shooting

Foraging habitat for this species is unlikely to be affected. There may be some increase in the level of disturbance of foraging birds as a result of increased visitation to the wetland area.

#### *Likelihood of local extinction*

Potential habitat for this species on the subject site is unlikely to be affected by the proposed development with the adoption of amelioration measures suggested in this report. The Proposed development is considered unlikely to result in the local extinction of this species.

### **3.4.3 Common blossom bat**

#### *Extent of the local population*

The NPWS online database contained three (3) sightings of this species within 10 kilometres of the Study area.

The NPWS online database contains five (5) sightings of this species in the Nambucca LGA the nearest of which occurred approximately 3.5km north of the Subject site near Hyland Park.

#### *Stages of the life cycle affected by the proposed development*

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis identified breeding and sheltering sites for Common blossom bat as consisting of subtropical and littoral rainforest. This species breeds twice, in the coastal complex and riverine rainforest in spring and in the coastal complex in autumn. It needs a diverse array of nectarivorous plant communities nearby. The Common blossom bat forages in a diverse range of nectar producing plant communities year round; occasionally eating some rainforest fruits.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Common blossom bat, with the following results:

1 <sup>st</sup> order disturbances	Clearing - habitat loss Management burns, including illegal
2 <sup>nd</sup> order disturbances	Clearing resulting in fragmentation, increasing predation and decreasing food availability Wildfire Apiary Weed invasion Drainage of swamps



	Sand mining
3 <sup>rd</sup> order disturbances	Logging of coastal sclerophyll forests with Banksia understorey Aerial spraying of bitou bush
4 <sup>th</sup> order disturbances	Sand dune disturbance from recreational 4WDs
5 <sup>th</sup> order disturbances	Barbed wire fences Introduced predators

This species may forage in suitable habitats within Nambucca State Forest adjacent to the Subject site and roost in Tall closed forest in the Study area. Trees on the Subject site may provide some secondary foraging resources for this species.

#### *Likelihood of local extinction*

The Proposed development is considered unlikely to result in the local extinction of this species.

#### **3.4.4 Eastern bent-wing bat**

##### *Extent of the local population*

The NPWS online database contained two (2) sightings of this species within 10 kilometres of the Study area.

The NPWS online database contains fifteen (15) sightings of this species in the Nambucca LGA the nearest of which occurred approximately 1.5km south-east of the Subject site near Stuarts Island.

##### *Stages of the life cycle affected by the proposed development*

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis was based on local expert knowledge and identified breeding sites for Eastern bent-wing bat as consisting of limestone caves, where it usually occurs in association with the Common bent-wing bat. It congregates in high numbers in maternity roost (in 1000's). It also shelters in a range of artificial structures including culverts, drains, mines etc. The Eastern bent-wing bat forages on flying insects in forested areas, predominantly swamp forest, moist eucalypt forest, rainforest and some dry forests.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Eastern bent-wing bat, with the following results:

1 <sup>st</sup> order disturbances	Clearing - habitat loss
2 <sup>nd</sup> order disturbances	Disturbance to camps/caves by limestone mining (cave collapse, altered air flow, noise, dust etc) and recreational activities.
3 <sup>rd</sup> order disturbances	Clearing - fragmentation Logging - loss of foraging habitat Frequent burning Altered hydrology/microclimate - old growth-regrowth



## Flora and Fauna Assessment

4 <sup>th</sup> order disturbances	Grazing Wildfire Pesticides
5 <sup>th</sup> order disturbances	Introduced predators

Suitable forage habitat for this species occurs on the subject site and will be retained under the proposed development. It is considered that this species will continue to forage within retained vegetation on the subject site.

### *Likelihood of local extinction*

The Proposed development is considered unlikely to result in the local extinction of this species.

### **3.4.5 Eastern false pipistrelle**

#### *Extent of the local population*

The NPWS online database did not contain any sightings of this species within 10 kilometres of the Study area.

The NPWS online database contains six (6) sightings of this species in the Nambucca LGA the nearest of which occurred approximately 50km west of the Subject site.

This species has been recorded from the subject site utilising an Anabat II ultrasonic call recorder.

#### *Stages of the life cycle affected by the proposed development*

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis was based on local expert knowledge and identified breeding sites for the Eastern false pipistrelle as consisting of hollows in mid-high altitude eucalypt forest. The Eastern false pipistrelle forages for beetles and moths in productive forests.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Eastern false pipistrelle, with the following results:

1 <sup>st</sup> order disturbances	Clearing-habitat loss Logging - loss of hollows & old growth
2 <sup>nd</sup> order disturbances	Climate change
3 <sup>rd</sup> order disturbances	Clearing - fragmentation Logging - loss of understorey Frequent burning Grazing
4 <sup>th</sup> order disturbances	Wildfire Altered hydrology/microclimate in old growth-re-growth



Suitable forage habitat for this species occurs within the adjacent Nambucca State Forest. This species may also occasionally forage over vegetated areas of the subject site. It is considered that the proposed development is unlikely to remove significant forage or roost habitat for this species.

*Likelihood of local extinction*

The Proposed development is considered unlikely to result in the local extinction of this species.

**3.4.6 Eastern free-tail bat**

*Extent of the local population*

The NPWS online database contained five (5) sightings of this species within 10 kilometres of the Study area.

The NPWS online database contains five (5) sightings of this species in the Nambucca LGA the nearest of which occurred approximately 1.5km south of the Subject site.

This species has been recorded from the subject site utilising an Anabat II ultrasonic call recorder.

*Stages of the life cycle affected by the proposed development*

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis was based on local expert knowledge and identified breeding sites for the Eastern free-tail bat as consisting of large mature tree hollows in dry forest woodland and possibly in moist forest. The Eastern free-tail bat forages for flying insects in dry forest woodland and moist forest as well as adjacent cleared areas.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Eastern free-tail bat, with the following results:

1 <sup>st</sup> order disturbances	Logging - loss of hollows Clearing - loss of habitat
3 <sup>rd</sup> order disturbances	Clearing - fragmentation Pesticides Grazing
4 <sup>th</sup> order disturbances	Logging - loss of Understorey
5 <sup>th</sup> order disturbances	Wildfire

Suitable forage habitat for this species occurs throughout the subject site. It is considered that the proposed development is unlikely to remove significant forage or roost habitat for this species as larger, more suitable areas of habitat occur within the adjacent Nambucca State Forest.



*Likelihood of local extinction*

The Proposed development is considered unlikely to result in the local extinction of this species.

**3.4.7 Glossy black-cockatoo**

*Extent of the local population*

The NPWS online database contained twenty-four (24) sightings of this species within 10 kilometres of the Study area.

The NPWS online database contains one hundred and four (104) sightings of this species in the Nambucca LGA the nearest of which occurred approximately 3.5km east of the Subject site near Nambucca headland.

A pair of Glossy black-cockatoos was observed on the subject site during the most recent survey (February 2007). Additionally, evidence of feeding activity has been recorded from the subject site during both the 2004 survey and the 2007 survey, indicating continued use of the subject site.

*Stages of the life cycle affected by the proposed development*

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis identified breeding sites for the Glossy black cockatoo as consisting of nests in large trees with large hollows (dead and alive) near streams and within 5-20km of a food source. The Glossy black cockatoo will shelter in stands of tall trees in elevated locations like ridgelines within range of the feeding resource. There is a relationship between roost sites and surface water sites. The Glossy black cockatoo usually forages close to the nest but is capable of travelling up to 20km away. It feeds on adult *Allocasuarina littoralis* and *A. torulosa* with individual trees believed to be selected on the basis of the nitrogen content of seeds. It will occasionally use alternative foods.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Glossy black cockatoo, with the following results:

1 <sup>st</sup> order disturbances	Clearing for agriculture Grazing and associated burning Urban development Logging that reduces age classes of eucalypts and <i>Allocasuarina</i>
3 <sup>rd</sup> order disturbances	Cats climbing into nests Firewood collection

Both *A. littoralis* and *A. torulosa* occur on the Subject site, and evidence of Glossy black-cockatoo feeding activity was recorded. Suitable nest sites do not exist on the Subject site. It is considered likely that this species will continue to utilise suitable habitat on the subject site as forage resource after development.

*Likelihood of local extinction*

The Proposed development is considered unlikely to result in the local extinction of this species.



#### **3.4.8 Greater broad-nosed bat**

##### *Extent of the local population*

The NPWS online database contained one (1) sighting of this species within 10 kilometres of the Study area.

The NPWS online database contains four (4) sightings of this species in the Nambucca LGA the nearest of which occurred approximately 2km north-east of the Subject site near Nambucca.

##### *Stages of the life cycle affected by the proposed development*

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis was based on local expert knowledge and identified breeding and sheltering sites for the Greater broad-nosed bat as consisting of hollows in dry sclerophyll, moist eucalypt forests and alluvial red gum forest. The Greater broad-nosed bat forages on beetles and moths in dry sclerophyll, moist eucalypt forests and rainforest.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Greater broad-nosed bat, with the following results:

1 <sup>st</sup> order disturbances	Clearing - habitat loss Logging - loss of hollows & old re-growth
3 <sup>rd</sup> order disturbances	Clearing - fragmentation Logging - loss of understorey Frequent burning Grazing
4 <sup>th</sup> order disturbances	Weed invasion Wildfire Altered hydrology/microclimate Barbed wire

Suitable forage habitat for this species occurs throughout the subject site. It is considered that the proposed development is unlikely to remove significant forage or roost habitat for this species as larger, more suitable areas of habitat occur within the adjacent Nambucca State Forest.

##### *Likelihood of local extinction*

The Proposed development is considered unlikely to result in the local extinction of this species.

#### **3.4.9 Green-thighed frog**

##### *Extent of the local population*

The NPWS online database contained one (1) sighting of this species within 10 kilometres of the Study area.



The NPWS online database contains one (1) sighting of this species in the Nambucca LGA which occurred approximately 2km north-east of the Subject site near Nambucca.

*Stages of the life cycle affected by the proposed development*

Green-thighed frogs occur in a range of habitats from rainforest and moist eucalypt forest to dry eucalypt forest and heath, typically in areas where surface water gathers after rain (NPWS 2002). There are three critical components to this habitat:

- 1) The presence of stands of lowland moist hardwood forest;
- 2) The presence of small, permanent streams that are subject to periodic flooding, with well established fringing vegetation; and
- 3) The presence of ephemeral overflow or pondage areas beside these creeks (AMBS 1995).

The Green-thighed frog appears to forage in areas with a complex, dense, mesic understorey and probably shelters in cavities in trees or under bark (Environment Australia 1999).

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis was based on local expert knowledge and concluded that disturbances for the Green-thighed frog are poorly known but may include:

- Disease;
- Habitat clearing;
- Altered hydrology;
- Old growth logging;
- Changes in soil moisture (from road construction and logging);
- Increased UV radiation;
- Predation by fish; and

Removal of large dead fallen trees and reduced leaf litter input.

Vegetation associated with Swampy Creek and SEPP 14 Wetland No. 362 on the subject site may provide suitable habitat for this species. These habitats are unlikely to be affected by the proposed development if amelioration measures recommended in this report are adopted.

*Likelihood of local extinction*

The Proposed development is considered unlikely to result in the local extinction of this species.

**3.4.10 Grey-headed flying fox**

*Extent of local population*



The NPWS online database contained twenty-eight (28) sightings of this species within 10 kilometres of the Study area.

The NPWS online database contains thirty-eight (38) sightings of this species in the Nambucca LGA the nearest of which occurred within 1km north of the Subject site.

This species was observed foraging on flowering Eucalypts and Melaleucas during both the 2004 and the 2007 survey periods.

*Stages of the life cycle affected by the proposed development*

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis identified breeding and sheltering sites for the Grey-headed flying fox as consisting of mainly rainforest and moist riparian forest with a complex mosaic of rainforest, swamp and sclerophyll forest resources less than 40-50km from roost. There is high site fidelity with roosts often in riverine rainforest. The Grey-headed flying fox forages in subtropical rainforest with a mosaic of resources - rainforest fruit, nectar and pollen. The Grey-headed flying fox is less restricted to rainforest remnants than the Black flying fox.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Grey-headed flying fox, with the following results:

1 <sup>st</sup> order disturbances	Clearing - habitat loss
2 <sup>nd</sup> order disturbances	Direct disturbance to camps Drainage of swamps
3 <sup>rd</sup> order disturbances	Powerlines Logging of Sclerophyll Management burns Shooting
4 <sup>th</sup> order disturbances	Clearing resulting in fragmentation Wildfire
5 <sup>th</sup> order disturbances	Disease - lyssavirus Apiary Barbed wire fences Weed invasion
6 <sup>th</sup> order disturbances	Climate change

Suitable habitat for this species will be retained on the subject site under the proposed development. It is considered that this species is likely to continue to utilise trees on the subject site as a forage resource.

*Likelihood of local extinction*

The Proposed development is considered unlikely to result in the local extinction of this species.

**3.4.11 Large-footed myotis**

*Extent of local population*

The NPWS online database contained three (3) sightings of this species within 10 kilometres of the Study area.





The NPWS online database contains seven (7) sightings of this species in the Nambucca LGA the nearest of which occurred within 2km south of the Subject site.

High quality habitat occurs on the subject site associated with Swampy Creek and the SEPP 14 Wetland No. 362. This species has not been recorded from the subject site but is considered likely to occur.

*Stages of the life cycle affected by the proposed development*

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis was based on local expert knowledge and identified breeding and sheltering habitat for the Large-footed myotis as consisting of any forested riparian and adjacent vegetation around water bodies and coastal lakes and streams greater than first order streams. Breeding is in hollows, as well as under bridges and in caves. The Large-footed myotis forages in still water bodies with associated vegetation (tree line) feeding on aquatic and other flying insects, and small fish.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Large-footed myotis, with the following results:

1 <sup>st</sup> order disturbances	Clearing - habitat loss (riparian vegetation) Clearing - fragmentation
2 <sup>nd</sup> order disturbances	Use of chemicals Grazing Use of chemicals - mosquito control, pesticides
3 <sup>rd</sup> order disturbances	Altered hydrology - sedimentation Altered hydrology - altered flow Bridge removal Eutrophication from grazing, agriculture and sewage Dams
4 <sup>th</sup> order disturbances	Logging - loss of hollows Frequent burning
5 <sup>th</sup> order disturbances	Recreational activities - fly fishing, boating Weeds
6 <sup>th</sup> order disturbances	Fish (trout)

Suitable habitat for this species will be retained on the subject site under the proposed development. It is considered that this species is likely to continue to utilise Swampy Creek and SEPP 14 Wetland No. 362 as a forage resources.

*Likelihood of local extinction*

The Proposed development is considered unlikely to result in the local extinction of this species.



### **3.4.12 Little bent-wing bat**

#### *Extent of the local population*

The NPWS online database contained two (2) sightings of this species within 10 kilometres of the Study area.

The NPWS online database contains fifteen (15) sightings of this species in the Nambucca LGA the nearest of which occurred approximately 1.5km south-east of the Subject site near Stuarts Island.

This species has been recorded from the subject site utilising an Anabat II ultrasonic call detector.

#### *Stages of the life cycle affected by the proposed development*

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis was based on local expert knowledge and identified breeding sites for Little bent-wing bat as consisting of limestone caves, where it usually occurs in association with the Common bent-wing bat. It congregates in high numbers in maternity roost (in 1000's). It also shelters in a range of artificial structures including culverts, drains, mines etc. The Little bent-wing bat forages on flying insects in forested areas, predominantly swamp forest, moist eucalypt forest, rainforest and some dry forests.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Little bent-wing bat, with the following results:

1 <sup>st</sup> order disturbances	Clearing - habitat loss
2 <sup>nd</sup> order disturbances	Disturbance to camps/caves by limestone mining (cave collapse, altered air flow, noise, dust etc) and recreational activities.
3 <sup>rd</sup> order disturbances	Clearing - fragmentation Logging - loss of foraging habitat Frequent burning Altered hydrology/microclimate - old growth-regrowth
4 <sup>th</sup> order disturbances	Grazing Wildfire Pesticides
5 <sup>th</sup> order disturbances	Introduced predators

Suitable forage habitat for this species occurs on the subject site and will be retained under the proposed development. It is considered that this species will continue to forage within retained vegetation on the subject site.



*Likelihood of local extinction*

The Proposed development is considered unlikely to result in the local extinction of this species.

**3.4.13 Koala**

*Extent of local population*

The NPWS online database contained eight (8) sightings of this species within 10 kilometres of the Study area.

The NPWS online database contains eighty-one (81) sightings of this species in the Nambucca LGA the nearest of which occurred approximately 6km north of the Subject site, near Valla.

*Stage of lifecycle affected by the proposed development*

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of landcover disturbance in the North-east region. The analysis identified feeding sites for Koalas in coastal forested environments (not woodland) as areas with stands with a high diversity of known food trees (three or more) including Tallowwood, Grey gum, Forest oak, Sydney blue gum, Swamp mahogany and Red gums. The Koala shelters in larger trees with big lateral branches (not necessarily food trees). The Koala disperses over any open habitat (including pasture and grassland) as long as scattered trees are present.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Koala, with the following results:

1 <sup>st</sup> order disturbances	Habitat clearing
2 <sup>nd</sup> order disturbances	Introduced predators - foxes and dogs
3 <sup>rd</sup> order disturbances	Intensive logging that removes the critical tree size classes from the stand (may be frequent or single and intensive) Logging that fails to retain stems in the 30-80 DBH size class.
4 <sup>th</sup> order disturbances	Wildfire
5 <sup>th</sup> order disturbances	Roadkills
6 <sup>th</sup> order disturbances	Disease

The proposed development will result in the loss of trees recognised as a food trees under Schedule 2 of SEPP 44 i.e. Forest red gums and Tallowwoods. However, scat searches under trees on the site did not reveal the presence of Koalas on the site. It is considered that Koalas may occasionally occur on the subject site as they disperse through the locality.

*Likelihood of local extinction*

The proposed development is unlikely to result in the local extinction of this species.



#### **3.4.14 Masked owl**

##### *Extent of the local population*

The NPWS online database contained one (1) sighting of this species within 10 kilometres of the Study area.

The NPWS online database contains eight (8) sightings of this species in the Nambucca LGA, the nearest of which occurred approximately 9km south-west of the Subject site, near Macksville.

##### *Stages of the life cycle affected by the proposed development*

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis identified breeding sites for the Masked owl as hollows (usually vertical) in large, live trees. This owl shelters in hollows and in densely foliated native and exotic understorey trees. The Masked owl feeds in sclerophyll forest with sparse, open understorey, particularly in the ecotone between wet and dry forest and non-forest habitat. It feeds on medium and small terrestrial mammals, some arboreal mammals and birds.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Masked owl, with the following results:

1 <sup>st</sup> order disturbances	Clearing for agriculture
2 <sup>nd</sup> order disturbances	Logging which increases structural density of forest which effects mid to ground layer and thus affects maneuverability
3 <sup>rd</sup> order disturbances	Fire - high frequency
4 <sup>th</sup> order disturbances	Clearing for urban development
5 <sup>th</sup> order disturbances	Road-kills
6 <sup>th</sup> order disturbances	Nest and roost site disturbance

This species may forage in suitable habitats within Nambucca State Forest adjacent to the Subject site and roost in Tall closed forest in the Study area. The Subject site may provide some secondary foraging resources for this species.

##### *Likelihood of local extinction*

The Proposed development is considered unlikely to result in the local extinction of this species.

#### **3.4.15 Osprey**

##### *Extent of the local population*

The NPWS online database contained twenty two (22) sightings of this species within 10 kilometres of the Study area.

The NPWS online database contains twenty (20) sightings of this species in the Nambucca LGA, two (2) of which occurred within 1km of the Subject site. A nest site was identified approximately 50m north of the Subject site on private land and was active during both the 2004 and 2007 survey.

##### *Stages of the life cycle affected by the proposed development*



As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Osprey, with the following results:

1 <sup>st</sup> order disturbances	Drainage of wetlands Chemical pollutants Urban development Loss of nest sites Commercial fishing (removal of prey, especially mullet)
------------------------------------	---

The Osprey may forage in Swampy Creek and associated wetlands adjacent to the site. The proposed development will not contribute toward the loss or fragmentation of habitat for this species and therefore will not result in a reduction in the availability of forage resources.

*Likelihood of local extinction*

The Proposed development is considered unlikely to result in the local extinction of this species.

**3.4.16 Powerful owl**

*Extent of the local population*

The NPWS online database contained three (3) sightings of this species within 10 kilometres of the Study area.

The NPWS online database contains twelve (12) sightings of this species in the Nambucca LGA, the nearest of which occurred approximately 10km south of the Subject site near Yarrahapinni State Forest.

*Stages of the life cycle affected by the proposed development*

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis identified breeding sites for the Powerful owl as consisting of hollows (branch and trunk) in large, live, old trees in areas with a high density of arboreal mammals. Nests tend to be in drainage lines (including minor ones), sometimes well upslope. There are often dense thickets to protect breeding roosts. Sheltering occurs in tall thickets where available, near drainage lines, in rainforest vegetation near waterfalls and on rock ledges. Juveniles can occur in patches of tall, dense shrubs. The Powerful owl forages in a wide range of wet and dry forest types and feeds on arboreal mammals, large birds and flying foxes.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Powerful owl, with the following results:

1 <sup>st</sup> order disturbances	Logging which reduces the availability of arboreal mammals for prey.
2 <sup>nd</sup> order disturbances	Fire which reduces prey
3 <sup>rd</sup> order disturbances	Nest and roost site disturbance by logging and



	recreational bird watching
4 <sup>th</sup> order disturbances	Habitat clearing
5 <sup>th</sup> order disturbances	Habitat fragmentation
6 <sup>th</sup> order disturbances	Introduced predators - dog and fox predation on juveniles
7 <sup>th</sup> order disturbances	Road kills on adults
8 <sup>th</sup> order disturbances	Cultivation for agriculture (juveniles)

This species may forage in suitable habitats within Nambucca State Forest adjacent to the Subject site and roost in mature forest in the Study area. The Subject site may provide some secondary foraging resources for this species.

*Likelihood of local extinction*

The Proposed development is considered unlikely to result in the local extinction of this species.

**3.4.17 Red-tailed black-cockatoo**

*Extent of the local population*

The NPWS online database contained eleven (11) sightings of this species within 10 kilometres of the Study area.

The NPWS online database contains eleven (11) sightings of this species in the Nambucca LGA all of which occurred approximately 4.5km north of the Subject site near Valla.

*Stages of the lifecycle affected by the proposed development*

This species has the widest distribution of all the Black-cockatoos and ranges across northern and western Australia as well as western Victoria. In NSW one population occurs on the north-western slopes and another in northern central NSW. Red-tailed black-cockatoos are found in a wide variety of habitats and in NSW have been recorded in Dry open forest and areas of mixed Rainforest-Eucalypt forest.

The NPWS Threatened Species Unit discusses the following threats for the Red-tailed black-cockatoo:

- Loss of native forest and riparian vegetation for agriculture and development;
- Removal of large trees containing large hollows needed for nesting;
- Too frequent burning of habitat;
- Overgrazing in areas of habitat which prevents regeneration of food resources; and
- Illegal taking of eggs and chicks for the aviculture trade.

This species may forage in suitable habitats adjacent to the Subject site, and occasionally use the Subject site as marginal forage habitat. The proposed development will not significantly contribute toward the loss or fragmentation of



habitat for this species. The development may result in a minor reduction in the availability of forage resources.

*Likelihood of local extinction*

The Proposed development is considered unlikely to result in the local extinction of this species.

**3.4.18 Sooty owl**

*Extent of the local population*

The NPWS online database contained two (2) sightings of this species within 10 kilometres of the Study area.

The NPWS online database contains sixteen (16) sightings of this species in the Nambucca LGA all of which occurred approximately 1.5km north-east of the Subject site near Nambucca State Forest.

*Stages of the lifecycle affected by the proposed development*

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis identified sheltering sites for the Sooty owl as patches of dense, tall understorey, strangler figs, hollows in live and dead trees, vine tangles, dense tree-fern heads, caves and rocky ledges and in rainforest vegetation near waterfalls and rock ledges in very dense, dark gorges. The Sooty owl breeds in wet forest (Rainforest and Wet sclerophyll) with a well developed mesomorphic understorey with very large, live old trees with hollows. The Sooty owl forages out of roosting habitat into drier areas, principally in wet gullies on small and medium sized terrestrial and arboreal mammals and very few birds.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Sooty owl, with the following results:

1 <sup>st</sup> order disturbances	Logging which reduces prey mammals
2 <sup>nd</sup> order disturbances	Nest and roost site disturbance
3 <sup>rd</sup> order disturbances	wildfire
4 <sup>th</sup> order disturbances	Fire which reduces prey -
5 <sup>th</sup> order disturbances	Bird watching including survey playback

This species may forage in suitable habitats within Nambucca State Forest adjacent to the Subject site and roost in mature/old growth forest in the Study area. The Subject site may provide some secondary foraging resources for this species.

*Likelihood of local extinction*

The Proposed development is considered unlikely to result in the local extinction of this species.

**3.4.19 Spotted-tail quoll**

*Extent of the local population*

The NPWS online database did not contain any sightings of this species within 10 kilometres of the Study area.



The NPWS online database contains eleven (11) sightings of this species in the Nambucca LGA all of which occurred approximately 25km west of the Subject site.

*Stages of the lifecycle affected by the proposed development*

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis was based on local expert knowledge and identified breeding sites for the Spotted Tailed Quoll as occurring amongst rockpiles, crevices and hollows. Shelter sites consist mainly of rockpiles and crevices but they will also shelter in logs, tree hollows, or burrows of other species. The Spotted Tailed Quoll forages in a broad range of habitats but is more abundant in larger, less disturbed forests.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Spotted Tailed Quoll, with the following results:

1 <sup>st</sup> order disturbances	Exotic predators - competition and predation by foxes, cats and dogs Baiting for dingoes
2 <sup>nd</sup> order disturbances	Clearing - loss of habitat
3 <sup>rd</sup> order disturbances	Grazing and associated frequent burning - loss of logs Clearing fragmentation
4 <sup>th</sup> order disturbances	Disease - toxoplasmosis which is spread by feral cats
5 <sup>th</sup> order disturbances	Road kills - correlated with fragmented habitat

This species may forage in suitable habitats within Nambucca State Forest adjacent to the Subject site and roost in mature/old growth forest in the Study area. Dense vegetation on the subject site may provide movement opportunities for this species in the locality.

*Likelihood of local extinction*

The Proposed development is considered unlikely to result in the local extinction of this species.

**3.4.20 Square-tailed kite**

*Extent of the local population*

The NPWS online database contained thirteen (13) sightings of this species within 10 kilometres of the Study area.

The NPWS online database contains eleven (11) sightings of this species in the Nambucca LGA the nearest of which occurred within 0.5km east of the Subject site, above the Pacific Highway.

*Stages of the life cycle affected by the proposed development*





As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis identified breeding sites for the Square-tailed kite as consisting of nests in tall trees with large branches in tall, open sclerophyll forest and woodland with or adjacent to areas of high densities of passerine birds. It typically occurs on tablelands and coastal plains. The Square-tailed kite forages on a high density of passerine birds, particularly honeyeaters. It will occasionally take lorikeets, quail, pipits and canopy foliage gleaners.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Square-tailed kite, with the following results:

1 <sup>st</sup> order disturbances	Clearing for agriculture
2 <sup>nd</sup> order disturbances	Grazing and associated burning Logging which increases the structural density through reducing age classes, decreased nectar production Intensive horticulture Nest site loss
3 <sup>rd</sup> order disturbances	Urban development
4 <sup>th</sup> order disturbances	Egg collecting

This species may occasionally forage on the site and in suitable habitats adjacent to the Subject site. The proposed development will not contribute toward the loss or fragmentation of habitat for this species and therefore will not result in a reduction in the availability of forage resources.

#### *Likelihood of local extinction*

The proposed development is considered unlikely to result in the local extinction of this species.

### **3.4.21 Squirrel glider**

#### *Extent of the local population*

The NPWS online database did not contain any sightings of this species within 10 kilometres of the Study area.

The NPWS online database contains eighteen (18) sightings of this species in the Nambucca LGA the nearest of which occurred approximately 15km south of the Subject site.

#### *Stages of the life cycle affected by the proposed development*

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis identified breeding sites for Squirrel glider as tree hollows with a preference for small hollow entrances. A single study found that densities declined linearly when the abundance of trees with hollows fell below 6/ha (Smith, 1998). The preferred feeding habitat contains winter flowering eucalypts or banksias including Swamp mahogany, Spotted gum, Coast banksia and Swamp paperbark. Probable association with larger trees with high nectar flows. The Squirrel glider shelters in hollow bearing trees.



The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Squirrel glider, with the following results:

1 <sup>st</sup> order disturbances	Habitat clearing
2 <sup>nd</sup> order disturbances	High frequency burning
3 <sup>rd</sup> order disturbances	Intensive logging that removes the critical tree size classes from the stand (may be frequent or single and intensive). Removal of large trees and hollows, includes firewood collection
4 <sup>th</sup> order disturbances	Apiary - competition for hollows
5 <sup>th</sup> order disturbances	Introduced predator - foxes, dogs and cats

This species may forage in suitable habitats within Nambucca State Forest adjacent to the Subject site and roost in mature forest in the Study area. The Subject site may provide some secondary foraging resources for this species.

#### *Likelihood of local extinction*

The Proposed development is considered unlikely to result in the local extinction of this species.

#### **3.4.22 Yellow-bellied glider**

The NPWS database contained one (1) record of this species within 10 kilometres of the Study area. The record was from February 2003 and occurred approximately 1.75km to the north-east, adjacent to the eastern portion of Nambucca State Forest.

#### *Stages of the life-cycle affected by the proposed development*

As part of the RFA process, Environment Australia (1999) completed an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis was based on local expert knowledge and identified breeding and sheltering sites for Yellow-bellied gliders as consisting of large hollow trees. It requires trees within gliding distance (on flat ground) in tall forest >40m. In steep forest, glides may be much longer (up to 300m). Trees may be quite scattered. For foraging Yellow-bellied gliders tend to select mature, highly diverse eucalypt forest with a high proportion of large mature trees of species that flower during winter months, are gum-barked and/or decorticate bark in strips (Teresa Eyre *pers comm.* 2005). There is some evidence to suggest that large, mature trees produce higher nectar yields and sap flows, therefore offering more productive foraging substrate for Yellow-bellied gliders (Law *et al.* 2000).

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Yellow-bellied glider, with the following results:

1 <sup>st</sup> order disturbances	Intensive logging that removes the critical tree size classes from the stand (may be frequent or single and intensive). Logging that fails to retain a high proportion of large trees and hollows.
2 <sup>nd</sup> order disturbances	Habitat clearing
3 <sup>rd</sup> order disturbances	High frequency burning



This species has been observed on a number of occasions within the Nambucca State Forest adjacent to the subject site. Past logging of the subject site is considered to have precluded this species from foraging and/or denning on the site.

*Likelihood of local extinction*

Given the extent of habitat conserved in the wider locality, it is considered unlikely that the Subject site is critical to the continued viability of Yellow-bellied glider populations in the area. Vegetation in the wider locality is considered likely to support habitats of sufficient diversity, connectivity and area to sustain Yellow-bellied glider populations in perpetuity.

*(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.*

Thirty-three (33) endangered populations have been identified under the TSC Act. The following four (4) endangered populations occur in north-eastern NSW:

- Long-nosed potoroo population, Cobaki Lakes and Tweed Heads West;
- Emu population in the NSW North Coast Bioregion and Port Stephens LGA;
- Low growing form of *Zieria smithii*, Diggers Head; and
- *Glycine clandestina* (Broad-leaf form) in the Nambucca LGA.

The proposed action will not have an adverse affect on any of these endangered populations.

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

- (v) *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*
- (vi) *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.*

Seven part tests for EEC's on the subject site have been completed in Section 5.2.3.

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

- (vii) *the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*
- (viii) *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*



- (ix) *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.*

Development of the subject site will cause the loss of vegetation and habitat for the construction of buildings, access roads, driveways and associated infrastructure. The majority of this vegetation consists of scattered trees within an area previously (2004) cleared/logged.

No areas of potential habitat for the threatened species considered to be a possible occurrence, will be fragmented or isolated from any other areas of potential habitat as a result of the proposed development.

The subject site occurs within an urban setting, with residential housing occurring to the south of the subject site, and rural residential to the north. Vegetation clearing within disturbed areas of the site will not cause the further isolation of habitats in the south of the subject site from significant habitats areas in Nambucca State Forest to the west. Vegetation to be retained will act as an adequate dispersal path for native fauna.

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

Critical habitat areas listed under the *Threatened Species Conservation Act (1995)* currently consist of habitat for Mitchell's rainforest snail in Stott's Island Nature Reserve, and habitat for the Little penguin population in Sydney's North Harbour.

There will be no adverse effects on either of these critical habitats from the action proposed.

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

A approved recovery plan exists for the large forest owls (Powerful owl, Masked owl & Sooty owl) which are considered possible occurrences on the Subject site. The objectives of this recovery plan are to:

- To minimise further loss and fragmentation of habitat outside conservation reserves and State Forests by protection and fragmentation of significant owl habitat (including protection of individual nest sites).
- To minimise the impacts of development activities on the two large forest owls and their habitat outside conservation reserves and State forests.
- To assess the distribution and amount of high quality habitat for each owl species across public and private lands to get an estimate of the number and proportion of occupied territories of each species that are, and are not protected.



- To monitor trends in population parameters (numbers, distribution, territory fidelity and breeding success) across the range of the three species and across different land tenures and disturbance histories.
- To assess the implementation and effectiveness of forest management prescriptions designed to mitigate the impact of timber-harvesting operations on the two owl species and, (if necessary), to use this information to refine the prescriptions so that forestry activities on State forests are not resulting in adverse changes in species abundance and breeding success.
- To improve the recovery and management of the two large forest owls based on an improved understanding of key areas of their biology and recovery.
- To raise awareness of the conservation requirements of the large forest owls among the broader community, to involve the community in owl conservation efforts and in so doing increase the information base about owl habitats and biology.
- To coordinate the implementation of the recovery plan and continually seek to integrate actions in this plan with actions in other recovery plans or conservation initiatives.

It is considered that the proposed development is consistent with the objectives of the Recovery Plan for the large forest owls.

An approved recovery plan has been prepared for the Yellow-bellied glider. According to the Recovery Plan, presence of Yellow-bellied gliders on a site should require implementation of effective mitigation measures to reduce the impact of proposed developments or activities (NPWS 2003). Mitigation should offer protection to the Yellow-bellied glider that is at least of the standard provided by SFNSW for forestry activities.

Under Prescription 16 of the Threatened Species License for the Upper North East Region (Forests NSW 2005):

- a) A 50 metres radius exclusion zone must be implemented around Yellow-bellied glider dens.*
- b) All Yellow-bellied glider sap feed trees<sup>3</sup> must be retained. All Yellow-bellied glider Sap feed trees must be marked for retention.*
- c) Where there is a record of a Yellow-bellied glider, the following must apply:*
  - i. Within a 100 metre radius of each retained Yellow-bellied glider sap feed tree, observation or den site record, 15 feed trees must be retained. Yellow-bellied glider sap feed trees must not be counted towards these 15 feed trees. Retained feed trees must have good*

---

<sup>3</sup> "Sap feed tree" means a tree with recent V-notch incisions or other incisions made by a Yellow-bellied. Recent incisions are incisions less than two years old as evidenced by non-occlusion of the incision (i.e. where the incision has not closed).



*crown development and should have minimal butt damage and should not be suppressed. Mature and late mature trees must be retained as feed trees where these are available.*

- ii. *Within a 200 metres radius of a Yellow-bellied glider call detection site record, 15 feed trees must be retained. Retained feed trees must have good crown development and should have minimal butt damage and should not be suppressed. Mature and late mature trees must be retained as feed trees where these are available.*
- iii. *The feed trees retained in condition (c) i. and ii. above, must be of the same species as the identified sap feed tree or identified den tree, or should be trees that shed their bark in long strips, eg. species from Blue, Flooded, Grey, Red and White Gum groups.*
- iv. *The feed trees retained in condition (c) i. and ii. Above must be marked for retention.*
- v. *The retained feed trees must be >30 centimetres dbh where available. Where retained hollow-bearing trees meet these requirements, the hollow-bearing trees can be counted as feed trees.*

It is considered that the proposed development is consistent with the objectives of the Recovery Plan for the Yellow-bellied glider.

A Draft recovery plan exists for the Koala which is considered a possible occurrence on the Subject site. The objectives of this recovery plan are:

- To conserve Koalas in their existing habitat;
- To rehabilitate and restore Koala habitat and populations;
- To develop a better understanding of the conservation biology of Koalas;
- To ensure that the community has access to factual information about the distribution, conservation and management of Koalas at a national, state and local level;
- To manage captive, sick or injured Koalas and orphaned wild Koalas to ensure consistent and high standards of care; and
- To manage over-browsing to prevent both Koala starvation and ecosystem damage in discreet patches of habitat.

It is considered that the proposed development is consistent with the objectives of the Recovery Plan for the Koala.

To date, only two Threat abatement plans have been approved:

- Predation by the Red fox
- Invasion by the Plague minnow

Neither of these invasive species are likely to have a significant impact on fauna on the Subject site.



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

A “threatening process” means a process that threatens, or may have the capability to threaten, the survival or evolutionary development of a species, population or ecological community. Key Threatening Processes have been listed in Schedule 3 of the *TSC Act (1995)*.

*Key Threatening Processes (Schedule 3):*

- *Lantana camara*;
- Exotic vines and scramblers;
- *Bufo marinus*;
- Invasion of the yellow crazy ant;
- Feral pigs;
- Competition and habitat destruction by feral goats;
- Entanglement in, or digestion of anthropogenic debris in marine and estuarine environments;
- Introduction of the large earth Bumble bee, *Bombus terrestris*;
- Removal of dead wood and dead trees;
- Death or injury to marine species following capture in shark control programs on ocean beaches;
- Invasion of native plant communities by exotic perennial grasses;
- Infection of frogs by amphibian chytrid, causing the disease chytridiomycosis
- Competition from feral honeybees;
- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands;
- Clearing of native vegetation;
- Bushrock removal;
- Ecological consequences of high frequency fires;
- Human-caused climate change;
- Invasion of native plant communities by Bitou Bush and Boneseed;
- Loss and/or degradation of sites used for hilltopping by butterflies;
- Predation by the European red fox;
- Predation by feral cats;
- Predation by the ship rat on Lord Howe Island;
- Predation by the Plague minnow (*Gambusia holbrooki*);
- Infection of native plants by *Phytophthora cinnamomi*;
- Infection by Psittacine circoviral (beak and feather) disease affecting endangered psittacine species and populations;
- Importation of red imported fire ants into NSW; and
- Competition and grazing by the feral European rabbit.

The proposed development will contribute towards the clearing of native vegetation, a key threatening process listed on Schedule 3 of the *TSC Act (1995)*. The final determination of the NSW Scientific Committee notes that clearing of native vegetation is recognised as a major factor contributing to loss of biological diversity, with impacts such as: destruction of habitat; fragmentation of habitat; riparian zone degradation; increased greenhouse gas emissions; increased habitat for invasive species; loss of leaf litter layer; loss or disruption of ecological function (e.g. loss of populations of pollinators or seed dispersers) and changes to soil biota.



The amount of native vegetation to be cleared has not been determined. Amelioration measures have been recommended to minimise the loss of native vegetation on the Subject site. Clearance of native vegetation will include clearance for building envelopes, access roads, fire buffers and fire trails however, all vegetation clearing will occur within historically disturbed areas of the subject site.

Habitat loss is the main threatening process affecting all Subject species. The Proposed development will make a contribution towards the loss of habitat in the region. However, the best habitat on the site will be retained and enhanced, and connectivity with adjacent significant habitat within Nambucca State Forest will be retained.

**On the basis of this assessment, it is considered that a Species Impact Statement (SIS) is not required.**





**APPENDIX 5**  
**Jnjnkj**



# **1 COMMONWEALTH ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT (1999)**

## **1.1 Introduction**

The *Environment Protection & Biodiversity Conservation (EPBC) Act (1999)* was passed by Commonwealth Parliament in June 1999 and came into force on 16 July, 2000. A person must not, without an approval under the Act, take an action that has or will have, or is likely to have, a significant impact on a matter of National Environmental Significance (NES). These matters are listed as:

- (a) the world heritage values of a declared World Heritage property;
- (b) the ecological character of a declared Ramsar wetland;
- (c) a threatened species or endangered community listed under the Act;
- (d) a migratory species listed under the Act; or
- (e) the environment in a Commonwealth marine area or on Commonwealth land.

The Act also prohibits the taking, without an approval under the Act, of:

- (a) a nuclear action; or
- (b) an action in a Commonwealth marine area or on Commonwealth land that has or will have, or is likely to have, a significant impact on the environment.

An action includes a project, development, undertaking or an activity or series of activities. An action does not require approval if it is a lawful continuation of a use of land, sea or seabed that was occurring before the commencement of the Act. An enlargement, expansion or intensification of a use is not a continuation of a use.

The *EPBC Act (1999)* does not require Commonwealth approval for the rezoning of land. It does, however, suggest that when rezoning land, planning authorities should consider whether to allow actions that could significantly affect NES matters or the environment of Commonwealth land.

Matters of NES in New South Wales are:

- (a) Declared World Heritage Areas;
- (b) Declared Ramsar Wetlands;
- (c) Listed Threatened Species (Schedule 1 and 2 of Commonwealth Endangered Species Protection Act 1992);
- (d) Listed Ecological Communities in Queensland; and
- (e) Listed migratory species (JAMBA and CAMBA).



## **1.2 Occurrence of Matter of NES on Subject Site**

### **1.2.1 Background**

A Commonwealth Assessment will be required for proposed activities on the subject site if they affect a matter of NES. Matters of NES in NSW were identified in the previous section. There are no declared World Heritage Areas or Ramsar Wetlands in the Locality, Study area or Subject site.

### **1.2.2 Listed Threatened species**

No Commonwealth Threatened flora species were recorded on the Subject site.

One (1) Commonwealth Threatened fauna species - the Grey-headed flying-fox - was recorded on the Subject site. One (1) additional Commonwealth Threatened species - Spotted-tail quoll - is considered a possible occurrence.

### **1.2.3 Listed Ecological Communities**

None of the ecological communities currently listed in the *EPBC Act (1999)* occur in the study area or wider locality.

### **1.2.4 Listed Migratory Species**

Listed migratory species in NSW are considered predominantly in the Japan-Australia Migratory Bird Agreement (JAMBA) and China-Australia Migratory Bird Agreement (CAMBA).

## **1.3 Assessment against EPBC Act Principal Significant Impact Guidelines**

### **1.3.1 Background**

The Commonwealth DEH has prepared EPBC Act Policy Statements, including the EPBC Act - Principal Significant Impact Guidelines 1.1 (2005) which outline a self-assessment process to assist in determining whether an action should be referred to the Department for a decision on whether assessment and approval is required under the Act. The following sections assess the proposed development (the action) against these guidelines.

### **1.3.2 Critically Endangered and Endangered Species**

#### **Significant Impact Criteria**

An action has, will have, or is likely to have a significant impact on a critically endangered or endangered species if it does, will, or is likely to:

- lead to a long-term decrease in the size of a population; or
- reduce the area of occupancy of the species; or
- fragment an existing population into two or more populations; or



- adversely affect habitat critical to the survival of a species; or
- disrupt the breeding cycle of a population; or
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline; or
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat; or
- interfere with the recovery of the species.

### **Assessment of Proposed Action**

The subject site does not support a population of any Endangered species listed in the *EPBC Act (1999)* and a significant impact on such species will not be incurred.

#### **1.3.3 Vulnerable Species**

##### **Significant Impact Criteria**

An action has, will have, or is likely to have a significant impact on a vulnerable species if it does, will, or is likely to:

- lead to a long-term decrease in the size of an important population of a species; or
- reduce the area of occupancy of an important population; or
- fragment an existing important population into two or more populations; or
- adversely affect habitat critical to the survival of a species; or
- disrupt the breeding cycle of an important population; or
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline; or
- result in invasive species that are harmful a vulnerable species becoming established in the vulnerable species' habitat; or
- interferes substantially with the recovery of the species.

An important population is one that is necessary for a species' long-term survival and recovery. This may include populations that are:

- key source populations either for breeding or dispersal;
- populations that are necessary for maintaining genetic diversity; and/or
- populations that are near the limit of the species range.

### **Assessment of Proposed Action**

It is considered that although the Grey-headed flying fox has been recorded, and the Spotted-tail quoll is considered a possible occurnec, the subject site does not support an important population of any Vulnerable species listed in the *EPBC Act (1999)* and a significant impact on such species will not be incurred.



#### **1.3.4 Migratory Species**

##### **Significant Impact Criteria**

An action has, will have, or is likely to have a significant impact on a migratory species if it does, will, or is likely to:

- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat of the migratory species; or
- result in invasive species that is harmful to the migratory species becoming established\* in an area of important habitat of the migratory species; or
- seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the species.

(\* Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a migratory species by direct competition, modification of habitat, or predation.)

An area of important habitat is:

1. habitat utilised by a migratory species occasionally or periodically within a region that supports an *ecologically significant proportion* of the population of the species, or
2. habitat utilised by a migratory species which is at the limit of the species range, or
3. habitat within an area where the species is declining.

##### **Assessment of Proposed Action**

It is considered that although a number of listed migratory species are known or likely to occur occasionally in the Study area, no area of important habitat occurs in the Study area for listed migratory species.

#### **1.3.5 Wetlands of International Importance**

##### **Significant Impact Criteria**

An action is likely to have a significant impact on the ecological character of a declared Ramsar wetland if there is a real chance or possibility that it will result in:

- areas of the wetland being destroyed or substantially modified, or
- a substantial and measurable change in the hydrological regime of the wetland for example, a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland, or
- the habitat or lifecycle of native species, including invertebrate fauna and fish species, dependant upon the wetland being seriously affected, or
- a substantial and measurable change in the water quality of the wetland for example, a substantial change in the level of salinity, pollutants, or



- nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health, or
- an invasive species that is harmful to the ecological character of the wetland being established in the wetland.

#### **Assessment of Proposed Action**

The proposed development is not considered to have a significant impact on any wetland of international importance.

#### **1.3.6 Requirement for Commonwealth Referral**

Based on the assessment provided above, Referral to the Commonwealth DEH is not required. The proposed action is unlikely to result in a significant impact on any matter of NES.

#### **1.3.7 Requirement for Commonwealth Assessment**

On the basis of the above assessment, it is concluded that Commonwealth Assessment is not required for the Proposed development of the subject site.

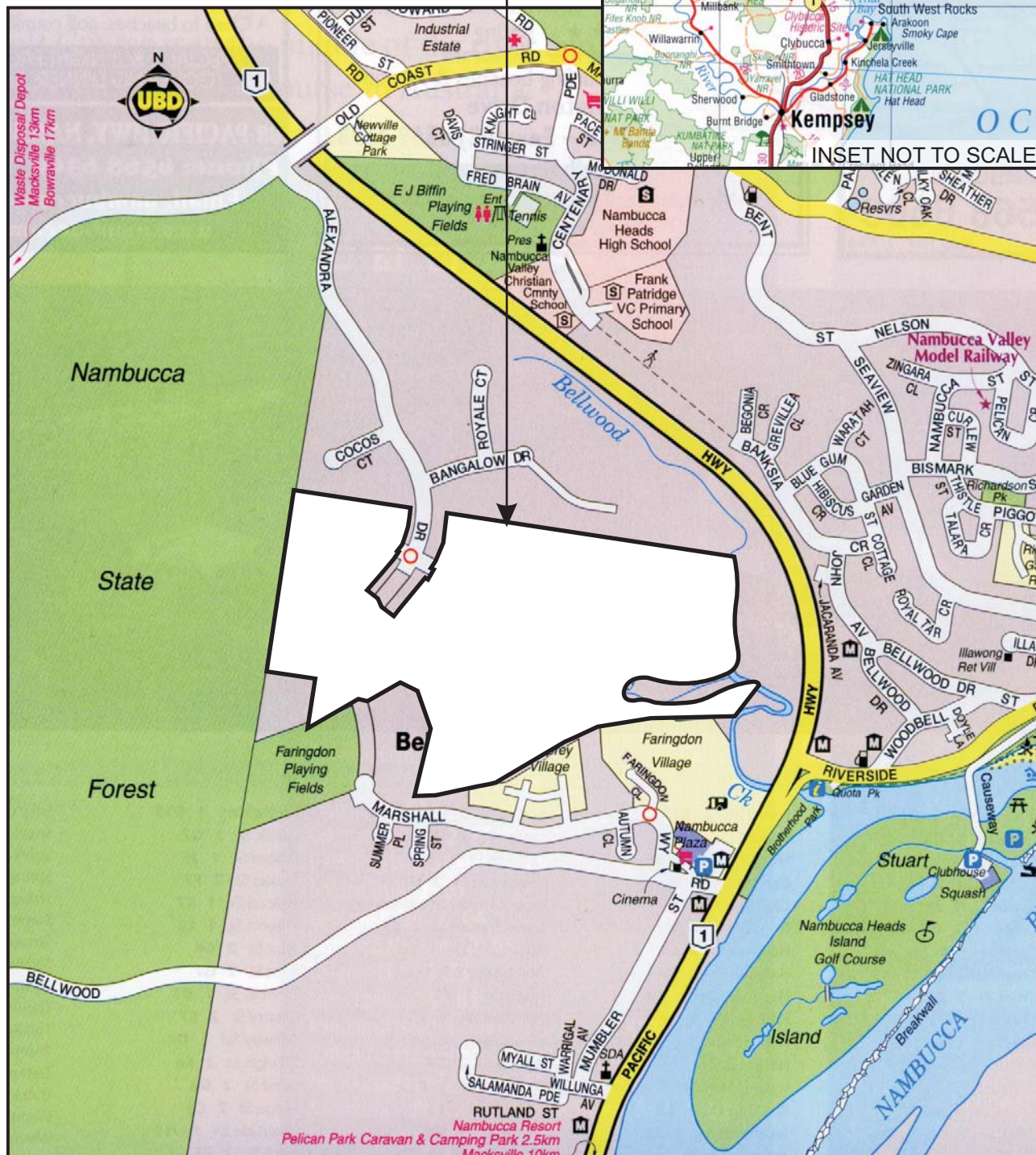


## Flora and Fauna Assessment

---



**SUBJECT SITE**



0 500m

SOURCE: UBD NSW Country Roads Atlas

SCALE: 1 : 15 000 @ A4

**JAMES WARREN & ASSOCIATES PTY LIMITED**  
Environmental Consultants

CLIENT  
Geoff Smyth Consulting  
PROJECT  
Flora & Fauna Assessment  
Lot 2 on DP1119830  
Marshall Way & Alexandra Drive, Bellwood, NSW  
Shire of Nambucca

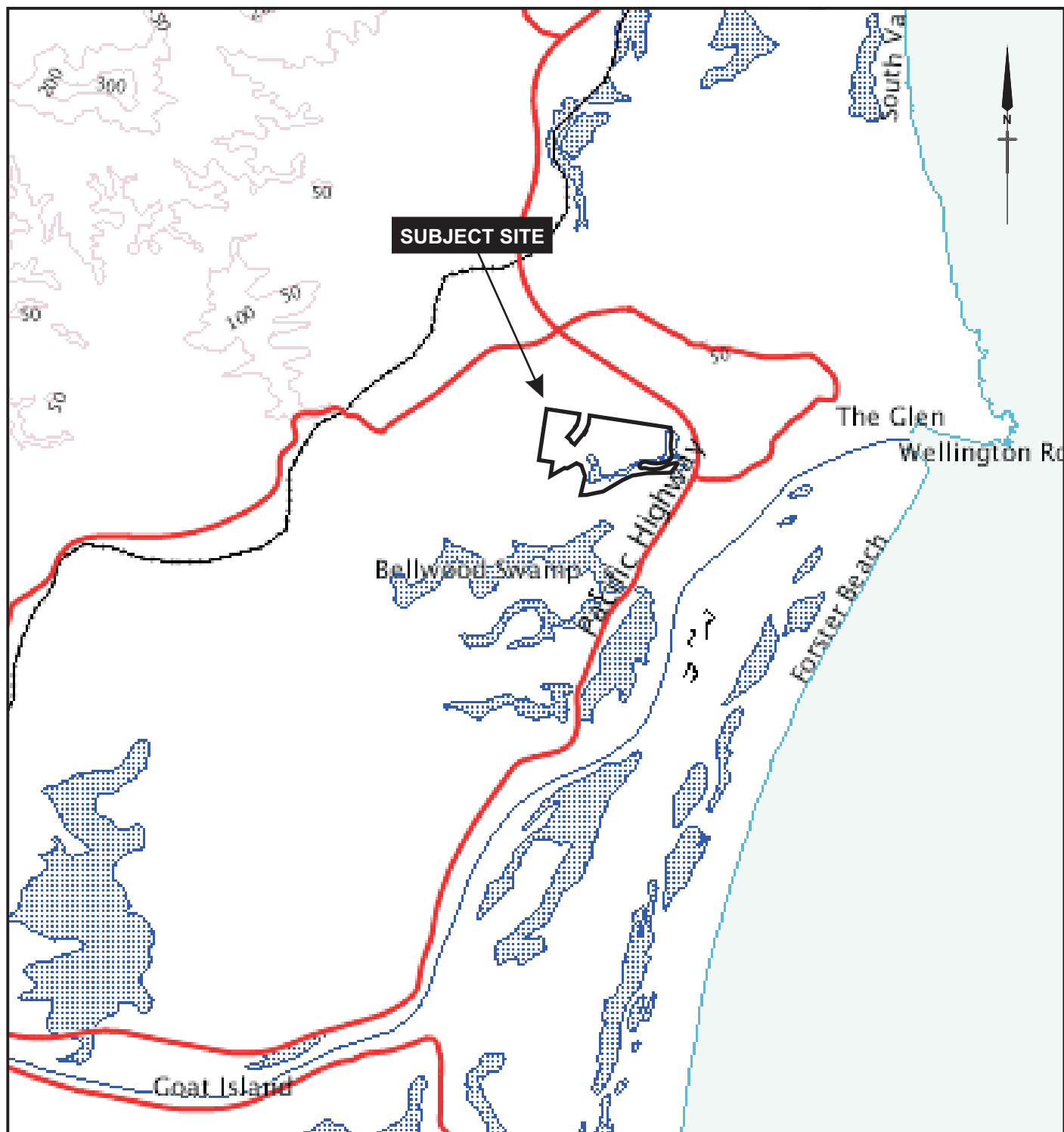
## FIGURE 1

PREPARED: BW  
DATE: 09 March 2010  
FILE: 03038\_Locality.cdr

TITLE

## LOCALITY PLAN





**Legend**  
 SEPP 14 Coastal Wetlands  
 Subject Site

0 500m

SOURCE: NSW Natural Resource Atlas -  
 SEPP 14 Coastal Wetlands (website accessed  
 06.04.09)

SCALE: 1 : 50 000 @ A4

**JAMES WARREN & ASSOCIATES PTY LIMITED**  
 Environmental Consultants

CLIENT  
 Geoff Smyth Consulting  
 PROJECT  
 Flora & Fauna Assessment  
 Lot 2 on DP1119830  
 Marshall Way & Alexandra Drive, Bellwood, NSW  
 Shire of Nambucca

## FIGURE 2A

PREPARED: BW  
 DATE: 09 March 2010  
 FILE: 03038\_SEPP14.cdr



TITLE

**SEPP No. 14  
 COASTAL  
 WETLANDS**





**Legend**

-  Area subject to SEPP No. 14
-  Subject Site

0 50m 100m  
1 : 4000

SOURCE: State Env. Planning Policy No. 14 Coastal Wetlands Map 24 Amend. No. 11 & Map 25 Amend. No.7  
Jan 2009 Aerial (Ref: BELLWOOD JAN 09\_11A\_warp 4)  
SCALE: 1 : 4000 @ A3  
**JAMES WARREN & ASSOCIATES PTY LIMITED**  
Environmental Consultants

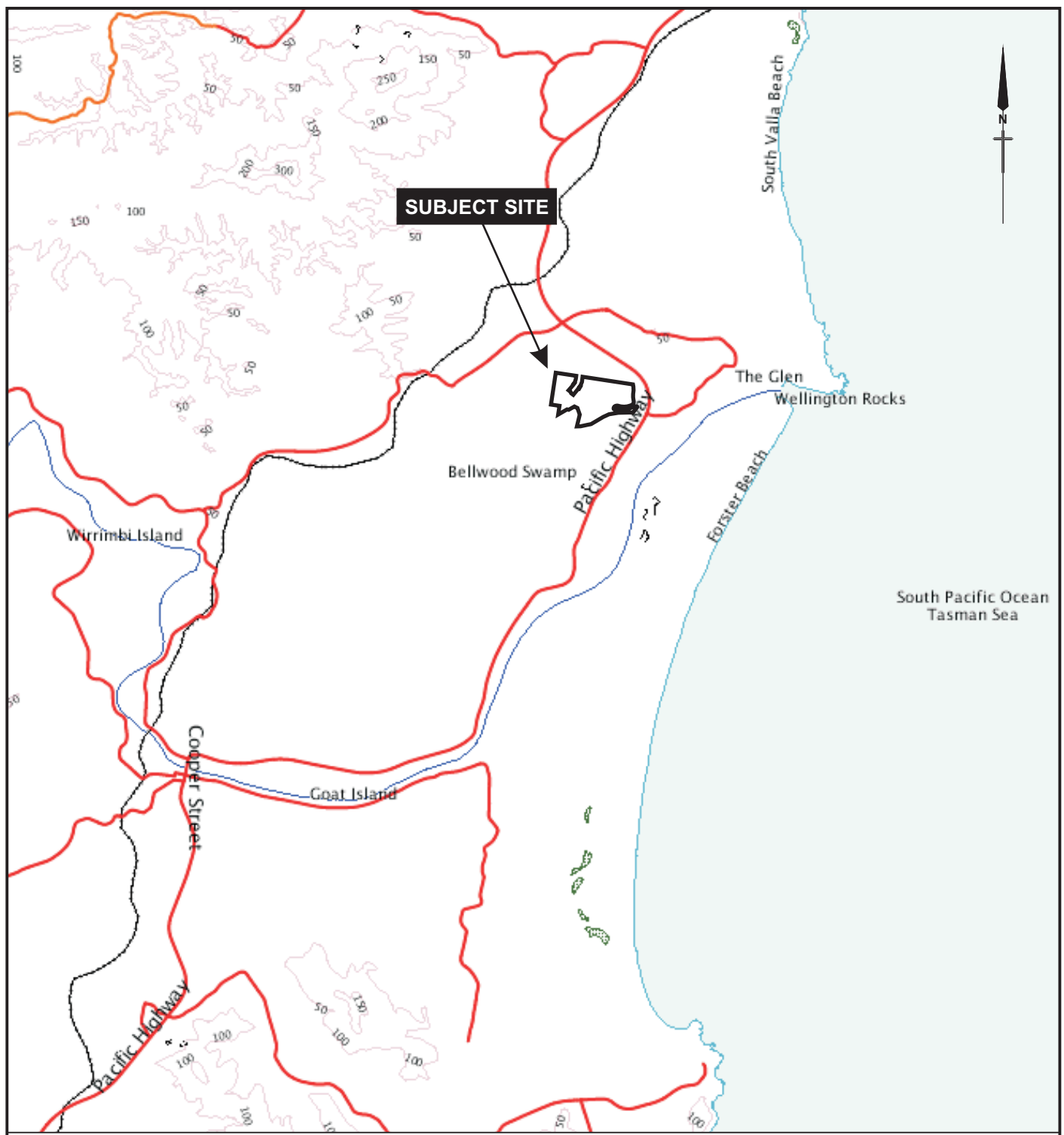
CLIENT  
Geoff Smyth Consulting  
PROJECT  
Flora & Fauna Assessment  
Lot 2 on DP1119830  
Marshall Way & Alexandra Drive, Bellwood, NSW  
Shire of Nambucca

**FIGURE 2B**


PREPARED: BW  
DATE: 09 March 2010  
FILE: 03038\_SEPP14 Site.cdr


TITLE  
**SEPP No. 14  
COASTAL  
WETLANDS**





**Legend**

 SEPP 26 Littoral Rainforest

 Subject Site

0 1km 2km

SOURCE: NSW Natural Resource Atlas -  
SEPP 26 Littoral Rainforests (website accessed  
02.12.08)

SCALE: 1 : 80 000 @ A4

**JAMES WARREN & ASSOCIATES PTY LIMITED**  
Environmental Consultants

CLIENT  
Geoff Smyth Consulting  
PROJECT  
Flora & Fauna Assessment  
Lot 2 on DP1119830  
Marshall Way & Alexandra Drive, Bellwood, NSW  
Shire of Nambucca

### FIGURE 3

PREPARED: BW  
DATE: 09 March 2010  
FILE: 03038\_SEPP26.cdr

TITLE

**SEPP No. 26  
LITTORAL  
RAINFOREST**





**Legend**  
[Red Outline] Subject Site

0 50m 100m  
1 : 4000

SOURCE: January 2009 Aerial Photograph  
(Ref: BELLWOOD JAN 09\_11A\_warp 4)  
SCALE: 1 : 4000 @ A3  
**JAMES WARREN & ASSOCIATES PTY LIMITED**  
Environmental Consultants

CLIENT  
Geoff Smyth Consulting  
PROJECT  
Flora & Fauna Assessment  
Lot 2 on DP1119830  
Marshall Way & Alexandra Drive, Bellwood, NSW  
Shire of Nambucca

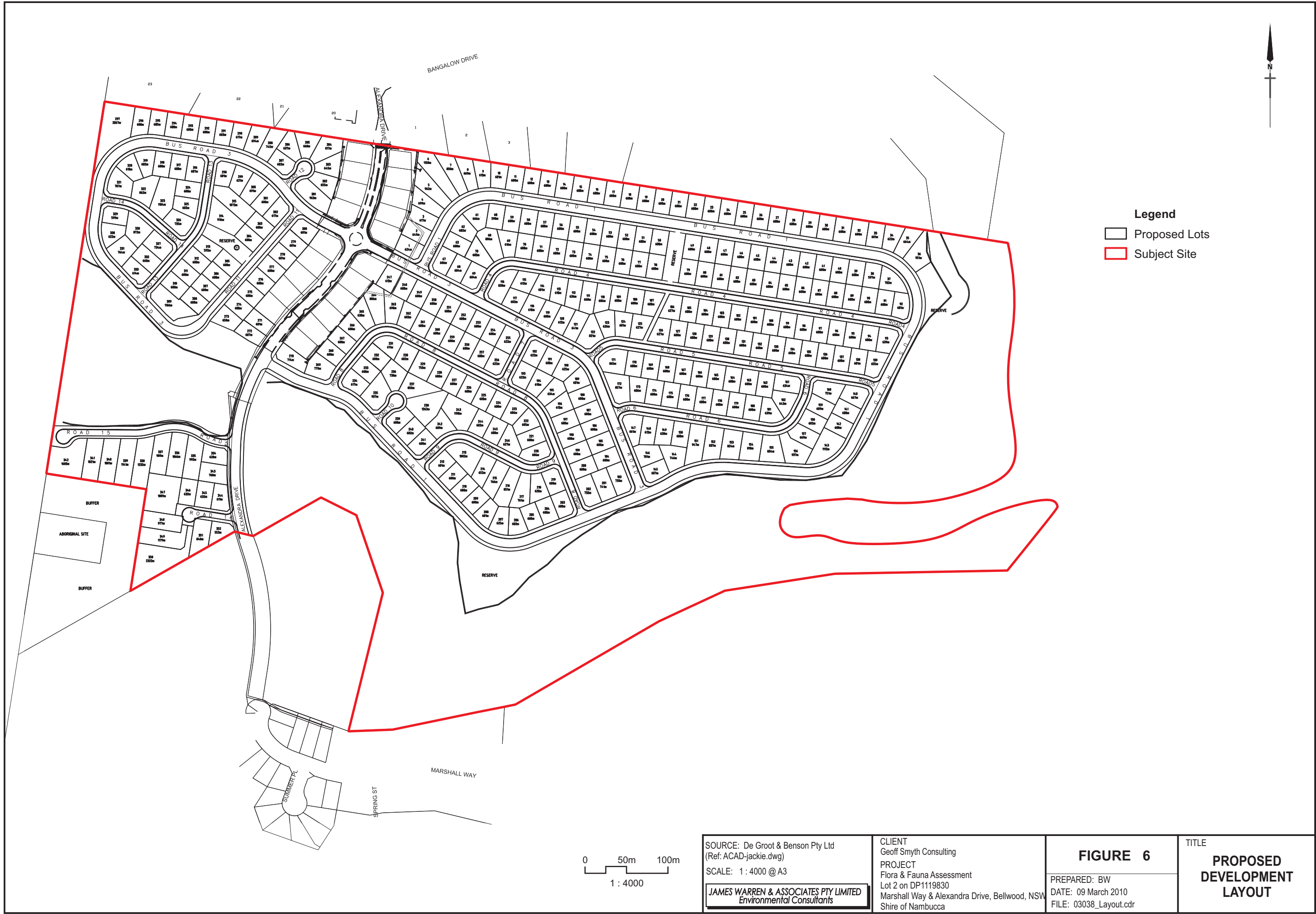
**FIGURE 4**  
PREPARED: BW  
DATE: 09 March 2010  
FILE: 03038\_Aerial.cdr

TITLE  
**AERIAL  
PHOTOGRAPH**









SOURCE: De Groot & Benson Pty Ltd  
(Ref: ACAD-jackie.dwg)

SCALE: 1 : 4000 @ A3

**JAMES WARREN & ASSOCIATES PTY LIMITED**  
Environmental Consultants






CLIENT  
Geoff Smyth Consulting  
PROJECT  
Flora & Fauna Assessment  
Lot 2 on DP1119830  
Marshall Way & Alexandra Drive, Bellwood, NSW  
Shire of Nambucca

PREPARED: BW  
DATE: 09 March 2010  
FILE: 03038\_Layout.cdr





**Legend**

-  Preferred Koala Food Tree Species
-  Potential Koala Habitat
-  Surveyed Edge of Vegetation
-  Track
-  Subject Site

0 50m 100m  
1 : 4000

SOURCE: JWA Site Investigations; Jan 2009  
Aerial (Ref: BELLWOOD JAN 09\_11A\_warp 4)  
SCALE: 1 : 4000 @ A3

**JAMES WARREN & ASSOCIATES PTY LIMITED**  
Environmental Consultants

CLIENT  
Geoff Smyth Consulting  
PROJECT  
Flora & Fauna Assessment  
Lot 2 on DP1119830  
Marshall Way & Alexandra Drive, Bellwood, NSW  
Shire of Nambucca

**FIGURE 7**

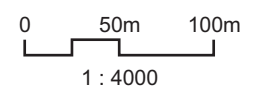
PREPARED: BW  
DATE: 10 March 2010  
FILE: 03038\_Koala.cdr

TITLE  
**POTENTIAL  
KOALA  
HABITAT**





- Legend**
- Preferred Koala Food Tree Species
  - Potential Koala Habitat
  - Surveyed Edge of Vegetation
  - Track
  - Subject Site



SOURCE: JWA Site Investigations; De Groot & Benson Pty Ltd (Ref: ACAD-jackie.dwg); Jan 2009  
Aerial (Ref: BELLWOOD JAN 09\_11A\_warp 4)  
SCALE: 1 : 4000 @ A3  
**JAMES WARREN & ASSOCIATES PTY LIMITED**  
Environmental Consultants

CLIENT  
Geoff Smyth Consulting  
PROJECT  
Flora & Fauna Assessment  
Lot 2 on DP1119830  
Marshall Way & Alexandra Drive, Bellwood, NSW  
Shire of Nambucca

**FIGURE 8**  
PREPARED: BW  
DATE: 10 March 2010  
FILE: 03038\_Impact Koala.cdr

TITLE  
**IMPACT ON  
POTENTIAL  
KOALA HABITAT**





- Legend**
- Endangered Ecological Communities (EEC's)
  - Surveyed Edge of Vegetation
  - Track
  - Subject Site

0 50m 100m  
1 : 4000

SOURCE: JWA Site Investigations; Jan 2009  
Aerial (Ref: BELLWOOD JAN 09\_11A\_warp 4)  
SCALE: 1 : 4000 @ A3  
**JAMES WARREN & ASSOCIATES PTY LIMITED**  
Environmental Consultants

CLIENT  
Geoff Smyth Consulting  
PROJECT  
Flora & Fauna Assessment  
Lot 116 & 117 or Proposed Subdivision of  
Lot 115 DP1057175, Bellwood, NSW  
Shire of Nambucca

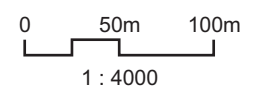
**FIGURE 9**  
PREPARED: BW  
DATE: 09 March 2010  
FILE: 03038\_EEC.cdr

TITLE  
**ENDANGERED  
ECOLOGICAL  
COMMUNITIES**





- Legend**
- Endangered Ecological Communities (EEC's)
  - Surveyed Edge of Vegetation
  - Track
  - Subject Site



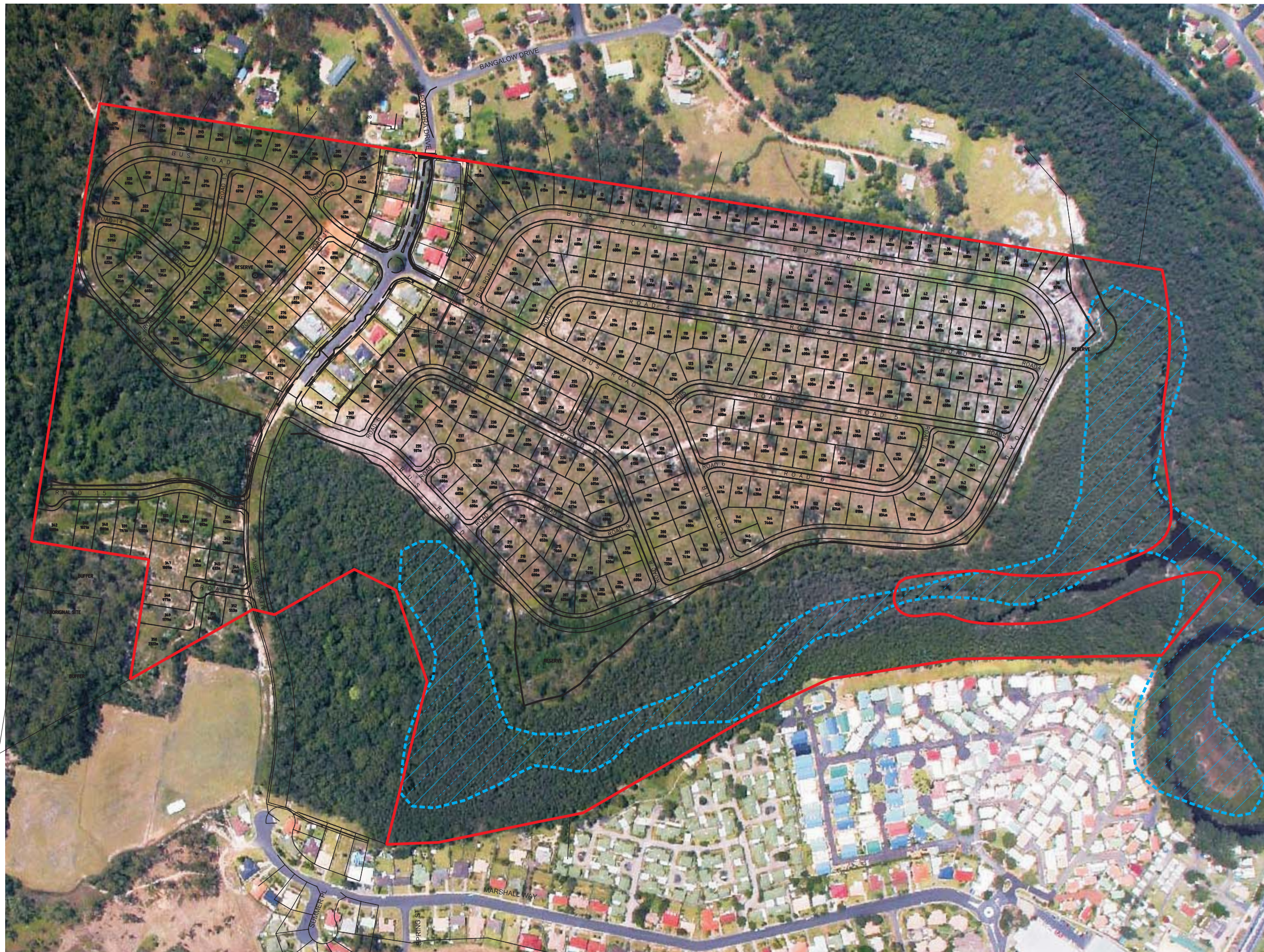
SOURCE: JWA Site Investigations; De Groot & Benson Pty Ltd (Ref: ACAD-jackie.dwg); Jan 2009  
Aerial (Ref: BELLWOOD JAN 09\_11A\_warp 4)  
SCALE: 1 : 4000 @ A3  
**JAMES WARREN & ASSOCIATES PTY LIMITED**  
Environmental Consultants

CLIENT  
Geoff Smyth Consulting  
PROJECT  
Flora & Fauna Assessment  
Lot 116 & 117 or Proposed Subdivision of  
Lot 115 DP1057175, Bellwood, NSW  
Shire of Nambucca

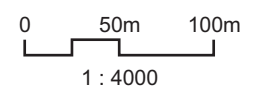
**FIGURE 10**  
PREPARED: BW  
DATE: 09 March 2010  
FILE: 03038\_Impacts EEC.cdr

TITLE  
**IMPACT ON  
ENDANGERED  
ECOLOGICAL  
COMMUNITIES**





- Legend**
- Area subject to SEPP No. 14
  - Subject Site



SOURCE: SEPP No. 14 Coastal Wetlands; De Groot & Benson (Ref: ACAD-jackie.dwg); Jan 2009  
Aerial (Ref: BELLWOOD JAN 09\_11A\_warped 4)  
SCALE: 1 : 4000 @ A3  
**JAMES WARREN & ASSOCIATES PTY LIMITED**  
Environmental Consultants

CLIENT  
Geoff Smyth Consulting  
PROJECT  
Flora & Fauna Assessment  
Lot 2 on DP1119830  
Marshall Way & Alexandra Drive, Bellwood, NSW  
Shire of Nambucca

**FIGURE 11**  
PREPARED: BW  
DATE: 09 March 2010  
FILE: 03038\_Impact SEPP14.cdr

TITLE  
**IMPACT ON  
SEPP No. 14  
COASTAL WETLANDS**





- Legend**
- 1. Dry sclerophyll forests**
- 1(a) Tall closed dry sclerophyll forest  
(*E. pilularis* +/- *C. intermedia* +/- *E. gummifera* +/- *A. costata* +/- *S. glomulifera* +/- *E. racemosa*)
  - 1(b) Tall closed dry sclerophyll forest  
(*E. microcorys* +/- *C. intermedia* +/- *E. gummifera* +/- *A. costata* +/- *S. glomulifera* +/- *E. pilularis*)
  - 1(c) Tall open dry sclerophyll forest  
(*E. pilularis*)
- 2. Swamp sclerophyll forests**
- 2(a) Tall closed swamp sclerophyll forest  
(*E. robusta* +/- *E. microcorys* +/- *E. saligna* +/- *Callistemon salignus* +/- *Melaleuca sieberi*)
  - 2(b) Mid-high closed Paperbark forest  
(*M. quinquenervia* +/- *Melaleuca sieberi* +/- *C. salignus* +/- *E. robusta*)
  - 2(c) Mid-high Swamp she-oak woodland  
(*Casuarina glauca*) +/- *Melaleuca sieberi*)
- 3. Wet sclerophyll forests**
- 3(a) Tall closed wet sclerophyll forest  
(*E. robusta* +/- *C. salignus*) +/- *A. costata* +/- *S. glomulifera* +/- *C. intermedia*)
  - 3(b) Tall closed wet sclerophyll forest  
(*S. glomulifera* +/- *E. gummifera* +/- *E. microcorys* +/- *Lophostemon confertus* +/- *Endiandra sieberi* +/- *L. suaveolens*)
  - 3(c) Tall closed wet sclerophyll forest  
(*E. robusta* +/- *E. microcorys* +/- *E. sieberi* +/- *A. costata* +/- *C. salignus*)
  - 3(d) Mid-high closed wet sclerophyll forest  
(*E. robusta* +/- *S. glomulifera* +/- *A. costata* +/- *E. racemosa* +/- *E. gummifera*)
- 4. Mangroves**
- 4 Low open Mangrove woodland  
(*Aegiceras corniculatum* +/- *Avicennia marina*)
- 5. Disturbed regrowth**
- 5(a) Mid-high disturbed rainforest regrowth  
(*Alphitonia excelsa* +/- *Rhodamnia rubescens* +/- *Cryptocarya microneura* +/- *Glochidion ferdinandi*)
  - 5(b) Low open dry sclerophyll regrowth  
(*E. pilularis*) +/- *A. costata*)
- 6. Clumps of trees/isolated trees**
- 6(a) Clumps of trees/isolated trees - Above 6m  
(*Eucalyptus racemosa* +/- *E. pilularis* +/- *E. microcorys* +/- *Corymbia intermedia* +/- *E. gummifera* +/- *Angophora costata* +/- *Syncarpia glomulifera* +/- *E. robusta* +/- *E. signata*)
  - 6(b) Clumps of trees/isolated trees - Below 6m  
(*Eucalyptus racemosa* +/- *E. pilularis* +/- *E. microcorys* +/- *Corymbia intermedia* +/- *E. gummifera* +/- *Angophora costata* +/- *Syncarpia glomulifera* +/- *E. robusta*)
- 7. Grasslands**
- 7 Mid-high closed grassland  
(*Paspalum dilatatum* +/- *Gahnia clarkei* +/- *Juncus* sp.)
- Other**
- Endangered Ecological Communities (EEC's)
  - Surveyed Edge of Vegetation
  - Track
  - Subject Site

0 50m 100m  
1 : 4000

SOURCE: JWA Site Investigations; De Groot & Benson Pty Ltd (Ref: ACAD-jackie.dwg); Jan 2009  
Aerial (Ref: BELLWOOD JAN 09\_11A\_warp 4)  
SCALE: 1 : 4000 @ A3  
JAMES WARREN & ASSOCIATES PTY LIMITED  
Environmental Consultants

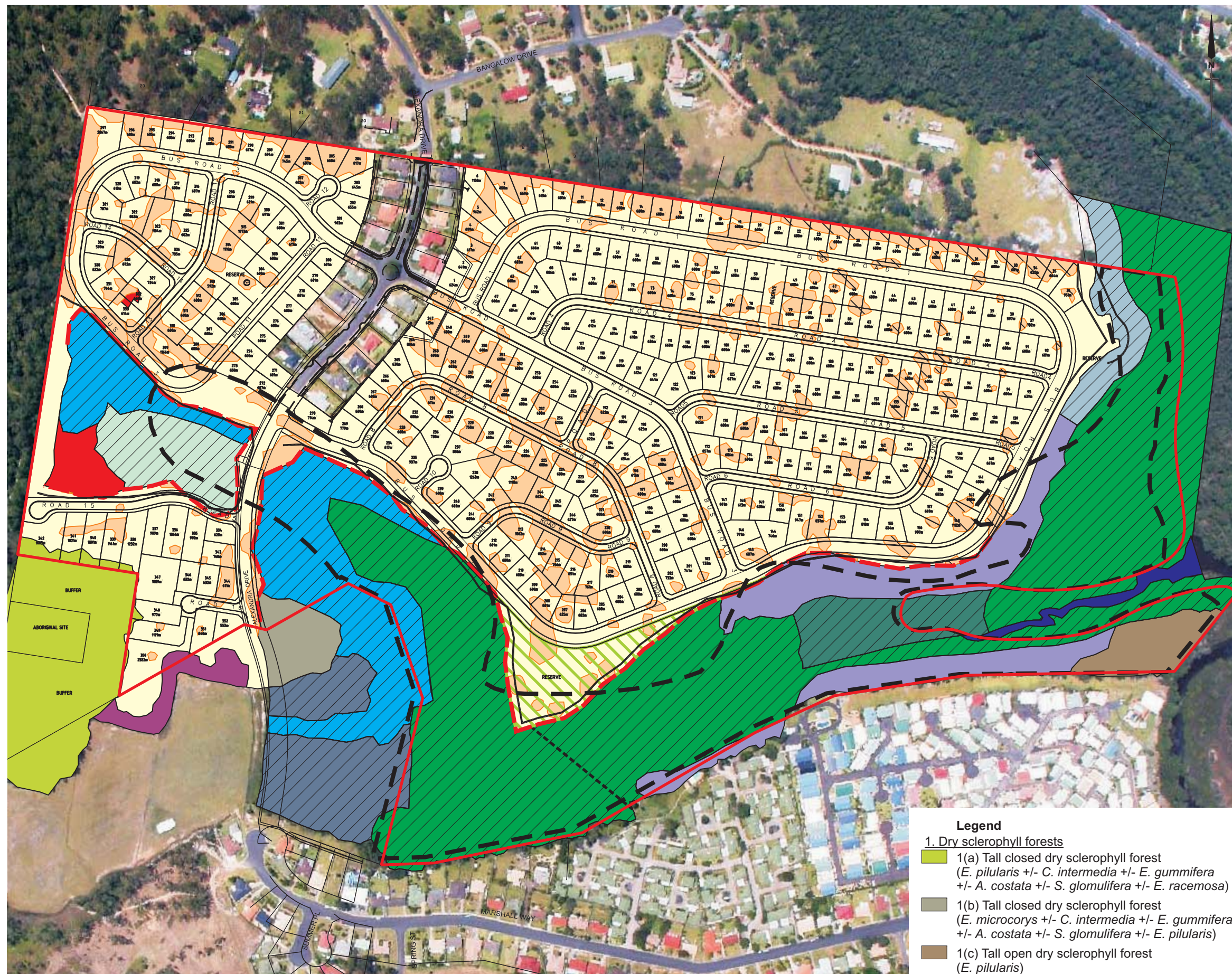
CLIENT  
Geoff Smyth Consulting  
PROJECT  
Flora & Fauna Assessment  
Lot 2 on DP1119830  
Marshall Way & Alexandra Drive, Bellwood, NSW  
Shire of Nambucca

FIGURE 12

PREPARED: BW  
DATE: 09 March 2010  
FILE: 03038\_Impact.cdr

TITLE  
IMPACT ON  
VEGETATION  
COMMUNITIES





0 50m 100m  
1 : 4000

SOURCE: JWA Site Investigations; Nambucca Shire Council; De Groot & Benson (ACAD-jackie.dwg); Jan 2009 Aerial (BELLWOOD JAN 09\_11A\_warped 4)  
SCALE: 1 : 4000 @ A3  
JAMES WARREN & ASSOCIATES PTY LIMITED  
Environmental Consultants

CLIENT  
Geoff Smyth Consulting  
PROJECT  
Flora & Fauna Assessment  
Lot 2 on DP1119830  
Marshall Way & Alexandra Drive, Bellwood, NSW  
Shire of Nambucca

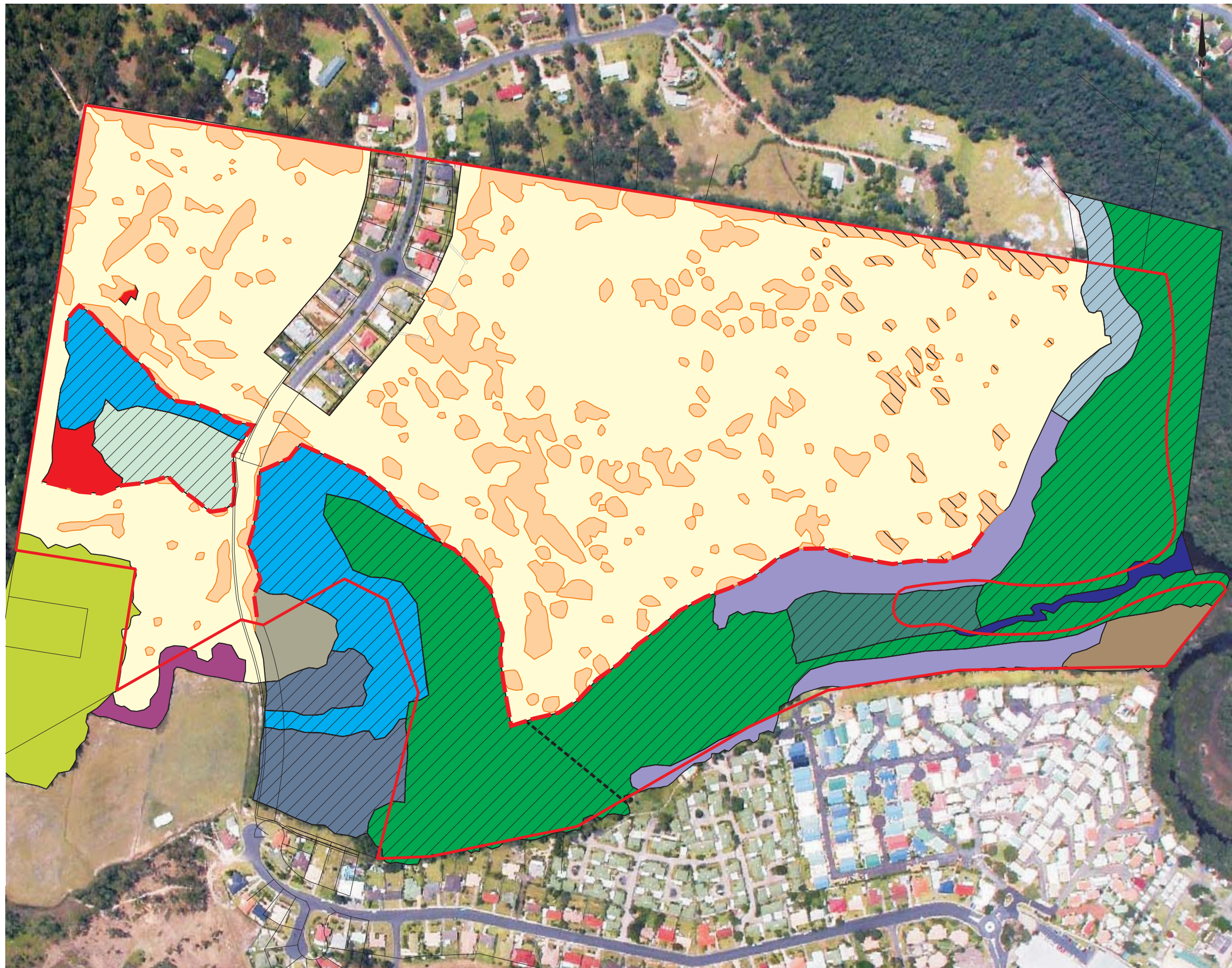
**FIGURE 13**

PREPARED: BW  
DATE: 09 March 2010  
FILE: 03038\_7A Impact.cdr

TITLE

**IMPACT ON  
7A LAND**





- Legend**
- 1. Dry sclerophyll forests**
- 1(a) Tall closed dry sclerophyll forest  
(*E. pilularis* +/- *C. intermedia* +/- *E. gummifera* +/- *A. costata* +/- *S. glomulifera* +/- *E. racemosa*)
  - 1(b) Tall closed dry sclerophyll forest  
(*E. microcorys* +/- *C. intermedia* +/- *E. gummifera* +/- *A. costata* +/- *S. glomulifera* +/- *E. pilularis*)
  - 1(c) Tall open dry sclerophyll forest  
(*E. pilularis*)
- 2. Swamp sclerophyll forests**
- 2(a) Tall closed swamp sclerophyll forest  
(*E. robusta* +/- *E. microcorys* +/- *E. saligna* +/- *Callistemon salignus* +/- *Melaleuca sieberi*)
  - 2(b) Mid-high closed Paperbark forest  
(*M. quinquenervia* +/- *Melaleuca sieberi* +/- *C. salignus* +/- *E. robusta*)
  - 2(c) Mid-high Swamp she-oak woodland  
(*Casuarina glauca*) +/- *Melaleuca sieberi*)
- 3. Wet sclerophyll forests**
- 3(a) Tall closed wet sclerophyll forest  
(*E. robusta* +/- *C. salignus*) +/- *A. costata* +/- *S. glomulifera* +/- *C. intermedia*)
  - 3(b) Tall closed wet sclerophyll forest  
(*S. glomulifera* +/- *E. gummifera* +/- *E. microcorys* +/- *Lophostemon confertus* +/- *Endiandra sieberi* +/- *L. suaveolens*)
  - 3(c) Tall closed wet sclerophyll forest  
(*E. robusta* +/- *E. microcorys* +/- *E. sieberi* +/- *A. costata* +/- *C. salignus*)
  - 3(d) Mid-high closed wet sclerophyll forest  
(*E. robusta* +/- *S. glomulifera* +/- *A. costata* +/- *E. racemosa* +/- *E. gummifera*)
- 4. Mangroves**
- 4 Low open Mangrove woodland  
(*Aegiceras corniculatum* +/- *Avicennia marina*)
- 5. Disturbed regrowth**
- 5(a) Mid-high disturbed rainforest regrowth  
(*Alphitonia excelsa* +/- *Rhodamnia rubescens* +/- *Cryptocarya microneura* +/- *Glochidion ferdinandi*)
  - 5(b) Low open dry sclerophyll regrowth  
(*E. pilularis*) +/- *A. costata*)
- 6. Clumps of trees/isolated trees**
- 6(a) Clumps of trees/isolated trees - Above 6m  
(*Eucalyptus racemosa* +/- *E. pilularis* +/- *E. microcorys* +/- *Corymbia intermedia* +/- *E. gummifera* +/- *Angophora costata* +/- *Syncarpia glomulifera* +/- *E. robusta* +/- *E. signata*)
  - 6(b) Clumps of trees/isolated trees - Below 6m  
(*Eucalyptus racemosa* +/- *E. pilularis* +/- *E. microcorys* +/- *Corymbia intermedia* +/- *E. gummifera* +/- *Angophora costata* +/- *Syncarpia glomulifera* +/- *E. robusta*)
- 7. Grasslands**
- 7 Mid-high closed grassland  
(*Paspalum dilatatum* +/- *Gahnia clarkei* +/- *Juncus* sp.)
- Other**
- Endangered Ecological Communities (EEC's)
  - Surveyed Edge of Vegetation
  - Track
  - Subject Site

0 50m 100m  
1 : 4000

SOURCE: JWA Site Investigations; Jan 2009  
Aerial (Ref: BELLWOOD JAN 09\_11A\_warp 4)  
SCALE: 1 : 4000 @ A3

JAMES WARREN & ASSOCIATES PTY LIMITED  
Environmental Consultants

CLIENT  
Geoff Smyth Consulting  
PROJECT  
Flora & Fauna Assessment  
Lot 2 on DP1119830  
Marshall Way & Alexandra Drive, Bellwood, NSW  
Shire of Nambucca

FIGURE 14

PREPARED: BW  
DATE: 09 March 2010  
FILE: 03038\_Vegetation.cdr

TITLE  
VEGETATION  
COMMUNITIES





- Legend**
- Pitfall Traps
  - Cage Traps
  - Harp Traps
  - Elliott Traps
  - Subject Site

0 50m 100m  
1 : 4000

SOURCE: JWA Site Investigations; Jan 2009  
Aerial (Ref: BELLWOOD JAN 09\_11A\_warp 4)  
SCALE: 1 : 4000 @ A3  
**JAMES WARREN & ASSOCIATES PTY LIMITED**  
Environmental Consultants

CLIENT  
Geoff Smyth Consulting  
PROJECT  
Flora & Fauna Assessment  
Lot 2 on DP1119830  
Marshall Way & Alexandra Drive, Bellwood, NSW  
Shire of Nambucca

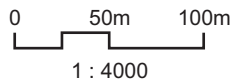
**FIGURE 15A**  
PREPARED: BW  
DATE: 09 March 2010  
FILE: 03038\_Survey 2007.cdr

TITLE  
**SURVEY  
LOCATIONS  
2007**





- Legend**
- Pitfall Traps
  - Cage Traps
  - Harp Traps
  - ANABAT
  - Elliott Traps
  - Arboreal Elliott Traps
  - Hair Tubes
  - Subject Site



SOURCE: JWA Site Investigations; Jan 2009  
Aerial (Ref: BELLWOOD JAN 09\_11A\_warp 4)  
SCALE: 1 : 4000 @ A3

**JAMES WARREN & ASSOCIATES PTY LIMITED**  
Environmental Consultants

CLIENT  
Geoff Smyth Consulting  
PROJECT  
Flora & Fauna Assessment  
Lot 2 on DP1119830  
Marshall Way & Alexandra Drive, Bellwood, NSW  
Shire of Nambucca

**FIGURE 15B**

PREPARED: BW  
DATE: 09 March 2010  
FILE: 03038\_Survey 2004.cdr

TITLE

**SURVEY  
LOCATIONS  
2004**





- Legend**
- Yellow-bellied glider (*Petaurus australis*) call location
  - Glossy black cockatoo (*Calyptorhynchus lathami*) sighting
  - Glossy black cockatoo (*Calyptorhynchus lathami*) chewed cones
  - Approx. Location of Osprey (*Pandion haliaetus*) nest
  - Subject Site

0 50m 100m  
1 : 4000

SOURCE: January 2009 Aerial Photograph  
(Ref: BELLWOOD JAN 09\_11A\_warp 4)  
SCALE: 1 : 4000 @ A3  
**JAMES WARREN & ASSOCIATES PTY LIMITED**  
Environmental Consultants

CLIENT  
Geoff Smyth Consulting  
PROJECT  
Flora & Fauna Assessment  
Lot 2 on DP1119830  
Marshall Way & Alexandra Drive, Bellwood, NSW  
Shire of Nambucca

**FIGURE 16**  
PREPARED: BW  
DATE: 09 March 2010  
FILE: 03038\_Fauna.cdr

TITLE  
**SIGNIFICANT  
FAUNA  
LOCATIONS**