KLEINFELDER
Bright People. Right Solutions.

ecobiological

Flora Fauna and Threatened Species Assessment

Lot 14 DP 258848 Fullerton Cove Road Port Stephens LGA

Prepared for **Fabcot Pty Ltd**

Ref 179-1192

www.ecobiological.com.au

Flora Fauna and Threatened Species Assessment

Final Report

Lot 14 DP 258848 Fullerton Cove Road Port Stephens LGA | Prepared for Fabcot Pty Ltd

Approved By	Approved By
Position	Position
Date	Date

Document Control

Version	Date	Prepared By	Reviewed By
1	22/11/2011	David Paull	Kristy Peters
2.1	31/01/2013	Shawn Capararo / Samara Schulz/ Dan Pedersen	Dan Pedersen
2.2	12/02/2013		
2.3	18/02/2013		

ecobiological

T | 1300 881 869 F | 1300 881 035
P | PO Box 585, Warners Bay NSW 2282
A | 64 Medcalf Street, Warners Bay NSW 2282
ABN 74 114 440 041

www.ecobiological.com.au

Executive Summary

The purpose of this report is to provide further information to Port Stephens Council in relation to the potential environmental impacts of the proposed rezoning of land at 135A Fullerton Cove Road, Fullerton Cove. It accompanies a Planning Proposal Application submitted by Fabcot Pty Ltd for the rezoning of the land to facilitate its development for a supermarket anchored shopping centre.

Kleinfelder/Ecobiological was commissioned by Fabcot Pty Ltd to prepare an assessment of ecological impacts from proposed development of 3.8 ha of land at Lot 14 DP 258848, Fullerton Cove Road, Port Stephens LGA. This report will support an application to Port Stephens Council to re-zone the land to enable development approval.

This report builds on the findings of preliminary ecological investigations undertaken by Ecobiological and lodged with the Planning Proposal application in 2011. It responds to the matters identified by Port Stephens Council in their letter to the applicant dated 12 October 2012, which among other things required more extensive surveys of the site's existing flora and fauna. In response to this analysis, the development footprint has been repositioned to the northern part of the site reducing the extent of vegetation that would need to be cleared as a result of the proposal when compared to the early concept design.

The assessment considered the likelihood of biodiversity offset requirements, and a section has been provided to inform alternate offsetting arrangements.

Field investigations confirmed the presence of the following flora, fauna, and vegetation communities in the Study Area:

- 123 plant species, sub-species or varieties (including 36 exotic). No threatened flora was detected;
- 78 fauna species (including 4 threatened and 3 exotic);
- 3 vegetation communities, two of which are Threatened Ecological Communities (TECs).

Desktop investigations identified additional threatened flora and fauna species recorded or predicted to occur within five kilometres of the Study Area including:

- 13 threatened flora species, five of which had the potential to occur in the type of habitat present on the Study Area;
- 39 threatened fauna species, 12 of which had the potential to occur in the type of habitat present on the Study Area.

Implementing the proposed development will have the following ecological impacts:

- Direct removal of 1.8 ha of Swamp Oak Floodplain Forest Threatened Ecological Community.

- Indirect impacts to retained vegetation including 2 Threatened Ecological Communities.
- No threatened flora or fauna populations will be significantly affected.
- No Matters of National Environmental Significance (MNES) will be affected.

The following actions are recommended to mitigate ecological impacts:

- A Vegetation Management Plan be developed in accordance with the management guidelines outlined in the Port Stephens DCP for submission with any development application;
- An Offset Strategy is developed in accordance with the BioBanking Scheme that contains a package of compensatory measures including off-site protection of a vegetation equivalent to that removed.
- Re-zoning for Lot 14 to include protection of retained vegetation for the conservation of Threatened Ecological Communities and Koala habitat.
- A buffer zone between the development and retained vegetation to reduce indirect impacts on retained vegetation.

Definitions

Arboreal – living in a tree or trees. Contrasted with *terrestrial*, living on the ground; *aquatic*, living in water; *amphibious*, living on land and in the water.

Aquatic – living in the water.

Amphibious – having two distinct life phases, one of which involves living on land and one of which involves living in water.

Conservation status – regarded as the degree of representation of a species or community in formal conservation reserves.

Cryptic – hidden. A cryptic species is one that is difficult to detect in the natural environment.

Development – has the same meaning as in the EP&A Act.

Direct impacts – impacts that directly affect habitat and individuals and include but are not limited to acute death through predation, trampling, poisoning of the organism itself and the removal of suitable habitat.

Distribution – The geographic range of where a species in known to occur.

Diurnal – An animal that is active by day is said to be diurnal.

Habitat – an area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community and includes any biotic or abiotic component. The habitat of a species is usually far less in extent than distribution indicated on a map.

Indirect impacts – occur when project-related activities affect resources in a manner other than a direct loss of the resource. A broad range of impacts need to be considered and include, but are not limited to, killing a species through starvation, exposure, predation by domestic and/or feral animals, loss of breeding opportunities, loss of shade/shelter, deleterious changes in the water table, increased soil salinity, promotion of erosion, inhibition of nitrogen fixation, provision of a suitable seed bed for exotic weed invasion, fertiliser drift, or increased human activity within or directly adjacent to sensitive habitat areas.

Local population – the population that occurs in the Study Area.

Locality – means the area within a 5km radius of the Study Area.

Nocturnal – pertaining to the night. An animal that is active by night is said to be nocturnal.

OEH – NSW Office of Environment and Heritage.

Opportunistic – used, in reference to diet, to denote the eating of any of a wide variety of foods, depending upon their availability. In respect of reproduction, it refers to a pattern of breeding that is linked with irregular favourable conditions (particularly unpredictable rainfall in arid areas) rather than to season.

Riparian – pertaining to the banks of a river.

Risk of extinction – the likelihood that the local population will become extinct either in the short-term or in the long-term as a result of direct or indirect impacts on the viability of that population.

Study Area – Lot 14

Subject species – those threatened and significant species, populations or ecological communities which are known or considered likely to occur in the Study Area.

Subspecies – an interbreeding population within a species, differing measurably from one or more other populations and usually geographically separate from these.

Terrestrial – living on the ground.

Threatening process – a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities. The defintion is not limited to key threatening processes.

Viable – the capacity to successfully complete each stage of the life cycle under normal conditions.

Table of Contents

List of Figures

List of Tables

List of Plates

1. Introduction

1.1. Scope

The purpose of this report is to provide further information to Port Stephens Council in relation to the potential environmental impacts of the proposed rezoning of land at 135A Fullerton Cove Road, Fullerton Cove. It accompanies a Planning Proposal Application submitted by Fabcot Pty Ltd for the rezoning of the land to facilitate its development for a supermarket anchored shopping centre.

Kleinfelder/Ecobiological was commissioned by Fabcot Pty Ltd to identify the flora, fauna and vegetation communities occurring within a 6.8 ha 'Study Area' at Lot 14 DP 258848, Fullerton Cove Road, Port Stephens LGA (**Figure 1**).

This report builds on the findings of preliminary ecological investigations undertaken by Ecobiological and lodged with the Planning Proposal application in 2011. It responds to the matters identified by Port Stephens Council in their letter to the applicant dated 12 October 2012, which among other things required more extensive surveys of the site's existing flora and fauna. In response to this analysis, the development footprint has been repositioned to the northern part of the site reducing the extent of vegetation that would need to be cleared as a result of the proposal when compared to the early concept design.

Further field assessments were conducted in December 2012 to gather the necessary information to satisfy these requirements.

This report details field surveys undertaken to date, presents an inventory of flora and fauna either detected during field surveys, or predicted to occur in the Study Area. Vegetation communities are described and their distribution within in the Study Area mapped. The likelihood of threatened species recorded within a five-kilometre radius occurring within the Study Area is also considered.

A 3.8 ha portion of the Study Area is proposed for development and is referred to as the 'Development Area'. The remainder of Lot 14 will be retained and is referred to as the 'Retained Area'. An assessment of the significance of impacts to flora and fauna arising from the proposal is made. This report will support an application to Port Stephens Council to re-zone the land to enable development approval.

Further to this assessment, **Kleinfelder/Ecobiological** has also been engaged to inform Fabcot Pty Ltd of the sites biodiversity offset potential.

1.2. Description of the Proposal

The proposed development is for a Woolworth Village retail store and car park to be accessed from Fullerton Cove Road, approximately 250 m from the junction with Nelson Bay Road.

Ecological constraints identified within the Study Area were considered in formulating an infrastructure layout and disturbance footprint for the development. **Figure 2** shows the indicative disturbance area being considered at the time of writing.

This assessment considers a scenario that will remove 3.8 ha of the Study Area for the development (Identified Development Area). The remaining **3** ha of the Study Area supports native vegetation and is to be retained (Retained Area).

1.3. Local Context

The Development Area is bound by Fullerton Cove Road to the north-west and cleared land to north-east. A band of bush land 100 to 150 m wide occurs along the south-east boundary and separates the Development Area from Nelson Bay Road (**Figure 2)**. A 50m bush land buffer adjacent to Nelson Bay Road is owned by the NSW Roads and Maritime Services (RMS).

The land is currently zoned 1(a) Rural Agriculture under the Port Stephens Local Environment Plan (2000).

1.4. Geology and Soils

Matthei (1995) identified the majority of Lot 14 as being a swamp landscape type, Lower Pindimar (lp) (**Figure 3**). This is a poorly drained Holocene sand-sheet with slopes less than 3%, low relief and with an elevation between 3 and 6 m. The soils are deep humus Podzols on sandy rises with poorly drained siliceous sands. There is potential for acid sulphate material at depths and potential for seasonal water-logging, high water tables and inundation. Other limitations include inundation hazard, non-cohesive soil, ground water pollution hazard, poor soil fertility and foundation hazard.

A small portion of the lot on the north-western edge is a Beach Landscape (Bobs Farm, bfa) which is a remnant lake shore sand deposit with a higher relief than the swamp landscape (Matthei 1995).

1.5. Legislation

This project was undertaken in accordance with the following Acts and Policies:

- *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- *NSW Threatened Species Conservation Act 1995* (TSC Act);
- *NSW Threatened Species Conservation Amendment Act 2002;*
- *National Parks and Wildlife Act 1974* (NP&W Act);
- *Environmental Planning and Assessment Act 1979* (EP&A Act);
- *Native Vegetation Act 2003* (NV Act);
- State Environmental Planning Policy 44: Koala Habitat Assessment;
- Port Stephens Council Local Environmental Plan 2004;
- Port Stephens Development Control Plan (DCP) 2007.

1.5.1. Environment Protection & Biodiversity Conservation Act 1999 (EPBC Act)

Under the EPBC Act assessment an approval is required for actions that are likely to have a significant impact on matters of national environmental significance. An action includes a project, development, undertaking, activity, or series of activities. When a person proposes to take an action they believe may need approval under the EPBC Act, they must refer the proposal to the Australian Government Minister for Sustainability, Environment, Water, Population and Communities. The Act identifies seven matters of national environmental significance:

- World Heritage properties;
- National heritage places;
- Wetlands of international importance (Ramsar);
- Listed threatened species and communities;
- Migratory species listed under international agreements;
- Commonwealth marine areas; and
- Nuclear actions.

1.5.2. NSW Threatened Species Act 1995 (TSC Act)

Schedules 1 and 2 of the TSC Act contain lists of flora and fauna species and communities, which have been determined by the NSW Scientific Committee as being under threat of serious decline that could ultimately lead to extinction. The TSC Act, pursuant to section 5A of the EP& A Act provides for a seven-part test of significance and impact to be applied to any of these listed species or communities that are found in an area subject to proposed development. Schedule 3 of the TSC Act contains a list of 'key threatening processes' deemed to be processes that have a negative impact on threatened species, populations or communities.

1.5.3. Port Stephens Development Control Plan (DCP) 2007

This control plan contains principles for:

- The management of vegetation:
- Weed control;
- Tree preservation; and
- Mosquito control.

1.5.4. Port Stephens Comprehensive Koala Plan of Management

Koalas are classified as a vulnerable and rare species. Port Stephens Council and the Australian Koala Foundation developed the Port Stephens Comprehensive Koala Plan of Management (CKPoM) to conserve koalas in their existing habitat. The Koala Habitat Planning Map provides the basis for identifying the areas that warrant the highest level of protection.

The Port Stephens Council CKPoM has been prepared in accordance with State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44). The principle aim of the CKPoM and SEPP 44 is to encourage the proper conservation and management of areas 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.

The Plan supersedes the requirements of SEPP 44 for the investigation of potential and core koala habitat and the requirement for preparation of Individual Koala Plans of Management. Effectively, compliance with the Port Stephens Council CKPoM will constitute compliance with SEPP 44 for relevant matters in the Port Stephens LGA.

Any rezoning development consent should comply with the Performance Criteria outlined in Port Stephens Comprehensive Koala Plan of Management Appendix 2 (Performance criteria for rezoning requests).

Figure 1: Locality Map

- Study Area
  Lot 14 DP 258848
- National Parks
- Forests NSW

KLEINFELDER ecobiological

Project Ref:	179-1192
Plot Date:	19/12/2012 10:40
Revision:	001 (gjoyce)

Map Projection:

GDA 1994 MGA Zone 56

Data Sources:

LPI - 2011
OEH - 2012
Bing Maps - 2012
Kleinfelder Ecobiological - 2012

Disclaimer:This is not an official or a legal map but is for informational use only. All data was compiled from the best sources available. All boundaries, scale and geographic points are approximate.

L:\GIS FOLDER\00 CLIENT FILES\179Fabcot Pty Ltd (Woolworths)\1192_FullertonCove\Mapping\179-1192_Fig1_Locality.mxd

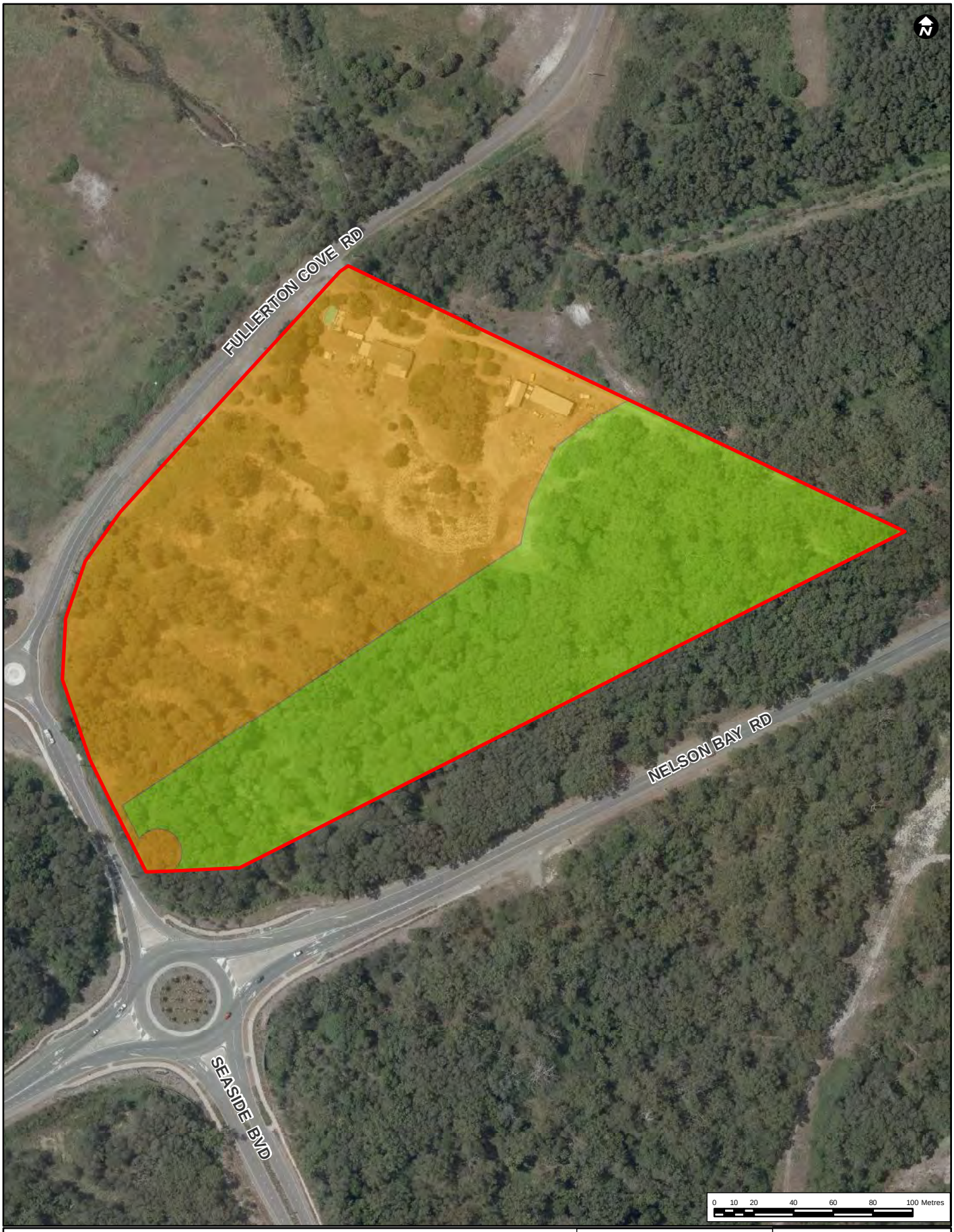


Figure 2: Development Proposal

- Study Area - Lot 14 DP 258848
- Assessed Development Area
- Retained Area

KLEINFELDER ecobiological

Project Ref:	179-1192
Plot Date:	1/02/2013 14:14
Revision:	002 (gjoyce)

Map Projection:

GDA 1994 MGA Zone 56

Data Sources:

LPI - 2012
OEH - 2012
Kleinfelder Ecobiological - 2012

Disclaimer:This is not an official or a legal map but is for informational use only. All data was compiled from the best sources available. All boundaries, scale and geographic points are approximate.

L:\GIS FOLDER\00 CLIENT FILES\179_Fabcot_Woolworths\1192_ FullertonCove\Mapping\179-1192_Fig2_DevelopmentProposal.mxd

2. Desktop Search

2.1. Literature Review

Ecological assessments have been undertaken for the nearby Fern Bay Seaside Village site since 1992 (Clements *et al*. 1992; Gunninah Environmental Consultants 1996 revised 1997; ERM 2004; 2005a; b, c, d, 2009).

Mapping by the Lower Hunter Central Coast Regional Environmental Management Strategy (LHCCREMS, NPWS 2000) has been used as a reference for the vegetation communities in the Study Area.

The Species Impact Statement for the Fern Bay development identified a total of 37 threatened species and one threatened ecological community potentially affected by the proposed development. The SIS assessed the impact of the proposal on these species and concluded that the proposed development has the potential to affect a number of threatened species and communities. The Masked Owl, Powerful Owl, Hoary Wattled Bat, Eastern Freetail-bat, Yellow-bellied Sheathtail-bat, Greater Broad-nosed Bat and Squirrel Glider were considered most likely to be impacted by the proposal, as local populations are present and depend on habitats such as found in the Study Area for their long-term viability (ERM 2005a). The threatened ecological community known as *Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions* occurs within the site (ERM 2005a) as do a high number of hollows and flowering resources. The main vegetation community across the site is Coastal Sand Apple-Blackbutt Forest.

2.2. Threatened Species Database Search

A database search and literature review was conducted prior to field surveys to determine the likelihood of threatened species occurring within the vicinity of the Study Area. The following databases were consulted:

- 5 km radius OEH's Atlas of NSW Wildlife search (http://www.bionet.nsw.gov.au);
- 5 km radius National Herbarium of NSW spatial search for Fullerton Cove (http://plantnet.rbgsyd.nsw.gov.auhttp://www.plantnet.rbgsyd.nsw.gov.au/); and
- 5 km radius SEWPAC's Protected Matters search (www.environment.gov.au/erin/ert/epbc/index.html);

2.3. Significant Flora of the Region

Thirteen threatened flora species have been previously recorded or are predicted to occur within a five-kilometre radius of the Study Area (**Table 1**).

Table 1: Threatened flora recorded or modelled to occur within a five-kilometre radius of the Study Area.

Scientific Name	Common Name	Legal Status		No. of Records
		TSC Act	EPBC Act	
Allocasuarina defungens	Dwarf Heath Casuarina	E	E	-
Diuris praecox	-	V	V	2
Eucalyptus camfieldii	Heart-leaved Stringybark	V	V	2
Eucalyptus parramattensis subsp. *decadens*	Earp's Gum	V	V	7
Maundia triglochinoides	-	V	-	-
Melaleuca biconvexa	Biconvex Paperbark	V	V	-
Persicaria elatior	Knotweed	V	V	-
Phaius australis	Lesser Swamp-orchid	E	E	-
Rulingia prostrata	Dwarf Kerrawang	E	E	-
Streblus pendulinus	Siah's Backbone	-	E	-
Syzygium paniculatum	Magenta Lilly Pilly	E	V	-
Tetratheca juncea	Black-eyed Susan	V	V	-
Zannichellia palustris	-	E	-	-

E = Endangered; V = Vulnerable (NSW TSC Act 1995 & EPBC Act 1999)

2.4. Significant Fauna of the Region

A total of 40 threatened fauna species, comprising three amphibians, 24 birds and 13 mammals were previously recorded or predicted to occur within a five-kilometre radius of the Study Area (**Table 2**). Marine reptiles, birds and mammals identified by databases have been omitted from this list due to unsuitability of habitat in the Study Area.

Table 2: Threatened fauna species recorded or modelled to occur within a five-kilometre radius of the Study Area.

Scientific Name	Common Name	Legal Status		No. of Records
		TSC Act	EPBC Act	
Amphibians				
Crinia tinnula	Wallum Froglet	V	-	2
Litoria aurea	Green and Golden Bell Frog	E	E	6
Mixophyes iteratus	Giant Barred Frog	E	E	-
Birds				
Anthochaera phrygia	Regent Honeyeater	CE	E	-
Botaurus poiciloptilus	Australasian Bittern	E	E	2
Burhinus grallarius	Bush Stone-curlew	E	-	2
Calidris tenuirostris	Great Knot	V	-	27
Charadrius leschenaultii	Greater Sand-plover	V	-	3
Charadrius mongolus	Lesser Sand-plover	V	-	38
Ephippiorhynchus asiaticus	Black-necked Stork	E	-	1
Epthianura albifrons	White-fronted Chat	V	-	21
Glossopsitta pusilla	Little Lorikeet	V	-	1
Haematopus fuliginosus	Sooty Oystercatcher	V	-	1
Haematopus longirostris	Pied Oystercatcher	E	-	11
Hieraaetus morphnoides	Little Eagle	V	-	1
Lathamus discolor	Swift Parrot	E	E	2

Scientific Name	Common Name	Legal Status		No. of Records
		TSC Act	EPBC Act	
Limicola falcinellus	Broad-billed Sandpiper	V	-	8
Limosa limosa	Black-tailed Godwit	V	-	265
Neophema pulchella	Turquoise Parrot	V	-	1
Ninox strenua	Powerful Owl	V	-	5
Pandion cristatus	Eastern Osprey	V	-	1
Ptilinopus magnificus	Wompoo Fruit-Dove	V	-	1
Puffinus carneipes	Flesh-footed Shearwater	V	-	2
Rostratula australis	Australian Painted Snipe	V	V	-
Sterna albifrons	Little Tern	E	-	25
Tyto novaehollandiae	Masked Owl	V	-	3
Xenus cinereus	Terek Sandpiper	V	-	240
Bats				
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	-
Chalinolobus nigrogriseus	Hoary Wattled Bat	V	-	1
Miniopterus australis	Little Bentwing-bat	V	-	4
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-	4
Mormopterus norfolkensis	Eastern Freetail-bat	V	-	4
Myotis macropus	Southern Myotis	V	-	1
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	11
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	11
Terrestrial/Arboreal Mammals				
Dasyurus maculatus maculatus	Spotted-tail Quoll	V	E	-
Petaurus norfolcensis	Squirrel Glider	V	-	12
Phascolarctos cinereus	Koala	V	V	86
Potorous tridactylus	Long-nosed Potoroo	V	V	1
Pseudomys novaehollandiae	New Holland Mouse	-	V	-

CE= Critically Endangered; E = Endangered; V = Vulnerable (NSW TSC Act 1995 & EPBC Act 1999)

2.5. Matters of National Significance

The Protected Matters Search Tool (PMST) identified several other Matters of National Environmental Significance (MNES) (**Table 3**).

Table 3: Other matters modelled to occur within a five-kilometre radius of the Study Area.

Common Name	Status (EPBC Act)
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Ecological Community	Critically Endangered
Fort Wallace NSW	Registered – National Estate
Stockton Rifle Range NSW	Indicative Place – National Estate
Worimi National Park	Nationally Important Reserve
Hunter Estuary Wetlands	Registered – National Estate
Newcastle Bight Coastal Area	Indicative Place – National Estate

2.6. Migratory Species

In addition, a further 41 marine/migratory species were modelled to occur within 5km of the Study Area (**Table 4**). True marine and pelagic species have been omitted due to the unsuitability of habitat in the Study Area. Fullerton Cove which is adjacent to the Study Area is a recognised biological hotspot for wading birds although these species are not likely to use the habitats contained within the Study Area.

Table 4: Migratory Species (EPBC Act Protected Matters Search).

Scientific Name	Common Name	EPBC Listed Marine Species	EPBC Listed Migratory Species						
			Terrestrial	Wetland	Marine	Bonn	Camba	Jamba	RoKamba
Actitis hypoleucos	Common Sandpiper	✓		✓		✓		✓	
Apus pacificus	Fork-tailed Swift	✓			✓		✓	✓	✓
Ardea alba	Great Egret	✓		✓	✓		✓	✓	
Ardea ibis	Cattle Egret	✓		✓	✓		✓		
Arenaria interpres	Ruddy Turnstone	✓		✓		✓	✓	✓	✓
Calidris acuminata	Sharp-tailed Sandpiper	✓		✓		✓	✓	✓	✓
Calidris canutus	Red Knot	✓		✓		✓	✓	✓	✓
Calidris ferruginea	Curlew Sandpiper	✓		✓		✓	✓	✓	✓
Calidris melanotos	Pectoral Sandpiper	✓				✓		✓	✓
Calidris ruficollis	Red-necked Stint	✓		✓		✓	✓	✓	✓
Calidris tenuirostris	Great Knot	✓		✓		✓	✓	✓	✓
Charadrius bicinctus	Double-banded Plover	✓		✓		✓			
Charadrius leschenaultii	Greater Sand Plover	✓		✓		✓	✓	✓	✓
Charadrius mongolus	Lesser Sand Plover	✓		✓		✓	✓	✓	✓
Charadrius ruficapillus	Red-capped Plover	✓							
Gallinago hardwickii	Latham's Snipe	✓		✓		✓	✓	✓	✓
Gallinago megala	Swinhoe's Snipe	✓				✓	✓	✓	✓
Gallinago stenura	Pin-tailed Snipe	✓				✓	✓	✓	✓
Haliaeetus leucogaster	White-bellied Sea-Eagle	✓	✓				✓		
Haliaeetus leucogaster	Grey-tailed Tattler	✓		✓		✓		✓	
Himantopus himantopus	Black-winged Stilt	✓							
Hirundapus caudacutus	White-throated Needletail	✓	✓				✓	✓	
Lathamus discolor	Swift Parrot	✓							
Limicola falcinellus	Broad-billed Sandpiper	✓		✓		✓	✓	✓	✓
Limosa lapponica	Bar-tailed Godwit	✓		✓		✓	✓	✓	✓
Limosa limosa	Black-tailed Godwit	✓		✓		✓	✓	✓	✓
Monarcha melanopsis	Black-faced Monarch	✓	✓			✓			
Merops ornatus	Rainbow Bee-eater	✓	✓					✓	
Myiagra cyanoleuca	Satin Flycatcher	✓	✓			✓			
Numenius madagascariensis	Eastern Curlew	✓		✓		✓	✓	✓	✓
Numenius minutus	Little Curlew	✓		✓		✓	✓	✓	✓
Numenius phaeopus	Whimbrel	✓		✓		✓	✓	✓	✓
Philomachus pugnax	Ruff (Reeve)	✓				✓	✓	✓	✓

Pluvialis fulva	Pacific Golden Plover	✓		✓		✓	✓	✓	✓
Pluvialis squatarola	Grey Plover	✓		✓		✓	✓	✓	✓
Recurvirostra novaehollandiae	Red-necked Avocet	✓							
Rhipidura rufifrons	Rufous Fantail	✓	✓			✓			
Rostratula benghalensis s. lat.	Painted Snipe	✓		✓			✓		
Tringa stagnatilis	Marsh Sandpiper	✓		✓		✓	✓	✓	✓
Anthochaera phrygia	Regent Honeyeater		✓					✓	
Xenus cinereus	Terek Sandpiper	✓		✓		✓	✓	✓	✓

3. Field Survey Methods

Field survey methods targeted at detecting threatened species predicted from desktop investigations and were conducted in winter 2011 and summer 2012.

3.1. Flora

Systematic flora surveys were conducted in accordance with the Threatened Biodiversity Survey and Assessment Guidelines for Developments and Activities (DEC 2004) and the BioBanking Assessment Methodology (DECC 2008). Flora survey effort is depicted in **Figure 3**. All flora species recorded during the survey are listed in **Appendix 1**.

Floristic Quadrats

A total of 6 standard 0.04 ha (20 m x 20 m) floristic quadrats were surveyed for the presence of flora species. Each quadrat was carefully examined to identify all plant species present. Surveys continued until it was confident that no new flora species were present. Cover abundance of flora species within each quadrat was recorded using the modified Braun-Blanquet cover-abundance scale (Poore 1955):

1	<5% cover, less than 5 individuals
2	<5% cover, more than 5 individuals
3	5 – 25% cover
4	26 – 50% cover
5	51 – 75% cover
6	76 – 100% cover

Random Meanders and Targeted Threatened Species Searches

A total of 16 person hours were spent undertaking random meanders over the investigation area. These random meanders included walks between floristic quadrats and time spent mapping vegetation communities. These meandering routes were also used to undertake targeted surveys for threatened flora species identified as occurring in the region.

Targeted surveys for *Maundia triglochinoides, Persicaria elatior* (Knotweed) and *Zannichellia palustris* were conducted on 03/11/11 and 12/12/12; within the flowering period of these species. These surveys were conducted in accordance with the LHCCREMS Flora and Fauna Survey Guidelines (Murray, Bell and Hoye 2002) and the Commonwealth Government survey guidelines for *P. elatior* (DSEWPaS 2012).

Targeted surveys were not conducted for *Diuris praecox* and *Tetratheca juncea* (Black-eyed Susan) as there will not be any direct impacts within areas of potential habitat for these species.

Floristic Identification and Nomenclature

Floristic identification and nomenclature was based on Harden (1992, 1993, 2000 and 2002) with subsequent revisions as published on PlantNet (http://plantnet.rbgsyd.nsw.gov.au). If a plant was unable to be identified using these references or a specimen was potentially rare or threatened, a sample was sent to the National Herbarium of New South Wales Royal Botanic Gardens, Sydney.

3.1.1. Vegetation Community Mapping

The identification of vegetation communities was based on dominant species present in the overstorey, midstorey, shrub and ground layers as recorded in 0.04 ha (20 m x 20 m) floristic quadrats. The species composition of each vegetation community was compared to the vegetation descriptions in Lower Hunter Central Coast Regional Environmental Management Strategy (LHCCREMS, NPWS 2000). In addition, each vegetation community was divided into vegetation formations and classes based on the classification system described by Keith (2004). An equivalent Biometric vegetation type was also assigned to all natural vegetation communities from the DECC Biometric Types Database.

The boundaries of each of the identified vegetation community within the investigation area were mapped using a combination of rapid data points (RDP), ecotone walking and aerial photography interpretation (API). RDPs involved taking waypoints over the investigation area using a hand held Global Positioning System (GPS) and recording the appropriate information. Ecotone walking involved mapping the boundary of vegetation communities using a hand held GPS and using the recorded tracks. The RDPs and ecotone tracks were then overlaid on an aerial photograph and were used in conjunction with API to define vegetation community boundaries.

3.2. BioBanking Assessment

Data was collected on the condition of the native vegetation within sample plots in the Study Area according to the BioBanking Assessment Methodology (Seidel and Briggs 2008). This data can be used to quantify the types and extent of biodiversity credits which may be required to offset impacts from the Development Proposal.

3.3. Koala Habitat Identification

SEPP 44 requires that any development proposals affecting one hectare or more of a property must be evaluated for potential and core Koala habitat. Potential Koala habitat is defined as 'areas of native vegetation where the trees listed in Schedule 2 of SEPP 44 (**Table 5**) constitute at least 15% of the total number of trees in the upper and lower strata of the tree component'.

Should potential Koala habitat be found in the Study Area, further investigation for the existence of core Koala habitat should be undertaken. Core Koala habitat is defined as 'an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population'. If such habitat is found to be present, then a detailed Plan of Management should be prepared for the Koala colony in the area.

Table 5: List of SEPP 44 – Schedule 2 preferred Koala Feed Trees.

Preferred Koala Feed Trees	
Scientific Name	Common Name
Eucalyptus tereticornis	Forest Red Gum
Eucalyptus microcorys	Tallowwood
Eucalyptus punctata	Grey Gum
Eucalyptus viminalis	Ribbon or Manna Gum
Eucalyptus camaldulensis	River Red Gum
Eucalyptus haemastoma	Broad-leaved Scribbly Gum
Eucalyptus signata	Scribbly Gum
Eucalyptus albens	White Box
Eucalyptus populnea	Bimble Box or Poplar Box
Eucalyptus robusta	Swamp Mahogany

3.3.1. Port Stephens CKPoM

The Port Stephens CKPoM map has been observed in relation to the study area and the locaility.

Further ground truthing of the vegetation type on the study site was undertaken in June 2011, and a site specific Koala Habitat Planning Map was drafted in accordance with CKPoM mapping priciples. The proposal assessment will detail the impacts and satisfy the items listed in PSC CKPoM Appendix 2.

3.4. Fauna

Surveys for fauna were undertaken in accordance with the Threatened Species Survey and Assessment guidelines (**Table 6**); field survey methods for fauna – Amphibians (DECC 2009) and the Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (DEC 2004).

Fauna surveys were stratified across the two structural formation types occurring in the Study Area: Dry Schlerophyll Forest and Forested Wetlands.

Table 6: Summary of fauna survey effort.

Method	Winter 2011		Summer 2012	
	Sample Period	Total Effort	Sample Period	Total Effort
Ground Elliott A Size Traps	-	-	4 Nights	202 Trap Nights
Arboreal Elliot B Size Traps	-	-	4 Nights	48 Trap Nights
Ground Elliot B Size Traps	-	-	4 Nights	82 Trap Nights
Cage Traps	-	-	4 Nights	24 Trap Nights
Anabat	1 Night	8 Detecting Hours	3 Nights	56 Detecting Hours
Harp Traps	-	-	3 Nights	9 Trap Nights
Spotlighting	2 Nights	2 Hours	4 Nights	4 Hours
Call Playback	2 Nights	2 Hours	4 Nights	3 Hours
Bird Survey	2 Mornings	2 Hours	2 Mornings	2 Hours
Diurnal Frog/Reptile Search	-	-	2 Days	8 Hours
Noctural Frog Search	2 Nights	4 Hours	2 Nights	4 Hours

3.4.1. Arboreal Mammals

'B' sized Elliott traps were placed in trees approximately 3m above the ground over four nights and checked daily in Summer 2012 (**Table 6**). The trunks of trees containing traps were sprayed with a mixture of honey and water.

Nocturnal spotlight surveys were also undertaken from dusk for a one hour periods on 2 nights in winter 2011 and four nights in summer 2012. After dark calls of threatened mammal species (Koala and Squirrel Glider) were broadcast over a megaphone in an attempt to elicit a response.

3.4.2. Terrestrial Mammals

'A' and 'B' sized Elliott traps and cage traps were placed at regular intervals along two transect for four nights and checked each morning.

Indirect signs of fauna activity such as diggings, droppings or scratch marks were noted during daytime searches.

3.4.3. Bats

Harp traps were placed in each vegetation formation across potential flight microbat flight paths for three consecutive nights in Summer 2012. In addition, Anabat II bat-call recorders (Titley Electronics, Ballina) were used to record the calls of any Microchiropteran bats feeding in the area. Units were set up at dusk and recording occurred automatically throughout the night (minimum 8 hrs detecting time). Spotlighting searches of blossoming trees were undertaken to identify any Megachiropteran bat species.

3.4.4. Birds

The site was surveyed for one hour over two mornings in both the winter and summer survey periods using a random meander technique. These surveys were inclusive of all community types within the site. Walking searches were difficult within the eastern portion of the Study Area due to the depth of water. However, visual searches using binoculars and listening for calls was undertaken on the edge of these freshwater wetland areas. Birds were identified either visually, with the aid of binoculars, or by call interpretation.

Additional targeted bird surveys were carried out in November 2011 to address seasonality and detectability issues for the Australasian Bittern and diurnal species such as the Fruit-Doves and the following migratory species (Rufous Fantail, Latham's Snipe, Painted Snipe (generally more active at dusk), Black-faced Monarch, Satin Flycatcher and Rainbow Bee-eater). Playback of pre-recorded calls of each of the Fruit-Dove species were used to supplement the standard diurnal search. Playback of pre-recorded calls of the Australasian Bittern were used to supplement the standard nocturnal searches, followed by spotlighting searches of the Study Area.

After dark calls of threatened owl species (Powerful Owl, Barking Owl, Sooty Owl, and Masked Owl) were broadcast over a megaphone to encourage a call back or fly in response. Surveys were carried out for 2 nights in winter and 4 nights in summer for one hour each night. A 2-5-minute listening period followed each 2-5 minute call playback, to determine any response. At the end of call playbacks, the Study Area was spotlighted to ascertain whether any mammals or owl species had become active or flown into perch in trees within the area.

3.4.5. Amphibians

Diurnal and nocturnal searches were conducted for set time intervals to detect the presence of amphibian species within the Study Area in Summer 2012. Diurnal searches involved actively searching suitable habitat as well as moving rocks, logs and rubbish. Nocturnal surveys involved spotlight searches in areas of suitable habitat. Adult frogs encountered were identified by visual morphological characteristics. In addition, a quiet listening period was carried out at various locations within the site to detect species by their distinct advertisement call during both Winter 2011 and Summer 2012.

3.4.6. Reptiles

Searches for reptiles in the Study Area were conducted on two separate warm days in summer 2012. Searches were conducted during the middle to late afternoon when temperatures were warm and reptiles more active. Suitable habitat such as rocks, hollow logs, coarse woody debris, leaf litter and dumped rubbish were overturned or broken open. Reptiles encountered were identified by visual morphological characteristics.

3.5. Biodiversity Offset Strategy Methodology

Biodiversity offsetting is a prescribed methodology and land planning arrangement that has been developed to mitigate the residual impact of a development. The offsetting principle arises from the Improve and Maintain outcomes through Avoid impact – Mitigate impact – Offset impact heirachy, whereby if avoidance and mitigation have residual ecological impact, offsetting may be a viable scenario.

Port Stephens Council has not requested a full Biobanking Assessment at this stage of the planning process (Correspondence 12/10/12). A strategy is presented in this report (7.3) to satisfy anticipated requirements for Biodiversity Offsetting under the proposal.

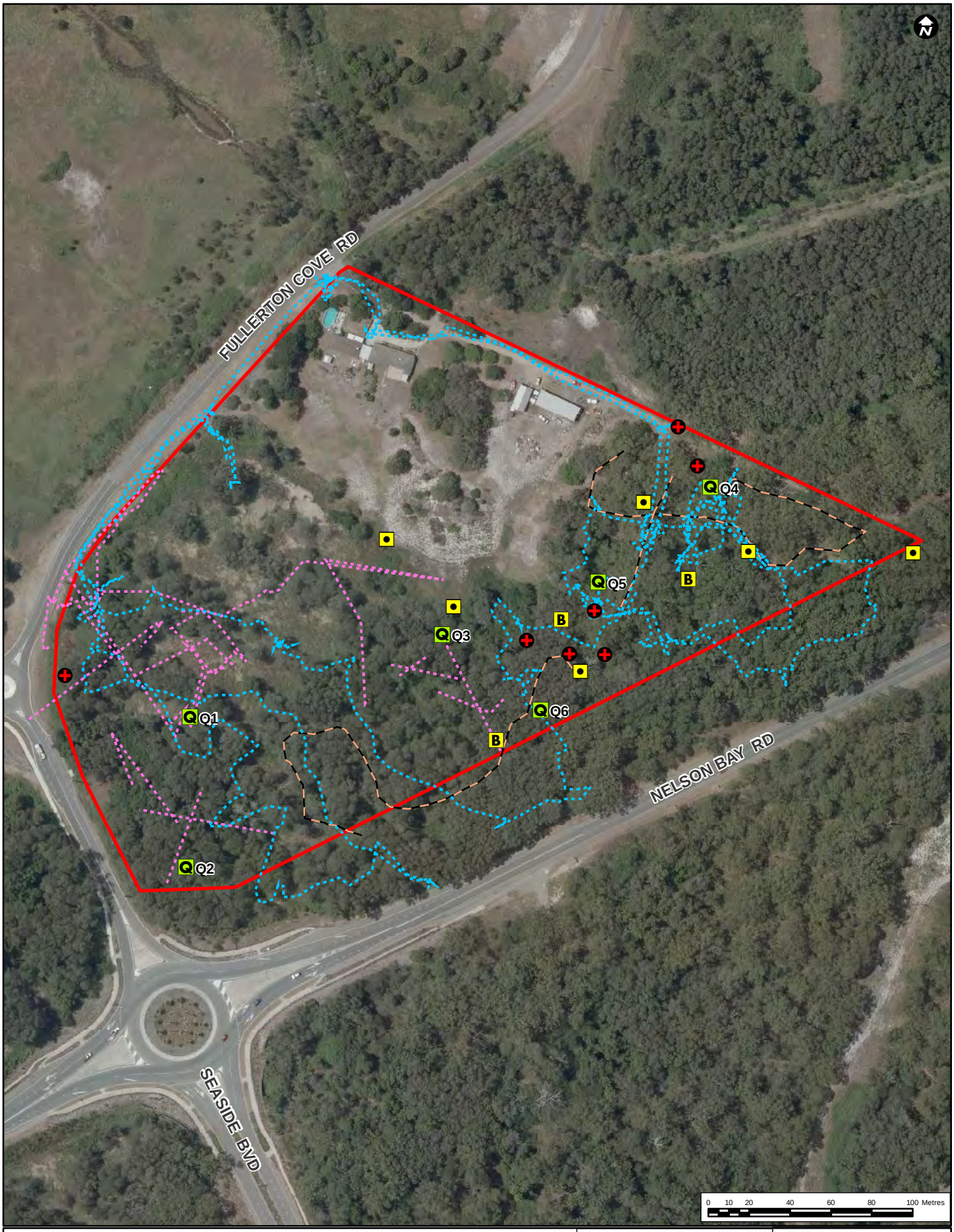


Figure 3: Flora & Fauna Survey Effort

Study Area
Lot 14 DP 258848

Flora Survey Effort
- 2011 Threatened Species Search
- 2012 Threatened Species Search
- Flora Quadrats

Fauna Survey Effort
- Trapping Transect
- Anabat
- Owl Call Playback
- Harp Trap

KLEINFELDER ecobiological

Project Ref:	179-1192
Plot Date:	19/12/2012 10:45
Revision:	001 (gjoyce)

Map Projection:
GDA 1994 MGA Zone 56

Data Sources:
LPI - 2012
OEH - 2012
Kleinfelder Ecobiological - 2012

Disclaimer:This is not an official or a legal map but is for informational use only. All data was compiled from the best sources available. All boundaries, scale and geographic points are approximate.

L:\GIS FOLDER\00 CLIENT FILES\179Fabcot Pty Ltd (Woolworths)\1192_FullertonCove\Mapping\179-1192_Fig3_SurveyEffort.mxd

4. Field Survey Results

4.1. Weather Conditions and Survey Activities

The prevailing weather conditions throughout the winter period in the Study Area were cool with considerable precipitation. The mean minimum and maximum temperatures were 5 ^{o} C and 19^{o} C respectively during this period. Surveys undertaken in spring and summer were subject to warm daytime and mild night-time conditions with moderate precipitation. The mean minimum and maximum temperatures during this period were 16.4 ^{o}C and 27.2 ^{o} C respectively.

A full list of survey activities and weather conditions during the survey period are provided in **Table 7**.

Table 7: Schedule of activities and weather conditions during the survey period.

Date	Weather Conditions	Flora			Fauna							
		Quadrats	Transect	Targeted TS	Spotlighting	Call playback	Anabat	Birds Survey	Nocturnal frog	Targeted bird	Diurnal Frog/reptile	Trapping
27/06/12	Cool with clear conditions Mild and clear night	X	X	X				X				
28/06/11	Cool with clear conditions Mild and clear night	X	X	X				X				
29/06/11	Cool with light rain				X	X			X			
2/7/11	Cool with light rain; Mild and clear night					X	X		X			
03/11/11	Warm day with a Mild night			X						X		
12/12/12	Warm day with light rain (heavy rain previous day).											
10/12/12	Overcast and moderate to heavy rain											X
11/12/12	Cool with light rain				X	X			X		X	X
12/12/12	Warm and clear	X	X	X	X	X					X	X
13/12/12	Warm and clear				X	X		X	X		X	X
14/12/12	Mild to warm							X				
17/12/12	Warm and clear				X	X						

4.2. Flora

A total of 123 flora species were detected in the Study Area from field surveys, and subsequent specimen analysis (**Appendix 1**); including 87 native and 36 exotic species. Of these exotic species one is classed as a Noxious Weed in NSW (Annual Ragweed) while three are Noxious within Port Stephens LGA (Blackberry, African Boxthorn, and Lantana) under the *Noxious Weeds Act 1993*. Five exotic species are also listed as Weeds of National Significance (WONS) under the National Weeds Strategy including: Bitou Bush, Lantana, African Boxthorn, Blackberry and Fireweed.

No threatened species were detected during the field surveys conducted in 2011 and 2012.

4.3. Vegetation Community Types

The Study Area contains three native vegetation communities; there is also a highly modified area in the north of the site:

- Swamp Oak Forest (SOF) (3.1 ha);
- Swamp Mahogany – Paperbark Forest (SMPB) (0.6 ha);
- Coastal Sand Apple – Blackbutt Forest (CSAB) (1.0 ha);
- Disturbed lands (2.1 ha)

These vegetation communities are outlined in **Appendix 2**, and their distribution within the site shown in **Figure 4**.

Historical aerial photography from 1954 held by Port Stephens Council indicated that Freshwater Wetland Complex was present across the site. This community has not been mapped within the site due to the presence of regenerating Swamp Oak Forest. Although small patches of the community are dominated by *Typha orientalis* and lack canopy cover they have been considered part of the surrounding Swamp Oak Forest, this is discussed within the Swamp Oak Forest community profile in **Appendix 2**.

4.3.1. Summary of Vegetation Communities in Study Area

The proposed development will impact on approximately 1.8 ha of the Swamp Oak Forest and 2.0 ha of the disturbed lands within the Study Area. The other two native vegetation communities will not be directly impacted. **Table 8** outlines the areas of vegetation within and outside the proposed Development Area:

Table 8: Extent of vegetation communities within the Study Area.

Vegetation Community	Development Area (ha)	Retained Area (ha)
Swamp Oak Forest	1.8	1.3
Swamp Mahogany – Paperbark Forest	-	0.6
Coastal Sand Apple – Blackbutt Forest	-	1.0
Disturbed Land	2.0	0.1
Total	**3.8**	**3.0**

4.4. BioBanking Assessment

Results of the BioBanking Assessment are presented in **Table 9** below.

Table 9: BioBanking site value data for Development Area.

Characteristics	Quadrats					
	Q1	Q2	Q3	Q4	Q5	Q6
Overstorey Cover	11%	68%	28%	25.50%	37%	39%
Midstorey Cover	0%	30%	3%	4%	13%	0%
Ground Cover (Grasses)	0%	56%	12%	6%	10%	18%
Ground Cover (Shrubs)	2%	32%	20%	20%	76%	40%
Ground Cover (Other)	98%	94%	96%	88%	80%	92%
Exotic	24%	44%	60%	100%	64%	4%
Number of Hollow Bearing Trees	0	0	0	3	3	0
Total Lengths of Fallen Timber	0	0	0	10	15	0
Plant Species Diversity	19	24	18	39	35	19

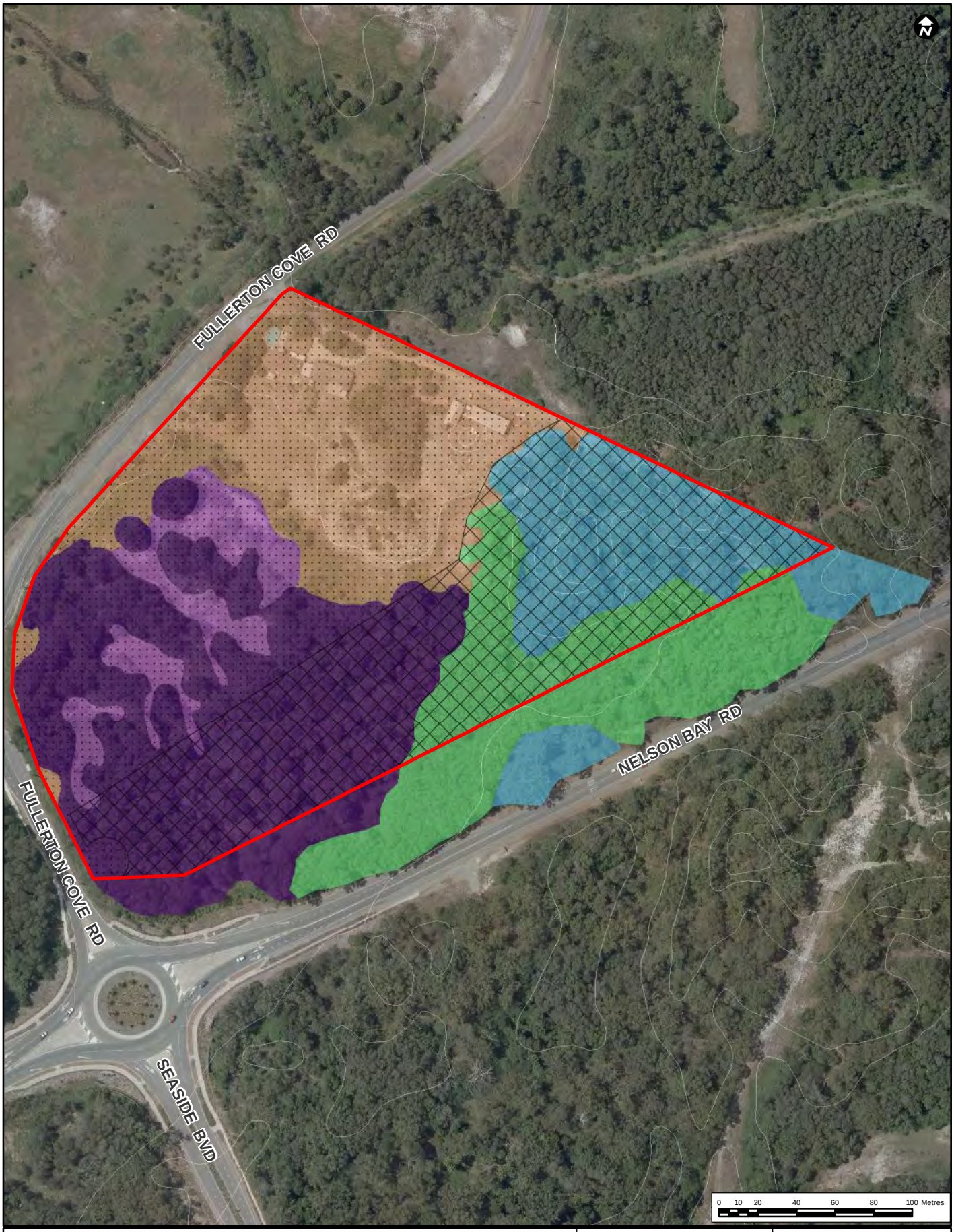


Figure 4: Vegetation Communities

Legend

Study Area
Lot 14 DP 258848
Assessed Development Area
Retained Area

Vegetation Community

- Swamp Oak Forest - Swamp Oak Dominated - EEC
- Swamp Oak Forest (Typha Dominated) - EEC
- Coastal Sand Apple - Blackbutt Forest
- Swamp Mahogany - Paperbark Forest -EEC
- Disturbed

KLEINFELDER ecobiological

Project Ref:	179-1192
Plot Date:	1/02/2013 14:18
Revision:	002 (gjoyce)

Map Projection:
GDA 1994 MGA Zone 56

Data Sources:
LPI - 2012
OEH - 2012
Kleinfelder Ecobiological - 2012

Disclaimer:This is not an official or a legal map but is for informational use only. All data was compiled from the best sources available. All boundaries, scale and geographic points are approximate.

L:\GIS FOLDER\00 CLIENT FILES\179_Fabcot_Woolworths\1192_FullertonCove\Mapping\179-1192_Fig4_VegetationCommunities.mxd

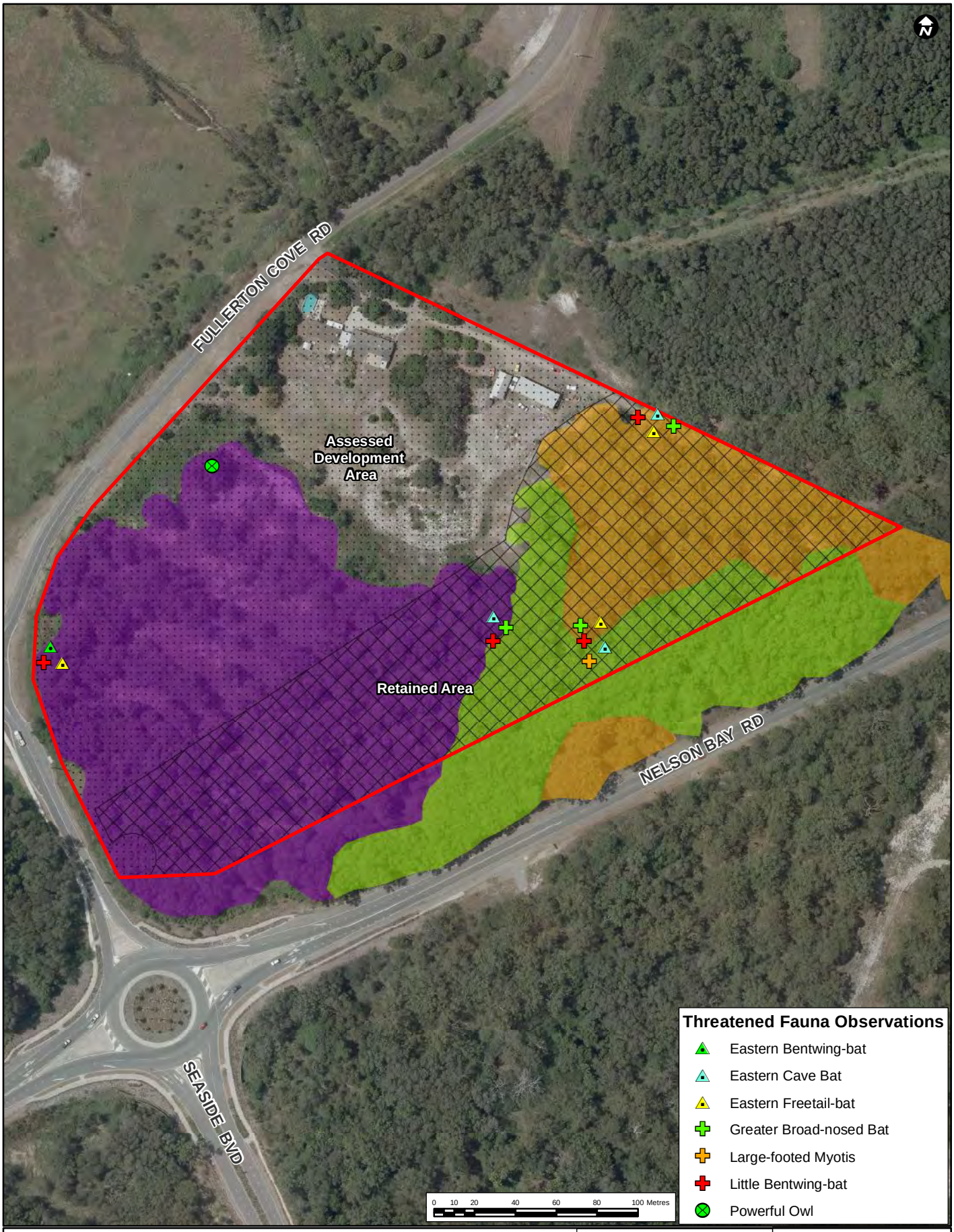


Figure 5: Site Constraints

- Study Area - Lot 14 DP 258848
- Swamp Oak Forest - EEC
- Preferred Koala Habitat
- Supplementary Koala Habitat

KLEINFELDER ecobiological

Project Ref:	179-1192
Plot Date:	19/12/2012 15:49
Revision:	001 (gjoyce)

Map Projection:
GDA 1994 MGA Zone 56

Data Sources:
LPI - 2012
OEH - 2012
Kleinfelder Ecobiological - 2012

Disclaimer:This is not an official or a legal map but is for informational use only. All data was compiled from the best sources available. All boundaries, scale and geographic points are approximate.

L:\GIS FOLDER\00 CLIENT FILES\179Fabcot Pty Ltd (Woolworths)\1192_FullertonCove\Mapping\179-1192_Fig5_SiteConstraints2.mxd

4.5. Koala Habitat Assessment

4.5.1. SEPP 44

The Koala Spot Assessment Technique (SAT) (ACF, 2009) was not applied as there were no preferred feed trees in the Development Area and only scattered individuals of *Melaleuca quinquinerva*, another tree species Koala is known to feed on. The Development Area was therefore considered to provide only marginal habitat for Koala. Preferred and Supplementary Koala Habitat exists on Lot 14 outside of the Development Area and in the Retained Area (**Figure 5**):

- 0.6 ha of Preferred Koala habitat (Swamp Sclerophyll Forest); and
- 1 ha of Supplementary Koala habitat (Coastal Sand Apple –Blackbutt forest).

4.5.2. CKPoM

Preliminary assessment: The study area and surrounding vegetation is considered (CKPoM Koala Habitat Planning Map) as Supplementary Koala habitat with identified areas of Preferred habitat to the south and west (greater than 800m from study area).

Vegetation mapping: Site specific vegetation mapping has provided an independent map showing:

- 0.6 ha of Preferred Koala habitat (Swamp Sclerophyll Forest); and
- 1 ha of Supplementary Koala habitat (Coastal Sand Apple –Blackbutt forest).

Koala habitat identification: A site specific Koala habitat map has been produced and is detailed in **Figure 6**.

Assessment of proposal: The rezoning application does not result in development within areas of prefferred Koala habitat or defined habitat buffers. The development footprint is located within 50m of identified preferred Koala habitat.

No Supplementary Koala habitat or habitat linking areas would be impacted.

No preferred Koala food trees will be removed.

The layout for development would not sever Koala movement across the site. The site is a peninsula from the to the north, and the retained area vegetation and roadside vegetation width exceeds 100m. The existing road layout (Fern Bay Road, Nelson Bay Road) are significant corridor breaks that limit this site as a suitable Koala corridor.

Summary: the proposed development is unlikely to have a significant impact upon the Koala.

Figure 6: Site Specific Koala Habitat

- Study Area - Lot 14 DP 258848
- Preferred Koala Habitat / Swamp Mahogany Paperbark Forest -EEC
- Swamp Oak Forest - Swamp Oak Dominated - EEC
- Supplementary Koala Habitat

KLEINFELDER ecobiological

Project Ref:	179-1192
Plot Date:	1/02/2013 14:21
Revision:	001 (gjoyce)

Map Projection:
GDA 1994 MGA Zone 56

Data Sources:
LPI - 2012
OEH - 2012
Kleinfelder Ecobiological - 2012

Disclaimer:This is not an official or a legal map but is for informational use only. All data was compiled from the best sources available. All boundaries, scale and geographic points are approximate.

L:\GIS FOLDER\00 CLIENT FILES\179_Fabcot_Woolworths\1192_FullertonCove\Mapping\179-1192_Fig6_KoalaHabitat.mxd

4.6. Fauna

A total of 78 fauna species were recorded in the Study Area (**Appendix 3**). These included 7 amphibians, 8 terrestrial/arboreal mammals, 18 bats, 40 birds and 5 reptiles. Eight species, consisting of 6 insectivourous bats, 1 flying-fox and 1 owl are listed as *Vulnerable* under the NSW TSC Act (**Table 11**). Grey-headed Flying Fox (*Pteropus poliocephalus*) is also listed as *Vulnerable* under the EPBC Act. Two of the threatened insectivourous bats species detected (*Falsistrellus tasmaniensis* and *Vespadelus troughtoni*) have not been recorded within 5 km of the site before. A probable identification of the threatened Large- footed Myotis (*Myotis macropus*) was made from an Anabat echolocation recording made in summer 2012, however no other evidence was available to confirm this record. Two species recorded in the Study Area, the European Rabbit and Brown Hare are exotic pests.

Table 11: Threatened fauna species detected in the Study Area.

Scientific Name	Common Name	Detection Method	Legal Status	
			TSC Act	EPBC Act
Falsistrellus tasmaniensis	Eastern False Pipistelle	Anabat	V	-
Miniopterus australis	Little Bentwing-bat	Anabat	V	-
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	Anabat	V	-
Mormopterus norfolkensis	Eastern Freetail-bat	Anabat	V	-
Ninox strenua	Powerful Owl	Nocturnal Call Playback	V	-
Pteropus poliocephalus	Grey- headed Flying Fox	Spotlighting	V	V
Scoteanax rueppellii	Greater Broad- nosed Bat	Anabat	V	-
Vespadelus troughtoni	Eastern Cave Bat	Anabat	V	-

5. Impact Assessment

5.1. Threatened Species

5.1.1. Assessment Methodology

An assessment as to whether each of the threatened species and ecological communities are likely to occur in the Study Area was undertaken using the following sources:

- Harden, G.J. (ed) (1992, 1993, 2000, 2002). *Flora of New South Wales Volume 1-4*. NSW University Press: Sydney.
- The Office of Environment and Heritage's threatened species website database http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/index.aspx;
- Van Dyke, S. and Strahan, R. (eds) (2008). *The Complete Book of Australian Mammals.* Reed New Holland Publishers, Australia.
- Cogger, H.A (ed) (2000). *Reptiles and Amphibians of Australia.* Reed New Holland Publishers, Australia.
- Higgins, P. J. *et al*. (1990-2007).*Handbook of Australian, New Zealand & Antarctic Birds.* Volumes 1 to 7. Oxford University Press Publishers, Melbourne.

5.1.2. Assessment of Likelihood of Occurrence

Based on information known about habitat requirements of threatened species known or predicted to occur in the vicinity of Study Area, a determination was made as to the likelihood of these species occurring on site.

A total of 25 threatened species, comprising nine flora species, one amphibian, six birds and seven bats and two terrestrial/arboreal mammals were considered to possibly occur in the type of habitat present in the Study Area. In addition, nine listed migratory species may also occur due to habitat suitability (**Appendix 4**).

5.2. Summary of Assessments of Significance (TSC Act)

Section 94 of the TSC Act and section 5A of the EP&A Act, as amended by the *Threatened Species Conservation Amendment Act 2002*, provides for the application of an 'assessment of significance' in the consideration of the likely impact of any development on threatened species, populations or habitats.

An assessment of significance was applied to threatened flora, fauna, populations and ecological communities that were considered to have potential impact from the proposal (**Appendix 5**).

5.2.1. Threatened Species

5.2.1.1. Flora

Of the 13 threatened flora species listed under the TSC Act and recorded or predicted within the vicinity, nine were considered to have suitable habitat present within the Study Area.

Seven of these species were detectable at the time of survey and were not identified within the Study Area, these include; *Eucalyptus parramattensis* subsp. *decadens*, *Maundia triglochinoides, Melaleuca biconvexa, Persicaria elatior*, *Rulingia prostrata*, *Syzigium paniculatum,* and *Zannichellia palustris*). The Assessments of Significance applied to these species concluded that the proposal will not have a significant impact on these threatened species.

Two threatened species with habitat within the Study Area were not detectable during the time of survey; *Diuris praecox* and *Tetratheca juncea*. These two species have potential habitat within the Coastal Sands Apple – Blackbutt Forest, as there will be no direct impact on this vegetation community the Assessments of Significance concluded that the proposal will not have a significant impact on the species.

There is the potential to indirectly impact the habitat of these threatened species through edge effects, weed dispersal, sedimentation and surface run-off. Mitigation measures have been recommended to limit the impact on the remaining vegetation within the Retained Area and surrounding the site.

5.2.1.2. Fauna

Forty fauna species listed under the TSC Act have been recorded within 5 km of the site. Of these species, 8 were detected within the Study Area during the current survey and there was thought to be suitable habitat present within the Study Area for a further 8.

Flowering and fruiting resources such as Lilly Pilly, Eucalypt, Melaleuca, Acacia and Banksia spp. were not flowering at the time of the bird survey. It is possible that several threatened species such as the Wompoo Fruit-dove (feed resource Lilly Pilly), Little Lorikeet (feed resources Eucalypt, Banksia, Melaleuca and Acacia spp.), Swift Parrot (feed resources *E. robusta* and *Corymbia gummifera*) and Regent Honeyeater (feed resource *E. robusta*) could be opportunistically attracted to these resources when in flower. However, the proposed development site is considered to represent sub-optimal habitat for these species as the dominant overstorey species is Swamp Oak with only a small number of Eucalypts occurring infrequently in the Development Area.

The lack of trees with hollows within the Development Area limits its utility as a refuge site for a range of arboreal mammals and bat species. It is unlikely this site provides anything more than a foraging area for threatened fauna.

The Assessments of Significance was applied to all these species (**Appendix 5**) and it was concluded that the proposed development will not have a significant impact on these threatened species.

5.2.2. Threatened Ecological Communities

Two Threatened Ecological Communities (TECs) were identified within the Study Area; *Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions* and *Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South Coast bioregions*. The Assessment of Significant applied to the *Swamp Sclerophyll Forest* concluded that there would not be a significant impact on the TEC as there will be no direct impact within this community. There is the potential for indirect impacts on the community through edge effects, weed dispersal, sedimentation and surface run-off which could change the composition of the TEC within and surrounding the Study Area. Measures have been recommended in **Section 7** to ensure that these impacts are mitigated.

The Assessment of Significance concluded that the impact on the *Swamp Oak Floodplain Forest* will be significant due to the removal 58% (1.8 ha) of the community within the Study Area. The proposal will provide mitigate to prevent the potential to indirectly impact the retained area of the *Swamp Oak Floodplain Forest*. Further to this protection of the retained natural vegetation within the study area, the vegetation removal would be offset through the appropriate biodiversity offsets (detailed further in section 7.3). These *Swamp Oak Floodplain Forest* ecosystem impact mitigation commitments are designed to minimise the overall impact, and would negate the need for a Species Impact Statement to be prepared.

5.2.3. Key Threatening Processes

The proposed activity may exacerbate the following Key Threatening Processes (KTP) currently acting on threatened species and communities that occur, or, have potential habitat within the Study Area:

- **Anthropogenic climate change:** Modification of the environment by humans may result in future climate change;
- **Clearing of native vegetation:** The proposed development will remove approximately 1.8 ha of native vegetation;
- **Infection of native plants by *Phytophthora cinnamomi*:** *P. cinnamomi* infection has been observed within the Hunter-Central Rivers CMA, the proposed development could cause the spread of the species;
- **Introduction and Establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae:** There is the potential to introduce these fungi on machinery;
- **Invasion and establishment of exotic vines and scramblers:** Species listed under this KTP (i.e. Coastal Morning Glory and Japanese Honeysuckle) occur within the site, the proposal has the potential to further spread these species into the remaining habitat for the species;
- **Invasion, establishment and spread of *Lantana camara*:** *Lantana camara* is present in the Study Area, the proposed development could cause the spread of the species; and,

- **Invasion of native plant communities by *Chrysanthemoides monilifera* (bitou bush and boneseed):** As the species occurs within the Study Area the proposal has the potential to spread the species within the site and into surrounding areas.

Active weed management of remaining vegetation will be important in reducing the impact of many of these processes.

5.3. Environmental Protection & Biodiversity Conservation Act 1999

5.3.1. Flora

Seven flora species listed under the EPBC Act were identified as having potential habitat within the Study Area. *Eucalyptus parramattensis* subsp. *decadens, Diuris praecox*, *Melaleuca biconvexa, Persicaria elatior*, *Syzigium paniculatum* and *Tetratheca juncea* are listed as Vulnerable under the Act and *Rulingia prostrata* is listed as Endangered. Targeted surveys were not conducted for *Diuris praecox* and *Tetratheca juncea* as there will not be any direct impacts within areas of potential habitat for these species. All other species were not identified during field surveys conducted.

The assessments conducted against the significant impact criteria determined that there would not be a significant impact on these threatened species; hence a referral to the Minister is not required.

5.3.2. Fauna

10 fauna species listed under the EPBC Act have been recorded within 5 km of the Study Area. One of these species, Grey-headed Flying-fox, was detected in the Study Area during field surveys. Assessments of the significance of the impact of the Development Proposal on this and two species of bird (Australian Bittern and Painted Snipe) concluded that there would not be a significant impact on these species and a referral to the Minister is not required.

6. Land Use Strategies

Consideration was given to the relationship of the Proposed Development to land use plans and policies operating the region that aim to conserve biodiversity.

6.1. SEPP 14 Coastal Wetlands

The Study Area is approximately 300 m from a SEPP 14 wetland on the fringes of Fullerton Cove (**Figure 7**). A sand ridge to the north and road infrastructure to the west form barriers to surface water flows from the Study Area into Fullerton Cove.

6.2. Wildlife Corridors

The Study Area does not lie within the primary regional "green corridor" as mapped by the Lower Hunter Regional Conservation Plan (DECCW 2009). Nor does it lie within an area mapped as a "Key Corridor" by the NPWS (Scotts 2003).

The Study Area does lie on the periphery of a distal portion the 'Watagan Stockton & Wallarah Green Corridors' as identified in the Department of Planning's Regional Strategy Update Report (DoP 2009). However, the connectivity to and from the site for fauna is hampered to the south and to the west by road infrastructure and a limited amount of available habitat. The areas to the north-west form part of the Fullerton Cove estuarine ecosystems which is distinctly different from the habitats found in the Study Area. This estuarine habitat is important to a suite of fauna species, such as wading birds, which are not likely to occur in the Study Area. The habitat connectivity to the east and north-east will remain following implementation of the proposed development due to the retention of part of Lot 14 which is augmented by a vegetated road setback area along Nelson Bay Road.

Scotts (2003) mapped the eastern half of the Study Area as "Key Habitat" (**Figure 7**). This mapping has been done at a coarse landscape scale and broadly corresponds to the extent of native woody vegetation cover in the region much of which would be retained under the Development Proposal.

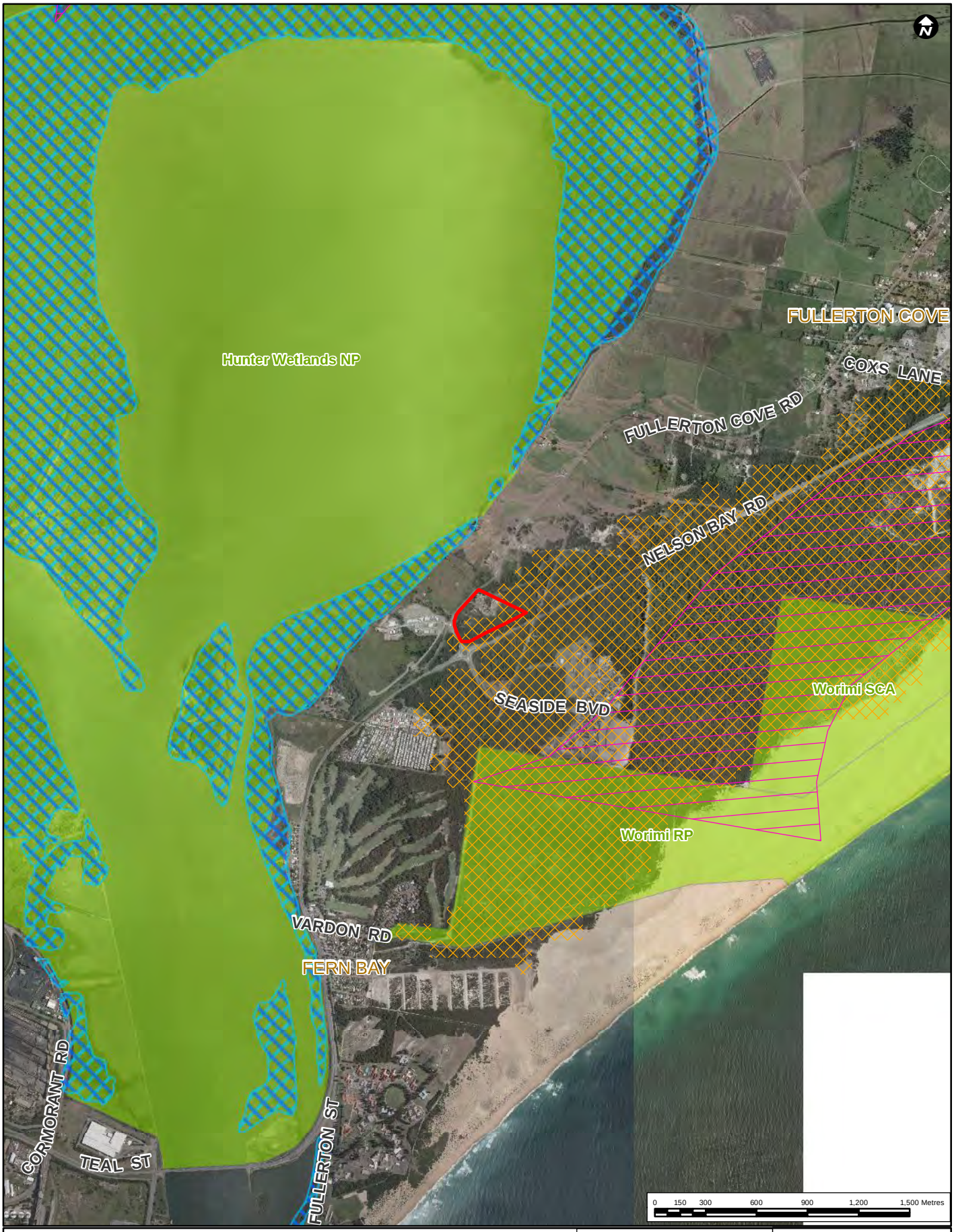


Figure 7: Regional Context

Legend

- Study Area Lot 14 DP 258848
- Fauna Key Habitats
- Fauna Key Corridors
- SEPP 14 Coastal Wetlands
- National Park

KLEINFELDER ecobiological

Project Ref:	179-1192
Plot Date:	1/02/2013 14:26
Revision:	001 (gjoyce)

Map Projection:

GDA 1994 MGA Zone 56

Data Sources:

LPI - 2012
OEH - 2012
Kleinfelder Ecobiological - 2012

Disclaimer:This is not an official or a legal map but is for informational use only. All data was compiled from the best sources available. All boundaries, scale and geographic points are approximate.

L:\GIS FOLDER\00 CLIENT FILES\179_Fabcot_Woolworths\1192_FullertonCove\Mapping\179-1192_Fig7_RegionalContext.mxd

7. Mitigation Measures

Significant impacts to Threatened Swamp Oak Forest arising from the proposed development will require the identification of suitable measures that mitigate impacts and offset losses in accordance with the Port Stephens DCP and OEH requirements.

A strategy is recommended that will include:

- A management plan for retained vegetation on the site; and
- A re-zoning plan that will enhance the conservation values of Lot 14 (Retained Area).
- Identification of a biodiversity offset strategy and land in the region that would provide adequate Biodiversity Credits in accordance with the Biobanking methodology.

7.1. Management of retained vegetation

Clause B2.C17 of the Port Stephens DCP states: *Council may require a Vegetation Management Plan (VMP) prepared by a suitably qualified person, for proposals to clear land and or remove tree(s). A VMP must include analysis of impacts on vegetation, strategies for preservation, protection and restoration of vegetation and a proposal for the management and monitoring of vegetation over the long term.*

It is proposed that a VMP be prepared for the Retained Area and recommended native vegetation buffer on Lot 14 for lodgement with the development application to council. It will detail measures for the:

(a) The control of weeds in retained vegetation

(b) The establishment of a native vegetation buffer between the development and the retained vegetation which will filter runoff from hard surfaces to minimise eutrophication and weed encroachment.

(c) The clean up and removal of dumped rubbish from retained vegetation

7.2. Rezoning

Three hectares of remnant vegetation will be retained on Lot 14 including 0.64 of Swamp Mahogany – Paperback Forest that is equivalent to a Threatened Ecological Community. This is supported by an additional 1.7 ha of native vegetation in the setback along Nelson Bay Road. Retention and protection of this area will generate biodiversity credits. This should be investigated to be used (in part) to offset native vegetation loss from the proposed development.

The Endangered Swamp Mahogany - Paperbark Forest occurring on the retained land is regarded as Preferred Koala Habitat, containing a greater than 15% cover of the tree species

Eucalyptus robusta. Also occurring within the retained area is 1 ha of Supplementary Koala habitat.

Zoning this area for environmental protection is consistent with the objectives of the Port Stephens CKPoM, which states:

"Rezoning koala habitat … to Environmental Protection provides a high degree of certainty. It provides a clear indication to future public land managers that such areas contain important koala habitat and need to be managed accordingly."

7.3. Biodiversity Offset Strategy

Under the proposed development 1.8 ha of Endangered Swamp Oak Forest would be removed and 1.3 ha retained. Experience of BioBanking Scheme offset ratios suggests that such an impact will require protection of a larger area of an equivalent vegetation type than currently available on the Retained Area.

I accordance with current practice, information would be provided in a Biodiversity Offset Strategy to be delivered at a later application stage.

The Biodiversity Offset Strategy would detail the following:

- Using the Biobanking methodology and principles, provide the calculated ecosystem credits for vegetation removal, and ecosystem credits required to offset removal. This offset land is to be identified and conserved on other lands, including the Retained Area;
- Identify the amount of land within the study area that can be utilised for offet purposes, including like for like vegetation, the potential for the similar vegetation type to be included (swamp forest), and any proposed rehabilitation of similar vegetation;
- The biobanking output will determine the vegetation types that would be suitable for offset (preliminary investigations indicate suitable vegetation types are HU546 and HU635), and the region in which these offsets can be acquired (preliminary investigations indicate the Hunter, Karuah-Manning and the Wyong CMA Sub-Regions are suitable regions to seek offset lands);
- A map showing the amount of these vegetation types known in the designated regions, and showing other conservation values (National Parks, State Conservation Reserves, State Forests etc.), using GIS mapping and existing vegetation data from OEH website;
- The suitable vegetation areas identified above would be defined to land ownership (including lot and DP details).

The above information would summarise the total amount of known suitable vegetation types in the area that could be sought for biodiversity offset approval. This is considered as

providing sufficient information to Council to determine that biodiversity offsets would be achievable. At this stage (rezoning) Council does not require a full assessment under the Biobanking Assessment Methodology.

Further to the offset location identification, the Strategy would identify alternate options for offset acquisition. The 4 main options are:

1. Direct purchase of Biobanking credits from the market (if available);
2. Land purchase derived from the research as detailed above;
3. Potential for compensating a land owner for the right to place a covenant over the property (e.g. conservation agreement), derived from the research as detailed above;
4. A financial obligation to Council with incentive for a biodiversity gain.

8. Conclusions

Implementing the proposed development will have the following ecological impacts:

- Direct removal of 1.8 ha of Swamp Oak Floodplain Forest Threatened Ecological Community.
- Potential indirect impacts to retained vegetation including 2 Threatened Ecological Communities (*Swamp Oak Floodplain Forest* and *Swamp Sclerophyll Forest*).
- No threatened flora or fauna populations have been determined to be significantly affected.
- No Matters of National Environmental Significance (MNES) have been determined to be significantly affected.

Positive ecological outcomes that could result from the proposed development include:

- Increased environmental protection and improved management (ecosystem enhancement through weed control, restricted access and rubbish removal etc.) for 3 ha of land that is containing two Threatened Ecological Communities (*Swamp Oak Floodplain Forest* and *Swamp Sclerophyll Forest*) and is part of the Watagan-Stockton & Wallarah Green Corridor.

9. References

Bibby, C.J., Burgess, N.D. and Hill, D.A. (2000). *Bird Census Techniques.* Academic Press Limited, London.

Brunner, H., Triggs, B. & Ecobyte Pty Ltd. (2002). Hair ID. An interactive tool for identifying Australia mammalian hair. CSIRO Publishing, Collingwood, Victoria.

Clements, A. M., Rodd, A. N., Lim, I., Clulow, J. and Hoye, G. (1992). Flora and Fauna Report part of the Environment Assessment of Fern Bay, New South Wales.

DEC (2004). Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (working draft), New South Wales Department of Environment and Conservation, Hurstville NSW.

DECC (2009). Threatened Species Survey and Assessment guidelines; field survey methods for fauna – Amphibians. Department of Environment and Climate Change: Sydney, NSW

DECCW (2009). Lower Hunter Regional Conservation Plan, Department of Environment, Climate Change and Water NSW: Sydney, NSW

Department of Planning (2009). New South Wales Regional Strategy Update Report. NSW Government, Sydney.

ERM (2004). Fern Bay Seaside Village Master Plan Study Ecological Assessment Report.

ERM (2005a). Fern Bay Estate Master Plan Study Species Impact Statement (SIS).

ERM (2005b). Fern Bay Estate Master Plan Study Response to the Port Stephens Comprehensive Koala Plan of Management.

ERM (2005c). Fern Bay Estate Master Plan Study Assessment of Matters of National Environmental Significance.

ERM (2005d). Fern Bay Estate Master Plan Study Aquatic Assessment Report .

ERM (2009). Fern Bay Seaside Village Ecology Assessment Report. Annexure P for the EA submitted to the DP&I for the Aspen Group Pty Ltd.

Gibbons, P. and Lindenmayer, D. (2002) *Tree Hollows and Wildlife Conservation in Australia*. CSIRO Publishing, Canberra.

Gunninah Environmental Consultants (1996 revised 1997). Fauna and Flora Assessment Proposed Residential Development, Nelson Bay Road, Fern Bay.

Harden, G.J. (ed) (1992). *Flora of New South Wales Volume 3*. NSW University Press: Sydney.

Harden, G.J. (ed) (1993). *Flora of New South Wales Volume 4*. NSW University Press: Sydney.

Harden, G.J. (ed) (2000). *Flora of New South Wales Volume 1*. NSW University Press: Sydney.

Harden, G.J . (ed) (2002). *Flora of New South Wales Volume 2*. NSW University Press: Sydney.

Lunney, D., Phillips, S., Callaghan, J. And Coburn, D. (1998). Determining the distribution of Koala habitat across a shire as a basis for conservation: a case study from Port Stephens, New South Wales. *Pacific Conservation Biology* **4:** 186-96.

Matthei, L.E. (1995). Soil Landscapes of the Newcastle 1:100 000 Mapsheet. Department of Lands and Water Conservation.

Meyer, E., Hero, J-M., Shoo, L. and Lewis, B. (2006). *National Recovery Plan for the Wallum Sedgefrog and other wallum-dependent frog species.* Report to Department of the Environment and water Resources, Canberra. Queensland parks and Wildlife Service, Brisbane.

NPWS (2000). Lower Hunter Central Coast Regional Management Strategy. Vegetation Survey, Classification and Mapping: Lower Hunter Central Coast Region (version 1.2). CRA Unit, Sydney Zone.

NSW Scientific Committee (2011a). *Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions - Determination to make a minor amendment to Part 3 of Schedule 1 of the Threatened Species Conservation Act*. OEH Website, Updated July 2011, Available: http://www.environment.nsw.gov.au/determinations/swampoak36a.htm

NSW Scientific Committee (2011b). *Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions - Determination to make a minor amendment to Part 3 of Schedule 1 of the Threatened Species Conservation Act*. OEH Website, Updated July 2011, Available: http://www.environment.nsw.gov.au/determinations/swampsclerophyll36a.htm

Scotts, D. (2003). Key Habitats and Corridors for Forest Fauna: A Landscape Framework for Conservation in North-east NSW. NSW NPWS Occasional paper 32, NPWS, Sydney.

Seidel, J. And Briggs, S. (2009). *BioBanking Assessment Methodology and Credit Calculator Operational Manual*. NSW Department of Environment and Climate Change, Sydney.

Triggs, B. (1996). *Tracks, Scats and Other Traces: A Field Guide to Australian Mammals*, Oxford University Press.

Appendix 1: Flora species recorded in the Study Area

(N.B. Cover-abundance ratings given. Where no value is given, species were detected during targeted threatened species searches)

Family	Scientific Name	Common Name	Q1	Q2	Q3	Q4	Q5	Q6
Adiantaceae	*Adiantium hispidulum*	Rough Maidenhair Fern			2			
Amaranthaceae	*Alternanthera denticulata*	Lesser Joyweed						
Apiaceae	**Foeniculum vulgare*	Fennel						
Apiaceae	**Hydrocotyle bonariensis*		2	3	4			2
Apiaceae	*Centella asiatica*	Indian Pennywort	1	2	1	2		
Apiaceae	*Hydrocotyle peduncularis*							
Apiaceae	*Platysace lanceolata*	Shrubby Platysace					2	
Apocynaceae	*Parsonsia straminea*	Common Silkpod	1	3	2	2	3	2
Araceae	**Zantedeschia aethiopica*	Arum Lily		2	2			
Areaceae	*Livistona australis*	Cabbage Palm		2	2	1		2
Asteraceae	**Ambrosia artemisiifolia*	Annual Ragweed						
Asteraceae	**Ambrosia tenuifolia*	Lacey Ragweed				2		
Asteraceae	**Bidens pilosa*	Cobbler's Pegs						
Asteraceae	**Chrysanthemoides monilifera* subsp. *rotundata*	Bitou Bush				3	3	
Asteraceae	**Conyza bonariensis*	Flaxleaf Fleabane				1	1	
Asteraceae	**Hypochaeris radicata*	Catsear				1	1	
Asteraceae	**Senecio madagascariensis*	Fireweed						
Asteraceae	**Sonchus oleraceus*	Common Sowthistle						
Asteraceae	**Tagetes minuta*	Stinking Roger						
Asteraceae	*Enydra fluctuans*		6	3	6			3
Asteraceae	*Senecio hispidulus*	Hill Fireweed				1		
Bignoniaceae	*Pandorea pandorana*	Wonga Wonga Vine				3	3	
Blechnaceae	*Blechnum indicum*	Swamp Water Fern						4
Campanulaceae	*Wahlenbergia communis*	Tufted Bluebell					1	

Family	Scientific Name	Common Name	Q1	Q2	Q3	Q4	Q5	Q6
Capricifoliaceae	**Lonicera japonica*	Japanese Honeysuckle						
Casuarinaceae	*Casuarina glauca*	Swamp Oak	1	5	5			3
Celastraceae	*Maytenus silvestris*	Narrow-leaved Orangebark				1	2	
Commelinaceae	**Tradescantia fluminensis*	Wandering Jew						
Commelinaceae	*Commelina cyanea*	Native Wandering Jew	1	2	1	1		2
Convolvulaceae	**Ipomoea cairica*	Coastal Morning Glory	3	4	4			2
Cyperaceae	*Baumea articulata*	Jointed Twig-rush	2	2				2
Cyperaceae	*Baumea rubiginosa*							3
Cyperaceae	*Carex appressa*	Tall Sedge						3
Cyperaceae	*Carex longebrachiata*		2	3				2
Cyperaceae	*Gahnia clarkei*	Tall Saw-sedge	1	2	4			5
Cyperaceae	*Gahnia melanocarpa*	Black-fruit Saw-sedge						
Dennstaedtiaceae	*Pteridium esculentum*	Common Bracken				3	3	
Ericaceae - Styphelioideae	*Monotoca scoparia*					3	3	
Euphorbiaceae	**Ricinus communis*	Castor Oil Plant						
Euphorbiaceae	*Homalanthus populifolius*	Bleeding Heart		2	1	1		2
Fabaceae - Faboideae	**Trifolium repens*	White clover						
Fabaceae - Faboideae	*Glycine clandestina*					1	2	
Fabaceae - Faboideae	*Hardenbergia violacea*	Purple Coral Pea				1		
Fabaceae - Faboideae	*Kennedia rubicunda*	Dusky Coral Pea				1		
Fabaceae - Mimosoideae	**Acacia saligna*	Golden Wreath Wattle						
Fabaceae - Mimosoideae	*Acacia irrorata subsp. irrorata*	Green Wattle					2	
Fabaceae - Mimosoideae	*Acacia longifolia* subsp. *longifolia*	Sydney Golden Wattle		1		1		
Juncaceae	**Juncus cognatus*							
Juncaginaceae	*Triglochin procera*		1					
Lauraceae	*Cassytha glabella*					2	3	
Lauraceae	*Cryptocarya microneura*	Murrogun					1	
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush				1	2	

Family	Scientific Name	Common Name	Q1	Q2	Q3	Q4	Q5	Q6
Luzuriagaceae	*Eustrephus latifolius*	Wombat Berry				3	3	
Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling Lily						
Menispermaceae	*Stephania japonica*	Snake Vine			3	2		
Menyanthaceae	*Villarsia exaltata*	Yellow Marsh Flower						1
Moraceae	*Ficus macrophyllla*	Moreton Bay Fig						
Moraceae	*Maclura cochinchinensis*	Cockspur Thorn		2				
Myrsinaceae	*Myrsine howittiana*	Brush Muttonwood		3				
Myrsinaceae	*Myrsine variabilis*					2	2	
Myrtaceae	*Acmena smithii*	Lilly Pilly			1			
Myrtaceae	*Angophora costata*	Smooth-barked Apple				2	3	
Myrtaceae	*Callistemon salignus*	Willow Bottlebrush						
Myrtaceae	*Eucalyptus grandis*	Flooded Gum						
Myrtaceae	*Eucalyptus pilularis*	Blackbutt				6	4	
Myrtaceae	*Eucalyptus piperita*	Sydney Peppermint						
Myrtaceae	*Eucalyptus robusta*	Swamp Mahogany						
Myrtaceae	*Melaleuca armillaris*	Bracelet Honey Myrtle						
Myrtaceae	*Melaleuca linariifolia*	Flax Leaved Paperbark						
Myrtaceae	*Melaleuca quinquenervia*	Broad-leaved Paperbark	1	3				6
Myrtaceae	*Melaleuca styphelioides*	Prickly-leaved Tea-tree	2	3				
Oxalidaceae	*Oxalis perennans*					2	2	
Passifloraceae	*Passiflora herbertiana*	Native Passionfruit				2	2	
Phormiaceae	*Dianella caerulea* var. *producta*	Blue Flax-lily				1	2	
Phyllanthaceae	*Breynia oblongifolia*	Coffee Bush			1	3	2	
Phyllanthaceae	*Glochidion ferdinandi var. ferdinandi*	Cheese Tree	1	3	1	3	3	2
Phyllanthaceae	*Glochidion ferdinandi var. pubens*	Cheese Tree					2	2
Pittosporaceae	*Billardiera scandens*	Hairy Apple Berry				2	2	
Pittosporaceae	*Bursaria spinosa*	Blacktorn					2	
Pittosporaceae	*Pittosporum revolutum*	Wild Yellow Jasmine				2	2	

Family	Scientific Name	Common Name	Q1	Q2	Q3	Q4	Q5	Q6
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum				1		
Plantaginaceae	**Plantago lanceolata*	Lamb's Tongues						
Poaceae	**Ehrharta erecta*	Panic Veldtgrass				4	2	
Poaceae	**Hyparrhenia hirta*	Coolatai Grass						
Poaceae	**Megathyrsus maximus*	Guinea Grass						
Poaceae	**Melinis repens*	Red Natal Grass						
Poaceae	**Paspalum urvillei*	Vasey Grass						
Poaceae	**Pennisetum clandestinum*	Kikuyu Grass	2		3			
Poaceae	**Stenotaphrum secundatum*	Buffalo Grass	1	3				
Poaceae	*Cynodon dactylon*	Couch						
Poaceae	*Dichelachne micrantha*	Shorthair Plumegrass				1	2	
Poaceae	*Entolasia marginata*	Bordered Panic	1	2		2	3	3
Poaceae	*Eragrostis parviflora*	Weeping Lovegrass				1		
Poaceae	*Imperata cylindrica*	Blady Grass					1	
Poaceae	*Isachne globosa*	Swamp Millet	2	1				
Poaceae	*Microlaena stipoides* var. *stipoides*	Weeping Grass				2		
Poaceae	*Oplismenus aemulus*	Basket Grass		2	3		3	
Poaceae	*Phragmites australis*	Common Reed		2				
Polygonaceae	**Acetosa sagittata*	Turkey Rhubarb						
Polygonaceae	**Acetosella vulgaris*	Sorrel				2		
Polygonaceae	*Persicaria hydropiper*	Water Pepper	4	3	6			
Polygonaceae	*Persicaria strigosa*	Spotted Knotweed	4	2	6			2
Polypodiaceae	*Platycerium bifurcatum*	Elkhorn Fern	1					
Proteaceae	*Banksia serrata*	Old Man Banksia				3		
Proteaceae	*Persoonia lanceolata*	Lance Leaf Geebung					1	
Ranunculaceae	*Clematis glycinoides*	Headache Vine				1		
Rhamnaceae	*Alphitonia excelsa*	Red Ash		3		1	3	
Rosaceae	**Rubus fruticosus* agg. sp.	Blackberry						

Family	Scientific Name	Common Name	Q1	Q2	Q3	Q4	Q5	Q6
Rosaceae	*Rubus parvifolius*	Native Raspberry				1		
Rubiaceae	*Opercularia aspera*	Coarse Stinkweed						
Rubiaceae	*Pomax umbellata*					2	2	
Rutaceae	*Zieria smithii*	Sandfly Zieria					2	
Sapindaceae	*Cupaniopsis anacardioides*	Tuckeroo					1	
Smilacaceae	*Smilax australis*	Wait-a-while					3	
Solanaceae	**Lycium ferocissimum*	African Boxthorn						
Solanaceae	**Solanum nigrum*	Black-berry Nightshade		2				
Thelypteridaceae	*Cyclosorus interruptus*		2	4	3			2
Tropaeolaceae	**Tropaeolum majus*	Nasturtium				2		
Typhaceae	*Typha orientalis*	Broad Leaved Cumbungi	6		3			
Verbenaceae	**Lantana camara*	Lantana			2	4	4	
Verbenaceae	**Verbena bonariensis*	Purpletop						
Verbenaceae	**Verbena rigida*	Veined Verbena						
Violaceae	*Viola hederacea*	Ivy-leaved Violet						

* denotes an introduced species

Appendix 2: Vegetation Communities in the Study Area

Swamp Oak Forest (SOF)

Plate 1: Swamp Oak Forest in the Study Area.

Survey Effort: Quadrats 1, 2 and 3

Vegetation Formation: Forested Wetlands.

Vegetation Class: Coastal Floodplain Wetlands.

Equivalent LHCCREMS Vegetation Type (NPWS 2000): MU41 Swamp Oak Sedge Forest.

Biometric Database Type (DECCW, 2008): HU635 Swamp Oak swamp forest fringing estuaries, Sydney Basin and South East Corner

Ecological Community Conservation Status: This vegetation community is included under the definition of the threatened ecological community *Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions* Endangered Ecological Community (EEC), listed under the TSC Act.

The inclusion of the Swamp Oak Forest on site within the *Swamp Oak Floodplain Forest* EEC was determined through floristic comparison with the NSW Scientific Committee's final determination and associated amendment (2011a). The presence of diagnostic species in the canopy (*Casuarina glauca*), mid-storey (*Melaleuca quinquenervia*, *Melaleuca styphelioides*, *Alphitonia excelsa* and *Glochidion ferdinandii*), shrub layer (*Acmena smithii*) and ground stratum (*Centella asiatica, Entolasia marginata, Gahnia clarkei, Parsonsia straminea, Persicaria strigosa* and *Phragmites australis*) within this community constitutes *Swamp oak floodplain forest* EEC.

Structure: Forest to 18 m tall.

Floristic Description: The overstorey is dominated predominantly by *Casuarina glauca* (Swamp Oak). *Eucalyptus robusta* (Swamp Mahogany) occur infrequently where this community intergrades with the Swamp Mahogany – Paperbark Forest in the in the eastern of the site. The mid-storey consists of a scattered occurrence of Paperbark species, including *Melaleuca armillaris* (Bracelet Honey Myrtle), *Melaleuca linariifolia* (Flax Leaved Paperbark), *Melaleuca quinquenervia* (Broad-leaved Paperbark) and *Melaleuca styphelioides* (Prickly-leaved Tea-tree). Less common mid-storey species include *Acmena smithii* (Lilly Pilly) and *Livistona australis (*Cabbage Palm).

The shrub layer is comprised of woody shrubs including *Glochidion ferdinandii* (Cheese Tree), *Alphitonia excelsa* (Red Ash), *Breynia oblongifolia* (Coffee Bush) and *Acacia longifolia* subsp. *longifolia* (Sydney Golden Wattle). The ground layer is comprised mainly of ferns and sedges such as *Carex longebrachiata*, *Cyclosorus interruptus* and *Adiantium hispidulum* (Rough Maidenhair Fern), the herbaceous species *Persicaria strigosa* (Spotted Knotweed) and *P hydropiper* (Water Pepper) are present throughout the community. There are also areas in the north of the community where *Typha orientalis* (Broad Leaved Cumbungi) dominates. Grasses included *Entolasia marginata (*Bordered Panic) and *Oplismenus aemulus* (Basket Grass). Wetter areas were dominated by *Centella asiatica* (Indian Pennywort) and *Gahnia clarkei* (Tall Saw-sedge).

Structural/ Floristic Variation: In the north west of the site there are sections of the community that lack connecting canopy cover, these areas are dominated by *Typha orientalis*. Historical imagery shows that the site has been cleared and the western portion of the site has regenerated to

Swamp Oak Forest, within this community there are also elements of Freshwater Wetland Complex (*Typha orientalis*) regenerating. The Typha dominated sections of the site have been included in the Swamp Oak Forest as they are small thin sections at lower elevation that are contained within the Swamp Oak Forest.

Weeds and Condition: Minor weed infestations include *Lantana camara* (Lantana) and *Zantedeschia aethiopica* (Arum Lily). A major infestation of the vine *Ipomoea cairica* (Coastal Morning Glory) occurs within the mid storey throughout the site and there is also a high occurrence of *Hydrocotyle bonariensis* throughout the community.

The community does suffer from edge effects due to the construction of Fullerton Cove Road and the presence of residential developments in the north of the site.

Swamp Mahogany – Paperbark Forest (SMPF)

Plate 2: Swamp Mahogany-Paperbark Forest in the Study Area.

Sample Sites: Quadrat 6.

Vegetation Formation: Forested Wetlands.

Vegetation Class: Coastal Swamp Forests.

Equivalent LHCCREMS Vegetation Type (NPWS 2000): MU37 Swamp Mahogany - Paperbark Forest.

Biometric Database Type (DECCW, 2008): HU633 Swamp Mahogany swamp forest on coastal lowlands of the North Coast and northern Sydney Basin.

Ecological Community Conservation Status: This community forms part of the *Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions* EEC listed under the TSC Act.

The inclusion of the Swamp Mahogany – Paperbark Forest on site within the *Swamp Sclerophyll Forest* EEC was determined through floristic comparison with the NSW Scientific Committee's final determination and associated amendment (2011b). The presence of diagnostic species in the canopy (*Eucalyptus robusta* and *Melaleuca quinquenervia*), mid-storey (*Glochidion ferdinandi*, *Casuarina glauca* and *Livistona australis*), shrub layer (*Gahnia clarkei*) and ground stratum (*Carex appressa, Baumea articulata, Blechnum indicum, Entolasia marginata, Parsonsia straminea*) within this community constitutes *Swamp Sclerophyll Forest* EEC.

Structure: Forest to 20 m tall.

Floristic Description: The canopy within the community is dominated by *Melaleuca quinquenervia* (Broad-leaved Paperbark) with an emergent tree layer of *Eucalyptus robusta* (Swamp Mahogany). The midstorey is dominated by *Glochidion ferdinandi var. ferdinandi* (Cheese Tree) with scattered occurrences of *Livistona australis (*Cabbage Palm) and *Casuarina glauca* (Swamp Oak).

The shrub layer dominated by the sedge *Gahnia clarkei* (Tall Saw-sedge). The ground layer is comprised of a range of sedges, rushes and fern species including *Carex appressa* (Tall Sedge), *Baumea rubiginosa*, *Carex longebrachiata*, *Baumea articulata* (Jointed Twig-rush), *Blechnum indicum* (Swamp Water Fern) and *Cyclosorus interruptus*. The grass species *Entolasia marginata* (Bordered Panic) is also present throughout the ground layer.

Weeds and Condition: There is a scattered occurrence of *Ipomoea cairica* (Coastal Morning Glory) throughout the community and there are infestations of *Lantana camara* (Lantana) at the edges of the community where it intergrades with the Coastal Sands Apple – Blackbutt Forest.

There is evidence of historical disturbance throughout the community within the Study Area as the majority of the community within the Study Area is dominated by a stand of monotypic aged *Melaleuca quinquenervia* and lacks *Eucalyptus robusta*. There is a small section of the community in the east of the site that is less disturbed and contains old growth canopy trees.

Coastal Sand Apple – Blackbutt Forest (CSABF)

Plate 3: Coastal Sand Apple – Blackbutt Forest in the Study Area.

Sample Sites: Quadrats 4 and 5.

Vegetation Formation: Dry Sclerophyll Forests (Shrubby subformation).

Vegetation Class: Coastal Dune Dry Sclerophyll Forests.

Equivalent LHCCREMS Vegetation Type (NPWS 2000): MU37 Swamp Mahogany - Paperbark Forest.

Biometric Database Type (DECCW, 2008): HU509 Blackbutt - Smooth-barked Apple shrubby open forest on coastal sands of the southern North Coast.

Ecological Community Conservation Status: Not Listed.

Structure: Open forest to 25 m with a shrubby understorey.

General description: This community is dominated by *Eucalyptus pilularis* (Blackbutt) and *Angophora costata* (Smooth-barked Apple). The midstorey is characterised by *Banksia serrata* (Old-man Banksia), *Monotoca scoparia*, *Glochidion ferdinandi* var. *ferdinandi* (Cheese Tree) and *Alphitonia excelsa* (Red Ash).

Common shrubs include *Breynia oblongifolia* (Coffee Bush), *Acacia irrorata* subsp. *irrorata* (Green Wattle), *Myrsine variabilis*, *Pittosporum revolutum* (Wild Yellow Jasmine), *Pomax umbellata* and *Zieria smithii* (Sandfly Zieria). The ground layer is typically dominated by *Pteridium esculentum* (Common Bracken), *Dianella caerulea* var. *producta* (Blue Flax-lily), *Entolasia marginata* (Brodered Panic) and *Oplismenus aemulus* (Basket Grass).

There are also a number of climbing speices within the communtiy, including *Eustrephus latifolius* (Wombat Berry), *Parsonsia straminea* (Common Silkpod), *Pandorea pandorana* (Wonga Wonga Vine) and *Cassytha glabella*.

Weeds and Condition: The CSABF within the stie old growth forest, but there are signs of disturbance with a number of tracks intersecting the community and a high occurrence of *Lantana camara* (Lantana) and *Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush).

Disturbed lands

Plate 4: Disturbed lands in the Study Area.

Vegetation Formation: NA

Vegetation Class: NA

Equivalent LHCCREMS Vegetation Type: NA

Ecological Community Conservation Status: NA

Structure: Manged grassland with scattered trees.

Floristic Description: The disturbed lands within the Study Area occur in the north of the site surrounding the residential developments and along Fullerton Cove Road. These areas contain scattered native relic trees including *Melaleuca* species (Paperbarks) and *Casuarina glauca* (Swamp Oak), along with a range of ornimental species. These areas are dominated by exotic species such as *Ipomoea cairica* (Coastal Morning Glory), *Ehrharta erecta* (Panic Veldtgrass), *Verbena bonariensis* (Purpletop), *Rubus fruticosus* agg. sp. (Blackberry) and *Pennisetum clandestinum* (Kikuyu Grass).

Appendix 3: Fauna species recorded in the Study Area

Scientific Name	Common Name	Record type
Amphibians		
Crinia signifera	Common Froglet	NH
Limnodynastes peronii	Striped Marsh Frog	NH
Litoria fallax	Dwarf Green Tree Frog	NH
Litoria peronii	Peron's Tree Frog	NH
Litoria verreauxi	Verreaux's Tree-frog	NH
Paracrinia haswelli	Red-groined Froglet	NH
Pseudophryne bibronii	Brown Toadlet	NH
Birds		
Acanthiza pusilla	Brown Thornbill	A
Acanthorhynchus tenuirostris	Eastern Spinebill	A,O
Accipiter cirrocephalus	Collared Sparowhawk	A
Cacatua roseicapilla	Galah	A,O
Cacatua tenuirostris	Long- billed Corella	A
Calyptorhynchus funereus	Yellow- tailed Black Cockatoo	A,O
Centropus phasianinus	Pheasant coucal	A
Chenonetta jubata	Australian Wood Duck	A
Cormobates leucophaea	White- throated Treecreeper	A
Corvus coronoides	Australian Raven	A
Cracticus nigrogularis	Pied Butcherbird	A
Cracticus torquatus	Grey Butcherbird	A
Dacelo novaeguineae	Laughing kookaburra	A,O
Eopsaltria australis	Eastern Yellow Robin	A
Eurystomus orientalis	Dollarbird	A,O
Gerygone olivacea	White- throated Gerygone	A,O
Gymnorhina tibicen	Australian Magpie	A,O
Lichenostomus chrysops	Yellow- faced Honeyeater	A,O

Scientific Name	Common Name	Record type
Malurus cyaneus	Superb Fairy-wren	O
Malurus lamberti	Variegated Fairy- wren	A
Manorina melanocephala	Noisy Miner	A
Meliphaga lewinii	Lewin's Honeyeater	A,O
Myiagra rubecula	Leaden Flycatcher	A
Neochmia temporalis	Red- browed Finch	A,O
Ninox strenua	#Powerful owl	NS
Oriolus sagittatus	Olive- backed Oride	A,O
Pachycephala pectoralis	Golden Whilstler	O
Pachycephala rufiventris	Rufous Whistler	A
Philemon corniculatus	Noisy Friarbird	A
Platycercus eximius	Eastern Rosella	A
Podargus strigoides	Tawny Frogmouth	NS
Psophodes olivaceus	Eastern Whipbird	A,O
Rhipidura albiscapa	Grey Fantail	A
Rhipidura rufifrons	Rufous Fantail	A,O
Scythrops novaehollandiae	Channel- billed Cuckoo	A
Sericornis frontalis	White- browed Scrubwren	A,O
Strepera graculina	Pied Currawong	A
Todiramphus sanctus	Sacred Kingfisher	A,O
Trichoglossus haematodus	Rainbow Lorikeet	A
Zosterops lateralis	Silvereye	A,O
Bats		
Chalinobolus gouldii	Gould's Wattled Bat	H
Chalinobolus morio	Chocolate Wattled Bat	H
Falsistrellus tasmaniensis	#Eastern False Pipistrelle	E
Miniopterus australis	#Little Bentwing-bat	H
Miniopterus schreibersii oceanensis	#Eastern Bentwing-bat	H
Mormopterus norfolkensis	#East Coast Freetail-bat	H
Mormopterus sp.2	Undescribed Freetail- bat	E

Scientific Name	Common Name	Record type
Nyctophilus gouldi	Gould's Long Eared Bat	H
Pteropus poliocephalus	Grey- headed Flying Fox	NS
Saccolaimus flaviventris	Yellow- bellied Sheathtail Bat	E
Scoteanax rueppellii	#Greater Broad- nosed Bat	E
Scotorepens orion	Eastern Broad- nosed Bat	E
Tadarida australis	White- striped Freetail Bat	E
Vespadelus darlingtoni	Large Forest Bat	E
Vespadelus pumilus	Eastern Forest Bat	E
Vespadelus regulus	Southern Forest Bat	E
Vespadelus troughtoni	#Eastern Cave Bat	E
Vespadelus vulturnus	Little Forest Bat	H
Terrestrial/Arboreal Mammals		
Antechinus stuartii	Brown Antechinus	T
Isoodon macrourus	Northern Brown Bandicoot	T
Lepus capensis	*Brown Hare	O
Oryctolagus cuniculus	*European Rabbit	O
Rattus fuscipes	Bush Rat	T
Rattus lutreolus	Swamp Rat	T
Rattus rattus	Black Rat	T
Trichosurus vulpecula	Common brushtail possum	T,NS
Reptiles		
Egernia major	Land mullet	T
Elapidae (Family)	Eastern Brown or Red-bellied Black	S
Hemiaspis signata	Marsh Snake	DH
Lampropholis sp.	Garden Skink	DH
Saiphos equalis	Three- toed yellow- bellied skink	NH

* denotes an introduced species
# denotes a threatened species under the NSW TSC Act 1995
+ identified by Anabat analysis
Record type: A- Avifauna survey, DH- Diurnal herp, NH- Nocturnal herp, NS- Nocturnal survey, O- Opportunistic, T- Fauna trapping, H- Harp Trap, S- Sign.

Appendix 4: An assessment of the likelihood of selected threatened flora and fauna species occurring on the Study Area

Scientific Name	Common Name	Likelihood of being found on the Study Area	7-part test/EPBC assessment required
Flora			
Allocasuarina defungens	Dwarf Heath Casuarina	**Unlikely –unsuitable habitat** Grows mainly in tall heath on sand, but can also occur on clay soils and sandstone in coastal areas. There are no records of the species in the locality **Not recorded in Study Area**	No
Diuris praecox	-	**Possible – suitable habitat present within the CSABF** Grows on hills and slopes of near-coastal districts in open forests which have a grassy to fairly dense understorey. **Surveys not conducted during flowering period**	**YES**
Eucalyptus camfieldii	Heart-leaved Stringybark	**Unlikely – unsuitable habitat** Poor coastal country in shallow sandy soils overlying Hawkesbury sandstone. Coastal heath mostly on exposed sandy ridges. There are two records of the species in the locality, both these records occur to the north of Fullerton Cove, below Tilligerry SCA. **Not recorded in Study Area**	No
Eucalyptus parramattensis subsp. *decadens*	-	**Possible – marginal habitat present within CSABF, SMPF and SOF** Occurs in dry Sclerophyll woodlands on sandy soil in low, often wet sites. There are seven records of the species in the locality. The closest of these occur within 1.5 km of the site, within vegetation to the east, and south east. **Not recorded in Study Area**	**YES**
Maundia triglochinoides	-	**Possible – suitable habitat present within SMPF and SOF** Grows in swamps or shallow freshwater on heavy clay; north from southern Sydney. **Not recorded in Study Area – Targeted surveys conducted during flowering period**	**YES**
Melaleuca biconvexa	Biconvex Paperbark	**Possible – suitable habitat present SMPF and SOF** Grows in damp places, usually near streams and alluvial soils. Found between Jervis Bay and Port Macquarie. **Not recorded in Study Area**	**YES**
Persicaria elatior	Knotweed	**Possible – suitable habitat present SMPF and SOF** Grows in damp places in the North, Central and Southern Coastal regions. **Not recorded in Study Area – Targeted surveys conducted during flowering period**	**YES**

Scientific Name	Common Name	Likelihood of being found on the Study Area	7-part test/EPBC assessment required
Phaius australis	Lesser Swamp-orchid	**Unlikely – Study Area outside known distribution of the species** Occurs in Queensland and north-east NSW as far south as Coffs Harbour. Historically, it extended farther south, to Port Macquarie. The species occurs in swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas. **Not recorded in Study Area – surveys conducted outside known flowering period of species**	No
Rulingia prostrata	Dwarf Kerrawang	**Possible – suitable habitat present within CSABF, SMPF and SOF** Occurs on sandy, sometimes peaty soils in a wide variety of habitats. Occurs on the Southern Highlands and Southern Tablelands, and on the North Coast (less than 100 plants at the Tomago sandbeds north of Newcastle). **Not recorded in Study Area**	**YES**
Streblus pendulinus	Siah's Backbone	**Unlikely – unsuitable habitat** The species grows in well developed rainforest, gallery forest and drier, more seasonal rainforest. **Not recorded in Study Area**	No
Syzygium paniculatum	Magenta Lilly Pilly	**Possible – marginal habitat present within SMPF and SOF** It grows on sandy soils in subtropical and littoral rainforest near the coast from Bulahdelah to Jervis Bay **Not recorded in Study Area**	**YES**
Tetratheca juncea	Black-eyed Susan	**Possible –habitat present within CSABF** Confined to the local government areas of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock. The species occurs in low open forest/woodland with a mixed shrub understorey and grassy groundcover. However, it has also been recorded in heathland and moist forest. **Not recorded in Study Area – Targeted surveys not conducted**	**YES**
Zannichellia palustris	-	**Possible – suitable habitat present within SMPF and SOF** Grows in fresh or slightly saline stationary or slowly flowing water. **Not recorded in Study Area – targeted survey conducted**	**YES**
Ecological Communities			
Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions	**Identified within the Study Area**		**YES**
Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	**Identified within the Study Area**		**YES**
White Box Yellow Box Blakely's Red Gum Woodland (TSC Act) / White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grasslands (EPBC Act)	**Not present.**		No

Scientific Name	Common Name	Likelihood of being found on the Study Area	7-part test/EPBC assessment required
Amphibians			
Crinia tinnula	Wallum Froglet	**Possible – sub-optimal habitat** Inhabit Wallum systems, which are silicious sand plains and dunes that support varying vegetation types including eucalypt forests and woodland, rainforest and heathland.	**YES**
Litoria aurea	Green and Golden Bell Frog	**Unlikely – unsuitable habitat** Prefers reed lined open water bodies.	No
Mixophyes iteratus	Giant Barred Frog	**Unlikely – unsuitable habitat** Requires second to fourth order shallow rocky flowing streams as breeding habitat	No
Birds			
Anthochaera phrygia	Regent Honeyeater	**Unlikely – unsuitable habitat** Mostly recorded in box-ironbark eucalypt associations. At times of food shortage the species also uses other woodland types and wet lowland coastal forest dominated by Swamp Mahogany or Spotted Gum.	No
Botaurus poiciloptilus	Australasian Bittern	**Possible – sub-optimal habitat present** Occurs in reeds and marshes in terrestrial freshwater wetlands and, occasionally estuarine habitats, generally where there is permanent water.	**YES**
Burhinus grallarius	Bush Stone-curlew	**Unlikely – unsuitable habitat** Requires shore and wading habitat	No
Calidris tenuirostris	Great Knot	**Unlikely – unsuitable habitat** Requires shore and wading habitat	No
Charadrius leschenaultii	Greater Sand-plover	**Unlikely – unsuitable habitat** Requires shore and wading habitat	No
Charadrius mongolus	Lesser Sand-plover	**Unlikely – unsuitable habitat** Requires shore and wading habitat	No
Ephippiorhynchus asiaticus	Black-necked Stork	**Unlikely – unsuitable habitat** Inhabits wetlands and vicinity, prefers open freshwater environs, including margins of billabongs, swamps, shallow floodwaters over grassland, dams, adjacent grassland and savannah woodlands.	No
Epthianura albifrons	White-fronted Chat	**Unlikely- unsuitable habitat** Found in open country, coastal estuaries, saltmarshes with low and often sparse samphire, swamp margins, remnant low vegetation on farmlands.	No
Glossopsitta pusilla	Little Lorikeet	**Possible – sub-optimal habitat present** Inhabits forests, woodlands, trees along watercourses and paddock trees.	**YES**
Haematopus fuliginosus	Sooty Oystercatcher	**Unlikely – unsuitable habitat** Requires shore and wading habitat	No
Haematopus longirostris	Pied Oystercatcher	**Unlikely – unsuitable habitat** Requires shore and wading habitat	No

Scientific Name	Common Name	Likelihood of being found on the Study Area	7-part test/EPBC assessment required
Hieraaetus morphnoides	Little Eagle	**Possible – sub-optimal habitat present** Favours hilly country, forests, woodlands, open scrublands, tree-lined watercourses of interior.	**YES**
Lathamus discolor	Swift Parrot	**Unlikely – unsuitable habitat** On the mainland, feed trees include winter flowering species such as *Eucalyptus robusta*, *Corymbia maculata* and *C. gummifera*. Commonly used lerp infested trees include *E. microcarpa*, *E. moluccana* and *E. pilularis.*	No
Limicola falcinellus	Broad-billed Sandpiper	**Unlikely – unsuitable habitat** Requires shore and wading habitat	No
Limosa limosa	Black-tailed Godwit	**Unlikely – unsuitable habitat** Coastal species found in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats.	No
Neophema pulchella	Turqoise Parrot	**Unlikely – unsuitable habitat** Requires shore and wading habitat	No
Ninox strenua	Powerful Owl	**Possible – sub-optimal habitat present** Preferred habitat is tall, moist productive eucalypt forests with a tall, shrub layer and abundant hollows supporting high densities of arboreal mammals. Removal of large hollow-bearing trees may adversely impact this species along with removal of habitat for preferred prey items (i.e. arboreal mammals). **Detected on site in summer 2012**	**YES**
Pandion poiciloptilus	Eastern Osprey	**Unlikely – unsuitable habitat** Requires shore and wading habitat	No
Ptilinopus magnificus	Wompoo Fruit-Dove	**Possible – sub-optimal habitat present** Inhabits tropical and subtropical rainforest of lowland and ranges, also monsoon forest and closed gallery forest of Cape York, temperate rainforests of SE Qld and NSW, occasionally wet eucalypt forest near rainforests.	**YES**
Puffinus carneipes	Flesh-footed Shearwater	**Unlikely – unsuitable habitat** Requires shore and wading habitat	No
Rostratula australis	Australian Painted Snipe	**Possible – sub-optimal habitat present** Prefers fringes of swamps, dams and nearby marshy areas. Nests on ground amongst tall vegetation such as grasses.	**YES**
Sterna albifrons	Little Tern	**Unlikely – unsuitable habitat** Requires shore and wading habitat	No
Tyto novaehollandiae	Masked Owl	**Unlikely – unsuitable habitat** Prefers open woodland with open ground cover for foraging and roosts and breeds in moist eucalypt forested gullies. Removal of large hollow-bearing trees may adversely impact this species along with removal of habitat for preferred prey items (i.e. arboreal mammals and terrestrial mammals).	No
Xenus cinereus	Terek Sandpiper	**Unlikely – unsuitable habitat**	No

Scientific Name	Common Name	Likelihood of being found on the Study Area	7-part test/EPBC assessment required
		Requires shore and wading habitat	
Mammals			
Dasyurus maculatus	Spotted-tail Quoll	**Unlikely – unsuitable habitat due to patch size, connectivity and lack of den sites.** 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.	No
Petaurus norfolcensis	Squirrel Glider	**Possible – suitable habitat** Preferred habitat is dry sclerophyll forest and woodland.	**YES**
Phascolarctos cinereus	Koala	**Possible – suitable habitat** Marginal habitat present with preferred habitat nearby	**YES**
Potorous tridactylus	Long-nosed Potoroo	**Unlikely – unsuitable habitat** In NSW found in a variety of forest and heath habitats with thick groundcover, generally with an annual rainfall >760 mm.	No
Pseudomys novaehollandiae	New Holland Mouse	**Unlikely – unsuitable habitat** Known from coastal dune, heaths and heathy woodlands.	No
Bats			
Chalinolobus dwyeri	Large-eared Pied Bat	**Unlikely – unsuitable habitat** Prefers dry forest close to sandstone ridgelines. Roosts in caves and crevices in cliffs.	No
Falsistrellus tasmaniensis	Eastern False Pipistrelle	**Confirmed – suitable foraging habitat present** Utilises hollow trunks of eucalypt trees for roosting. **Detected in summer 2012**	**YES**
Miniopterus australis	Little Bentwing-bat	**Possible - suitable habitat present** Utilises hollows for roosting and forages through and above the vegetated canopy as well as over cleared areas. **Detected while foraging**	**YES**
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	**Confirmed– suitable foraging habitat present** Forages through and above the vegetated canopy as well as over cleared areas. Roosts primarily in caves, but can also roost in derelict mines, storm-water tunnels, buildings and other man-made structures. **Detected while foraging**	**YES**
Mormopterus norfolkensis	East Coast Freetail-bat	**Confirmed – suitable foraging habitat present** Utilises hollows for roosting and forages through and above the vegetated canopy as well as over cleared areas. **Detected while foraging**	**YES**
Myotis macropus	Southern Myotis	**Unlikely – unsuitable habitat** Roosts in a variety of locations including caves, bridges, tree hollows, and even dense foliage. Skims the surface of streams and ponds to catch insects and small fish.	No

Scientific Name	Common Name	Likelihood of being found on the Study Area	7-part test/EPBC assessment required
Pteropus poliocephalus	Grey-headed Flying-fox	**Confirmed – suitable habitat present** Occur across a variety of habitats including tall sclerophyll forests and woodlands. Feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia. **Detected on site in summer 2012**	**YES**
Scoteanax rueppellii	Greater Broad-nosed Bat	**Possible – suitable foraging habitat present** A range of forest habitats **Not recorded in The Subject Site**	**YES**
Vespadelus troughtoni	Eastern Cave Bat	**Confirmed – suitable foraging habitat present** Roostes in overhang caves, boulder piles, cracks and crevices. **Detected on site in summer 2012**	**YES**
Migratory Species			
Actitis hypoleucos	Common Sandpiper	**Unlikely- unsuitable habitat** Prefers non-tidal fresh or brackish wetlands	No
Apus pacificus	Fork-tailed Swift	**Possible – aerial foraging habitat present** Aerial forager in low to very high airspace over varied habitat types.	**YES**
Ardea alba	Great Egret	**Possible – sub-optimal habitat present** Wetlands, flooded pasture, dams, estuarine mudflats, mangroves	**YES**
Ardea ibis	Cattle Egret	**Possible – sub-optimal habitat present** Inhabits moist pastures with tall grass, shallow open wetlands.	**YES**
Arenaria interpres	Ruddy Turnstone	**Unlikely – unsuitable habitat** Prefers rocky coastlines, on coral and sand islands	No
Calidris acuminata	Sharp-tailed Sandpiper	**Unlikely – unsuitable habitat** Prefers non-tidal fresh or brackish wetlands	No
Calidris canutus	Red Knot	**Unlikely – unsuitable habitat** Prefers intertidal mud and sandflats	No
Calidris ferruginea	Curlew Sandpiper	**Unlikely – unsuitable habitat** Prefers exposed intertidal mudflats, occasionally on inland freshwater wetlands.	No
Calidris melanotos	Pectoral Sandpiper	**Unlikely – unsuitable habitat** Prefers non-tidal fresh or brackish wetlands	No
Calidris ruficollis	Red-necked Stint	**Unlikely – unsuitable habitat** Inhabits a variety of fresh and saltwater habitats in coastal and inland areas.	No
Calidris tenuirostris	Great Knot	**Unlikely – unsuitable habitat** Inhabits sheltered coastal mudflats of estuaries, inlets, harbours, lagoons, mangrove swamps.	No
Charadrius bicinctus	Double-banded Plover	**Unlikely – unsuitable habitat** Mainly occurs on intertidal sand and mudflats and on ocean beaches.	No
Charadrius leschenaultia	Greater Sand Plover	**Unlikely – unsuitable habitat** Inhabits coastal, intertidal mudflats and sandbanks of sheltered bays and estuaries, sandy cays of coral reefs, reef platforms, less often coastal saltmarsh, brackish and rarely freshwater wetlands.	No

Scientific Name	Common Name	Likelihood of being found on the Study Area	7-part test/EPBC assessment required
Charadrius mongolus	Lesser Sand Plover	**Unlikely – unsuitable habitat** Inhabits intertidal sandflats and mudflats, beaches, estuary mudflats and sandbars, reef flats.	No
Charadrius ruficapillus	Red-capped Plover	**Unlikely – unsuitable habitat** Prefers non-tidal fresh or brackish wetlands	No
Gallinago megala	Swinhoe's Snipe	**Unlikely – unsuitable habitat** Prefers non-tidal fresh or brackish wetlands	No
Gallinago stenura	Pin-tailed Snipe	**Unlikely – unsuitable habitat** Prefers non-tidal fresh or brackish wetlands	No
Gallingo hardwickii	Latham's Snipe	**Possible – sub-optimal habitat present** Inhabits a variety of freshwater wetland types.	**YES**
Haliaeetus leucogaster	White-bellied Sea-Eagle	**Unlikely – unsuitable habitat** Usually inhabits coastal areas, over islands, reefs, beaches, estuaries, lagoons and floodplains.	No
Heteroscelus brevipes	Grey-tailed Tattler	**Unlikely – unsuitable habitat** Inhabits sheltered coasts with reefs and rock platforms or with intertidal mudflats.	No
Himantopus himantopus	Black-winged Stilt	**Unlikely – unsuitable habitat** Prefers non-tidal fresh or brackish wetlands	No
Hirundapus caudacutus	White-throated Needletail	**Possible – aerial foraging habitat** Aerial forager in high open spaces over varied habitat types.	**YES**
Lathamus discolor	Swift Parrot	**Unlikely – unsuitable habitat** Prefers habitats dominated by Spotted Gum, ironbarks and box tree species.	No
Limicola falcinellus	Broad-billed Sandpiper	**Unlikely – unsuitable habitat** Inhabits sheltered coastal estuaries, lagoons with soft intertidal mudflats, muddy coastal creeks, swamps, sewage ponds.	No
Limosa lapponica	Bar-tailed Godwit	**Unlikely – unsuitable habitat** Inhabits intertidal mudflats, rarely far from the coast.	No
Limosa limosa	Black-tailed Godwit	**Unlikely – unsuitable habitat** Usually found in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats.	No
Merops ornatus	Rainbow Bee-eater	**Possible – sub-optimal habitat present** Inhabits woodland, open forest, open country with scattered trees, semi-arid scrub.	**YES**
Monarcha melanopsis	Black-faced Monarch	**Possible – sub-optimal habitat present** Inhabits rainforests, mangroves, eucalypt forests and woodlands.	**YES**
Myiagra cyanoleuca	Satin Flycatcher	**Possible – sub-optimal habitat present** Inhabits tall forests and woodlands, mangroves, and in breeding season favours dense, wet gullies of eucalypt forest.	**YES**
Numenius madagascariensis	Eastern Curlew	**Unlikely – unsuitable habitat** Prefers intertidal mudflats and exposed seagrass beds	No
Numenius minutus	Little Curlew	**Unlikely – unsuitable habitat** Prefers short, dry grasslands, edges of freshwater wetlands	No

Scientific Name	Common Name	Likelihood of being found on the Study Area	7-part test/EPBC assessment required
Numenius phaeopus	Whimbrel	**Unlikely – unsuitable habitat** Prefers intertidal mud and sandflats	No
Philomachus pugnax	Ruff (Reeve)	**Unlikely – unsuitable habitat** Prefers intertidal mud and sandflats	No
Pluvialis fulva	Pacific Golden Plover	**Unlikely – unsuitable habitat** Inhabits intertidal sand and mudflats, coastal saltmarshes and rocky shores	No
Pluvialis squatarola	Grey Plover	**Unlikely – unsuitable habitat** Inhabits intertidal sand and mudflats, especially in estuaries and bays	No
Recurvirostra novaehollandiae	Red-knecked Avocet	**Unlikely – unsuitable habitat** Prefers intertidal mud and sandflats	No
Rhipidura rufifrons	Rufous Fantail	**Possible – sub-optimal habitat present** Inhabits rainforest, dense wet eucalypt and monsoon forests, paperbark and mangrove swamps **Detected on site in summer 2012**	**YES**
Rostratula benghalensis s. lat.	Painted Snipe	**Unlikely – unsuitable habitat** Inhabits shallow, vegetated, temporary or infrequently filled wetlands.	No
Tringa stagnatilis	Marsh Sandpiper	**Unlikely – unsuitable habitat** Inhabits coastal and inland fresh or saltwater wetlands, avoiding intertidal mudflats unless protected	No
Xenus cinereus	Terek Sandpiper	**Unlikely – unsuitable habitat** Inhabits coastal mudflats in sheltered estuaries and lagoons as well as sandbars, reefs, coastal swamps and saltfields.	No
Threatened Ecological Communities			

Appendix 5: TSC Act Assessment of Significance

Flora Assessment of Significance

Threatened flora species that were considered to possibly occur in the type of habitat represented both in the Study Area and in the locality are discussed below.

1. Rough Doubletail *(Diuris praecox)*

(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,

This member of the Donkey Orchid group has a light yellow flower with patchy brown blotches and flowers primarily between July and August (Bishop, 2000). The species is found in open forests with a grassy to dense understory, typically on hills and slopes of near-coastal districts (OEH, 2012). Its distribution ranges from Ourimbah to Nelson Bay along coastal areas (Harden, 1993).

Diuris praecox is vulnerable both in NSW and at a commonwealth level. Several threats are identified for this species. These include destruction and fragmentation of habitat, competition with weeds and impacts of recreational activities (OEH 2012).

Targeted surveys for *Diuris praecox* were not conducted within the Study Area and therefore it is not known if a local population of the species is present. Potential habitat for the species occurs within the Coastal Sand Apple – Blackbutt Forest, as there will not be any direct impacts within this community it is unlikely that the proposal will place a viable local population at the risk of extinction.

(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,

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

Not applicable.

(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,

Not applicable.

(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

The species has potential habitat within the Costal Sand Apple – Blackbutt Forest within the Study Area. The proposed development will not result in the loss of any habitat for this species. As the habitat for *D. praecox* is in close proximity to the proposed development there is the potential for indirect impacts on 1.0 ha of habitat within the site and 0.3 ha directly adjacent to the site. Indirect impacts include habitat modification through edge effects, weed dispersal, sedimentation and surface run-off.

(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

The Study Area constitutes a small patch of vegetation on the edge of a larger area of bushland to the east. As the proposed development site is already located on the periphery of patch of vegetation the proposal will not isolate or fragment the remaining potential habitat for the species.

(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,

The Coastal Sand Apple – Blackbutt Forest within the Study Area is already degraded due to the high occurrence of weed species and presence of tracks. This area of habitat is not of high importance to the long term survival of the species in the locality.

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

No critical habitat is listed for the species.

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

No recovery plan or threat abatement plan has been prepared for this species.

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

The proposed activity may contribute to the following Key Threatening Processes (KTP) relevant to the species:

- **Anthropogenic climate change:** Modification of the environment by humans may result in future climate change;
- **Clearing of native vegetation:** The proposed development will remove approximately 1.8 ha of native vegetation adjacent to the habitat for this species;
- **Infection of native plants by *Phytophthora cinnamomi*:** *P. cinnamomi* infection has been observed within the Hunter-Central Rivers CMA, the proposed development could cause the spread of the species;
- **Invasion and establishment of exotic vines and scramblers:** Species listed under this KTP (i.e. Coastal Morning Glory and Japanese Honeysuckle) occur within the site, the proposal has the potential to further spread these species into the remaining habitat for the species;
- **Invasion, establishment and spread of *Lantana camara*:** *Lantana camara* is present in the Study Area, the proposed development could cause the spread of the species; and,
- **Invasion of native plant communities by Chrysanthemoides monilifera (bitou bush and boneseed):** As the species occurs within the Study Area the proposal has the potential to spread the species within the site and into surrounding areas.

Conclusion:

As there will not be any direct impacts in areas of habitat for this species it is unlikely that the proposal will have a significant impact on the species.

References

Bishop, T. (2000). *Field Guide to the Orchids of New South Wales and Victoria*. University of New South Wales Press: Sydney.

Harden, G.J. (ed) (1993). *Flora of New South Wales: Volume 4*. NSW University Press: Sydney.

Office of Environment and Heritage (2012). Rough Doubletail - profile. OEH website: http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10240

2. Earp's Gum *(Eucalyptus parramattensis subsp. decadens)*

(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,

Eucalyptus parramattensis subsp. decadens generally occurs in dry sclerophyll woodland with dry heath understorey on deep, low-nutrient sands, in areas subject to periodic inundation or have relatively high water tables. It also occurs as an emergent in dry or wet heath land and often where the species occurs it is a dominant species (OEH, 2012). The species is distributed in two main disjunct locations being the Tomago sandbeds and the Cessnock-Kurri area. Bell (2006) estimates that there are 2 500 to over 8 000 plants in each area.

As no *Eucalyptus parramattensis subsp. decadens* plants were identified within the Study Area the proposal is unlikely to have a significant impact on the life cycle of the species.

(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,
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
Not applicable.

(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,
Not applicable.

(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
The species has potential habitat within all native vegetation communities within the Study Area. The proposed development will result in the loss of approximately 1.8 ha of marginal habitat for this species. Additionally, as the remaining potential habitat for *E. parramattensis subsp. decadens* (2.9 ha within the site and 1.7 ha adjacent) is in close proximity to the proposed development there is the potential for indirect impacts, predominantly habitat modification through edge effects, weed dispersal, sedimentation and surface run-off.

(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
The Study Area constitutes a small patch of vegetation on the edge of a larger area of bushland to the east. As the proposed development site is already located on the periphery of patch of vegetation the proposal will not isolate or fragment the remaining potential habitat for the species.

(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,
The potential habitat for the species that occurs within the Development Area is already disturbed and as no individuals were identified within the Study Area the habitat to be removed is not of high importance to the species.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),
No critical habitat is listed for the species.

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

No recovery plan or threat abatement plan has been prepared for this species.

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

The proposed activity may contribute to the following Key Threatening Processes (KTP) relevant to the species:

- **Anthropogenic climate change:** Modification of the environment by humans may result in future climate change;
- **Clearing of native vegetation:** The proposed development will remove approximately 1.8 ha of native vegetation;
- **Infection of native plants by *Phytophthora cinnamomi*:** *P. cinnamomi* infection has been observed within the Hunter-Central Rivers CMA, the proposed development could cause the spread of the species;
- **Introduction and Establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae:** There is the potential to introduce these fungi on machinery;
- **Invasion and establishment of exotic vines and scramblers:** Species listed under this KTP (i.e. Coastal Morning Glory and Japanese Honeysuckle) occur within the site, the proposal has the potential to further spread these species into the remaining habitat for the species;
- **Invasion, establishment and spread of *Lantana camara*:** *Lantana camara* is present in the Study Area, the proposed development could cause the spread of the species; and,
- **Invasion of native plant communities by Chrysanthemoides monilifera (bitou bush and boneseed):** As the species occurs within the Study Area the proposal has the potential to spread the species within the site and into surrounding areas.

Conclusion:

As the species was not detected within the Study Area there is a low likelihood that the proposal will have a significant impact on the species. There will be impacts to marginal habitat of the species (1.8 ha), but due to the already degraded nature of these areas of habitat, this impact is not considered significant for this species.

References

Bell, S.A.J. (2006). *Eucalyptus parramattensis subsp. decadens*: *Status, distribution and habitat.* Unpublished report prepared for the Department of Environment & Conservation, Newcastle. Eastcoast Flora Survey. June 2006.

OEH (2012) *Eucalyptus parramattensis* subsp. *decadens* - profile. OEH website, Updated: September 2012, Available: http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10305

3. *Maundia triglochinoides*

(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,

Maundia triglochinoides grows in permanent swaps and shallow fresh water on heavy clay in the North Coast and northern part of the Central Coast floristic regions (Harden, 1993; NSW Scientific Committee, 2001) and is associated with other wetland vegetation, such as *Triglochin procerum* (Benson & McDougall, 2002). There are old records of this species occurring as far south as Sydney, however it is presumed extinct from these sites, and Wyong in now thought to be the southern limit of its range (OEH, 2012).

Targeted surveys were conducted within the known flowering period of the species and no *Maundia triglochinoides* plants were identified. As a population of the species is not present within the Study Area the proposal is unlikely to have a significant impact on the life cycle of the species.

(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,

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

Not applicable.

(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,

Not applicable.

(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

The species has potential habitat within the Swamp Mahogany – Paperbark Forest and Swamp Oak Forest within the Study Area. The proposed development will result in the loss of approximately 1.8 ha of potential habitat for this species. Additionally, as the remaining potential habitat for *M. triglochinoides* (1.9 ha within the site and 1.4 ha adjacent) is in close proximity to the proposed development there is the potential for indirect impacts, predominantly habitat modification through edge effects, weed dispersal, sedimentation and surface run-off.

(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

The Study Area constitutes a small patch of vegetation on the edge of a larger area of bushland to the east. As the proposed development site is already located on the periphery of patch of vegetation the proposal will not isolate or fragment the remaining potential habitat for the species.

(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,

The potential habitat for the species that occurs within the Development Area is already disturbed and as no individuals were identified within the Study Area the habitat to be removed is not of high importance to the species.

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

No critical habitat is listed for the species.

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

No recovery plan or threat abatement plan has been prepared for this species.

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

The proposed activity may contribute to the following Key Threatening Processes (KTP) relevant to the species:

- **Anthropogenic climate change:** Modification of the environment by humans may result in future climate change;
- **Clearing of native vegetation:** The proposed development will remove approximately 1.8 ha of native vegetation;
- **Infection of native plants by *Phytophthora cinnamomi*:** *P. cinnamomi* infection has been observed within the Hunter-Central Rivers CMA, the proposed development could cause the spread of the species;
- **Invasion and establishment of exotic vines and scramblers:** Species listed under this KTP (i.e. Coastal Morning Glory and Japanese Honeysuckle) occur within the site, the proposal has the potential to further spread these species into the remaining habitat for the species;
- **Invasion, establishment and spread of *Lantana camara*:** *Lantana camara* is present in the Study Area, the proposed development could cause the spread of the species; and,
- **Invasion of native plant communities by Chrysanthemoides monilifera (bitou bush and boneseed):** As the species occurs within the Study Area the proposal has the potential to spread the species within the site and into surrounding areas.

Conclusion:

As the species was not detected within the Study Area there is a low likelihood that the proposal will have a significant impact on the species. There will be impacts to the habitat of the species (1.8 ha), but due to the already degraded nature of these areas of habitat, this impact is not considered significant for this species.

References

Benson, D. and McDougall, L. (2002) *Ecology of Sydney Plant Species. Part 9*, Cunninghamia 7(4), pp. 695-930.

Harden, G.J. (ed) (1993). *Flora of New South Wales Volume 4*. UNSW Press, Sydney.

NSW Scientific Committee (2001) *Maundia triglochinoides* (a herb) – Vulnerable Species Determination – Final. DEC (NSW)
http://www.environment.nsw.gov.au/determinations/MaundiaTriglochinoidesVulSpListing.htm

OEH (2012) *Maundia triglochinoides* – profile. OEH website, Updated: September 2012, Available http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10511

4. Biconvex Paperbark *(Melaleuca biconvexa)*

(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,

A paperbark tree growing to about 20 metres tall and occurring predominantly in the Wyong and Gosford LGA. A record exists of this plant also occurring in Port Macquarie however recently this record has come into question as a possible misidentification. (S. Duncan pers comm.) This would suggest that populations within the Lake Macquarie LGA would be at the most northerly limit of the range of this tree. *Melaleuca biconvexa* appears to have restricted habitat requirements being most commonly found in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects, along freshwater watercourses and in association with *Eucalyptus saligna* (Sydney Bluegum) or *Eucalyptus robusta* (Swamp Mahogany) (Duncan, 2001).

As no *Melaleuca biconvexa* plants were identified within the Study Area the proposal is unlikely to have a significant impact on the life cycle of the species.

(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,

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

Not applicable.

(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,

Not applicable.

(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

The species has potential habitat within the Swamp Mahogany – Paperbark Forest and Swamp Oak Forest within the Study Area. The proposed development will result in the loss of approximately 1.8 ha of potential habitat for this species. Additionally, as the remaining potential habitat for *M. biconvexa* (1.9 ha within the site and 1.4 ha adjacent) is in close proximity to the proposed development there is the potential for indirect impacts, predominantly habitat modification through edge effects, weed dispersal, sedimentation and surface run-off.

(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

The Study Area constitutes a small patch of vegetation on the edge of a larger area of bushland to the east. As the proposed development site is already located on the periphery of patch of vegetation the proposal will not isolate or fragment the remaining potential habitat for the species.

(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,

The potential habitat for the species that occurs within the Development Area is already disturbed and as no individuals were identified within the Study Area the habitat to be removed is not of high importance to the species.

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

No critical habitat is listed for the species.

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

No recovery plan or threat abatement plan has been prepared for this species.

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

The proposed activity may contribute to the following Key Threatening Processes (KTP) relevant to the species:

- **Anthropogenic climate change:** Modification of the environment by humans may result in future climate change;

- **Clearing of native vegetation:** The proposed development will remove approximately 1.8 ha of native vegetation;
- **Infection of native plants by *Phytophthora cinnamomi*:** *P. cinnamomi* infection has been observed within the Hunter-Central Rivers CMA, the proposed development could cause the spread of the species;
- **Invasion and establishment of exotic vines and scramblers:** Species listed under this KTP (i.e. Coastal Morning Glory and Japanese Honeysuckle) occur within the site, the proposal has the potential to further spread these species into the remaining habitat for the species;
- **Invasion, establishment and spread of *Lantana camara*:** *Lantana camara* is present in the Study Area, the proposed development could cause the spread of the species; and,
- **Invasion of native plant communities by Chrysanthemoides monilifera (bitou bush and boneseed):** As the species occurs within the Study Area the proposal has the potential to spread the species within the site and into surrounding areas.

Conclusion:

As the species was not detected within the Study Area there is a low likelihood that the proposal will have a significant impact on the species. There will be impacts to the habitat of the species (1.8 ha), but due to the already degraded nature of these areas of habitat, this impact is not considered significant for this species.

References

Duncan, S. (2001) The Conservation of *Melaleuca biconvexa* within the Wyong Shire. Unpublished Thesis.

5. Knotweed *(Persicaria elatior)*

(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,

An erect herb to 90 cm tall with small pink flowers that grows in damp places within the North Coast, Central Coast and South Coast floristic regions of NSW (Harden, 2005). Records of the species in south-eastern NSW include Mt Dromedary, Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui and Picton Lakes. The species has also been found in northern NSW in Raymond Terrace and the Grafton area (OEH, 2012).

Targeted surveys were conducted within the known flowering period of the species and no *Persicaria elatior* plants were identified. As a population of the species is not present within the Study Area the proposal is unlikely to have a significant impact on the life cycle of the species.

(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,

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

Not applicable.

(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,

Not applicable.

(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

The species has potential habitat within the Swamp Mahogany – Paperbark Forest and Swamp Oak Forest within the Study Area. The proposed development will result in the loss of approximately 1.8 ha of potential habitat for this species. Additionally, as the remaining potential habitat for *P. elatior* (1.9 ha within the site and 1.4 ha adjacent) is in close proximity to the proposed development there is the potential for indirect impacts, predominantly habitat modification through edge effects, weed dispersal, sedimentation and surface run-off.

(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

The Study Area constitutes a small patch of vegetation on the edge of a larger area of bushland to the east. As the proposed development site is already located on the periphery of patch of vegetation the proposal will not isolate or fragment the remaining potential habitat for the species.

(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,

The potential habitat for the species that occurs within the Development Area is already disturbed and as no individuals were identified within the Study Area the habitat to be removed is not of high importance to the species.

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

No critical habitat is listed for the species.

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

No recovery plan or threat abatement plan has been prepared for this species.

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

The proposed activity may contribute to the following Key Threatening Processes (KTP) relevant to the species:

- **Anthropogenic climate change:** Modification of the environment by humans may result in future climate change;
- **Clearing of native vegetation:** The proposed development will remove approximately 1.8 ha of native vegetation;
- **Infection of native plants by *Phytophthora cinnamomi*:** *P. cinnamomi* infection has been observed within the Hunter-Central Rivers CMA, the proposed development could cause the spread of the species;
- **Invasion and establishment of exotic vines and scramblers:** Species listed under this KTP (i.e. Coastal Morning Glory and Japanese Honeysuckle) occur within the site, the proposal has the potential to further spread these species into the remaining habitat for the species;
- **Invasion, establishment and spread of *Lantana camara*:** *Lantana camara* is present in the Study Area, the proposed development could cause the spread of the species; and,
- **Invasion of native plant communities by Chrysanthemoides monilifera (bitou bush and boneseed):** As the species occurs within the Study Area the proposal has the potential to spread the species within the site and into surrounding areas.

Conclusion:

As the species was not detected within the Study Area there is a low likelihood that the proposal will have a significant impact on the species. There will be impacts to the habitat of the species (1.8 ha), but due to the already degraded nature of these areas of habitat, this impact is not considered significant for this species.

References

Harden G.J. (ed.) (2005). *Flora of New South Wales Volume 1 Revised Edition*. UNSW Press, Sydney.

OEH (2012). Tall Knotweed- Profile. OEH website, Updated September 2012, Available: http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10590

6. Dwarf Kerrawang (*Rulingia prostrata*)

(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,

Rulingia prostrata, as it name indicates, is a prostrate shrub forming dense mats to 1m across and only 5 cm high. Stems and branches are sparsely covered with stellate hairs. Leaves are ovate to lanceolate, mostly 2-6 cm long, 5-20 mm wide with margins irregularly crenate or lobed. Upper leaf surfaces are green and glabrescent, lower surface sparsely tomentose. Flowering is mainly between October and November. Initially white, the petals turn pink with age. Petals are 2-3mm long and cymes can have 3-12 flowers. Capsules are between 8-10 mm diameter, having stellate hairs on short and dense bristles. Fruits can be found during spring to summer (Harden 2000).

Dwarf Kerrawang occurs on the Southern Tablelands (one plant at Penrose State Forest, one plant at Rowes Lagoon and one plant at Tallong) and on the North Coast (less than 100 plants at the Tomago sandbeds north of Newcastle). It is also found in Victoria (OEH 2012).

Habitat occurs on sandy, sometimes peaty soils in a wide variety of habitats: Snow Gum (*Eucalyptus pauciflora*) Woodland at Rose Lagoon; Blue leaved Stringybark (*E. agglomerata*) Open Forest at Tallong; and in Brittle Gum (*E. mannifera*) Low Open Woodland at Penrose; Scribbly Gum (*Eucalyptus haemastoma*)/ Swamp Mahogany (*E. robusta*) Ecotonal Forest at Tomago (OEH 2012).

As no *Rulingia prostrata* plants were identified within the Study Area the proposal is unlikely to have a significant impact on the life cycle of the species.

(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,

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

Not applicable.

(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,

Not applicable.

(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

The species has potential habitat within all native vegetation communities within the Study Area. The proposed development will result in the loss of approximately 1.8 ha of potential habitat for this species. Additionally, as the remaining potential habitat for *R. prostrata* (2.9 ha within the site and 1.7 ha adjacent) is in close proximity to the proposed development there is the potential for indirect impacts, predominantly habitat modification through edge effects, weed dispersal, sedimentation and surface run-off.

(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

The Study Area constitutes a small patch of vegetation on the edge of a larger area of bushland to the east. As the proposed development site is already located on the periphery of patch of vegetation the proposal will not isolate or fragment the remaining potential habitat for the species.

(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,

The potential habitat for the species that occurs within the Development Area is already disturbed and as no individuals were identified within the Study Area the habitat to be removed is not of high importance to the species.

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

No critical habitat is listed for the species.

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

No recovery plan or threat abatement plan has been prepared for this species.

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

The proposed activity may contribute to the following Key Threatening Processes (KTP) relevant to the species:

- **Anthropogenic climate change:** Modification of the environment by humans may result in future climate change;
- **Clearing of native vegetation:** The proposed development will remove approximately 1.8 ha of native vegetation;
- **Infection of native plants by *Phytophthora cinnamomi*:** *P. cinnamomi* infection has been observed within the Hunter-Central Rivers CMA, the proposed development could cause the spread of the species;
- **Invasion and establishment of exotic vines and scramblers:** Species listed under this KTP (i.e. Coastal Morning Glory and Japanese Honeysuckle) occur within the site, the proposal has the potential to further spread these species into the remaining habitat for the species;
- **Invasion, establishment and spread of *Lantana camara*:** *Lantana camara* is present in the Study Area, the proposed development could cause the spread of the species; and,
- **Invasion of native plant communities by Chrysanthemoides monilifera (bitou bush and boneseed):** As the species occurs within the Study Area the proposal has the potential to spread the species within the site and into surrounding areas.

Conclusion:

As the species was not detected within the Study Area there is a low likelihood that the proposal will have a significant impact on the species. There will be impacts to the habitat of the species (1.8 ha), but

due to the already degraded nature of these areas of habitat, this impact is not considered significant for this species.

References

Harden, G. J. (ed.) (2000). *Flora of New South Wales: Volume 1*. UNSW Press, Kensington, NSW.

OEH (2005). Dwarf Kerrawang – profile. OEH website, Updated: September 2012, Available: http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10736

7. Magenta Lilly Pilly (*Syzygium paniculatum*)

(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,

This plant is commonly known as Magenta Lilly Pilly, it is a small tree or tall shrub growing to 8 m (Williams et at. 1984). It produces white coloured flowers from November to February, which than turn into magenta coloured spherical or egg shaped berries (OEH 2012). It grows on sandy soils in subtropical and littoral rainforest near the coast from Bulahdelah to Jervis Bay (Harden 2002).

As no *Syzygium paniculatum* plants were identified within the Study Area the proposal is unlikely to have a significant impact on the life cycle of the species.

(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,

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

Not applicable.

(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,

Not applicable.

(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

The species has potential habitat within the Swamp Mahogany – Paperbark Forest and Swamp Oak Forest within the Study Area. The proposed development will result in the loss of approximately 1.8 ha of potential habitat for this species. Additionally, as the remaining potential habitat for *S. paniculatum* (1.9 ha within the site and 1.4 ha adjacent) is in close proximity to the proposed development there is the potential for indirect impacts, predominantly habitat modification through edge effects, weed dispersal, sedimentation and surface run-off.

(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

The Study Area constitutes a small patch of vegetation on the edge of a larger area of bushland to the east. As the proposed development site is already located on the periphery of patch of vegetation the proposal will not isolate or fragment the remaining potential habitat for the species.

(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,

The potential habitat for the species that occurs within the Development Area is already disturbed and as no individuals were identified within the Study Area the habitat to be removed is not of high importance to the species.

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

No critical habitat is listed for the species.

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

No recovery plan or threat abatement plan has been prepared for this species.

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

The proposed activity may contribute to the following Key Threatening Processes (KTP) relevant to the species:

- **Anthropogenic climate change:** Modification of the environment by humans may result in future climate change;
- **Clearing of native vegetation:** The proposed development will remove approximately 1.8 ha of native vegetation;
- **Infection of native plants by *Phytophthora cinnamomi*:** *P. cinnamomi* infection has been observed within the Hunter-Central Rivers CMA, the proposed development could cause the spread of the species;
- **Invasion and establishment of exotic vines and scramblers:** Species listed under this KTP (i.e. Coastal Morning Glory and Japanese Honeysuckle) occur within the site, the proposal has the potential to further spread these species into the remaining habitat for the species;
- **Invasion, establishment and spread of *Lantana camara*:** *Lantana camara* is present in the Study Area, the proposed development could cause the spread of the species; and,
- **Invasion of native plant communities by Chrysanthemoides monilifera (bitou bush and boneseed)**: As the species occurs within the Study Area the proposal has the potential to spread the species within the site and into surrounding areas.

Conclusion:

As the species was not detected within the Study Area there is a low likelihood that the proposal will have a significant impact on the species. There will be impacts to the habitat of the species (1.8 ha), but due to the already degraded nature of these areas of habitat, this impact is not considered significant for this species.

References

Harden, G.J. (ed) (2002). *Flora of New South Wales: Volume 2 revised edition*. NSW University Press: Sydney.

OEH (2012). Magenta Lilly Pilly - Profile. OEH website, Updated November 2012, Available: http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10794

Williams, J. B., Harden, G. J. and McDonald, W. J. F. (1984). *Trees and Shrubs in Rainforests of NSW and Southern Queensland*. University of New England, Armidale.

8. Black-eyed Susan (*Tetratheca juncea*)

(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,

Tetratheca juncea Smith (Tremandraceae) is a terrestrial herbaceous plant endemic to NSW and listed under Schedule 2 of the NSW *Threatened Species Conservation Act* 1995 as Vulnerable and having a ROTAP coding of 3VCa (Briggs and Leigh 1995). It is also listed as Vulnerable in the *Commonwealth Environment Protection and Biodiversity Conservation Act* 1999. Thompson (1976), in a revision of the *Tetratheca* genus, noted that there were records from the late 1800's of the plant occurring in suburbs of Sydney, from Port Jackson and suburbs to the south. *T. juncea* is now known to exist only from the Wyong area to Bulahdelah and inland to the edge of the main ranges with the greatest concentration of records being from the Wyong and Lake Macquarie local government areas (Payne 2000).

Tetratheca juncea propagates through both rhizomal spread and seed development and germination (Thompson 1976, Payne 2000). Propagation by seed appears to be limited by a dispersal mechanism that is most probably by ants collecting the seed for the lipid rich elaiosome (Brew *et al.* 1989, Boeswinkel 1999).

Tetratheca juncea is distinguished from other members of the *Tetratheca* genus by having generally leafless stems that have a distinctly angular, winged structure (Thompson 1976). The flowers of *T. juncea* however share the four-petalled, pink form that is characteristic of the genus. The flowering period for *T. juncea* is generally reported as being from mid to late winter through to late summer (Gardner & Murray 1992). The flowers grow from nodes on the mostly leafless stem and are commonly solitary but occasionally in pairs with each flower facing downward, suspended on a peduncle of about 10mm length. The four petals range in colour from mauve through pink to almost white (Thompson 1976, Payne 2000).

Driscoll (2003) used GIS analysis of 400 records (compiled from Payne 2000, Bartier *et al.* 2001, and S. Bell & C. Driscoll unpub.) and showed that *T. juncea* has been reported from 16 separate, and often widely differing, vegetation community types as defined in NPWS (2000) and Eco Logical (2002). However over 60% of records were from within *Coastal Plains Smooth-barked Apple Woodland* (MU30) about 14% from *Coastal Plains Scribbly Gum Woodland* (MU31) and about 11% from *Coastal Foothills Spotted Gum - Ironbark Forest* (MU15). These results indicate that within the range of its occurrence, *T. juncea* should be considered as possibly occurring in most common vegetation communities.

Targeted surveys for *Tetratheca juncea* were not conducted within the Study Area and therefore it is not known if a local population of the species is present. Potential habitat for the species occurs within the Coastal Sand Apple – Blackbutt Forest, as there will not be any direct impacts within this community it is unlikely that the proposal will place a viable local population at the risk of extinction.

(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,

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

Not applicable.

(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,

Not applicable.

(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

The species has potential habitat within the Costal Sands Apple – Blackbutt Forest within the Study Area. The proposed development will not result in the loss of any habitat for this species. As the habitat for *T. juncea* is in close proximity to the proposed development there is the potential for indirect impacts on 1.0 ha of habitat within the site and 0.3 ha directly adjacent to the site. Indirect impacts include habitat modification through edge effects, weed dispersal, sedimentation and surface run-off.

(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

The Study Area constitutes a small patch of vegetation on the edge of a larger area of bushland to the east. As the proposed development site is already located on the periphery of patch of vegetation the proposal will not isolate or fragment the remaining potential habitat for the species.

(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,

The Coastal Sand Apple – Blackbutt Forest within the Study Area is already degraded due to the high occurrence of weed species and presence of tracks. This area of habitat is not of high importance to the long term survival of the species in the locality.

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

No critical habitat is listed for the species.

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

No recovery plan or threat abatement plan has been prepared for this species.

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

The proposed activity may contribute to the following Key Threatening Processes (KTP) relevant to the species:

- **Anthropogenic climate change:** Modification of the environment by humans may result in future climate change;
- **Clearing of native vegetation:** The proposed development will remove approximately 1.8 ha of native vegetation adjacent to the habitat for this species;
- **Infection of native plants by *Phytophthora cinnamomi*:** *P. cinnamomi* infection has been observed within the Hunter-Central Rivers CMA, the proposed development could cause the spread of the species;
- **Invasion and establishment of exotic vines and scramblers:** Species listed under this KTP (i.e. Coastal Morning Glory and Japanese Honeysuckle) occur within the site, the proposal has the potential to further spread these species into the remaining habitat for the species;
- **Invasion, establishment and spread of *Lantana camara*:** *Lantana camara* is present in the Study Area, the proposed development could cause the spread of the species; and,
- **Invasion of native plant communities by Chrysanthemoides monilifera (bitou bush and boneseed):** As the species occurs within the Study Area the proposal has the potential to spread the species within the site and into surrounding areas.

Conclusion:

As there will not be any direct impacts in areas of habitat for this species it is unlikely that the proposal will have a significant impact on the species.

References

Brew, C.R., O'Dowd, D.J. & Rae, I.D. (1989). Seed dispersal by ants: behaviour-releasing compounds in elaiosomes. *Oecologia* 80, 490-497.

Boeswinkel, F.D. (1999). Ovules and seeds of Tremandraceae. *Australian Journal of Botany* 47, 769-781.

Briggs, J.D. & Leigh, J.H. (1995). *Rare or Threatened Australian Plants*, CSIRO.

Driscoll, C. (2003). The pollination ecology of *Tetratheca juncea* Smith (Tremandraceae): finding the pollinators. *Cunninghamia* 9(1) 133-140.

Gardner, C. & Murray, L. (1992). Tremandraceae. In: *Flora of New South Wales: Volume 3* (ed. G.J. Harden) pp. 74-78. UNSW Press.

NPWS (2000). *Vegetation Survey, Classification and Mapping Lower Hunter and Central Coast Region.* Version 1.2. A project undertaken for The Lower Hunter and Central Coast Regional Environment Management Strategy CRA Unit Sydney Zone, National Parks and Wildlife Service.

Payne, R.J. (2000). Lake Macquarie Tetratheca juncea Conservation Management Plan Final Report November 2000. A report prepared for Lake Macquarie City Council, NSW National Parks and Wildlife Service and BHP Pty Ltd.

Thompson, J. (1976). A Revision of the Genus *Tetratheca* (Tremandraceae). *Telopea* 1 (3), 139-215.

9. *Zannichellia palustris*

(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,

Zannichellia palustris is a small submerged aquatic plant with narrow opposite leaves less than 1mm wide and 2-7cm long (Harden 1993). This species is restricted to the lower hunter and Murray River Estuary of NSW, and is found in slow moving fresh or slightly saline environments (NSW Scientific Committee 2008). This plant has separate male and female flowers which appear in the warmer months (Harden 1993). It is either a perennial or annual species, however it acts as an annual by dying off in summer in NSW (OEH 2012).

As no *Zannichellia palustris* plants were identified within the Study Area the proposal is unlikely to have a significant impact on the life cycle of the species.

(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,

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

Not applicable.

(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,

Not applicable.

(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

The species has potential habitat within the Swamp Mahogany – Paperbark Forest and Swamp Oak Forest within the Study Area. The proposed development will result in the loss of approximately 1.8 ha of potential habitat for this species. Additionally, as the remaining potential habitat for *S. paniculatum* (1.9 ha within the site and 1.4 ha adjacent) is in close proximity to the proposed development there is the potential for indirect impacts, predominantly habitat modification through edge effects, weed dispersal, sedimentation and surface run-off.

(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

The Study Area constitutes a small patch of vegetation on the edge of a larger area of bushland to the east. As the proposed development site is already located on the periphery of patch of vegetation the proposal will not isolate or fragment the remaining potential habitat for the species.

(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,

The potential habitat for the species that occurs within the Development Area is already disturbed and as no individuals were identified within the Study Area the habitat to be removed is not of high importance to the species.

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

No critical habitat is listed for the species.

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

No recovery plan or threat abatement plan has been prepared for this species.

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

The proposed activity may contribute to the following Key Threatening Processes (KTP) relevant to the species:

- **Anthropogenic climate change:** Modification of the environment by humans may result in future climate change;
- **Clearing of native vegetation:** The proposed development will remove approximately 1.8 ha of native vegetation;
- **Infection of native plants by *Phytophthora cinnamomi*:** *P. cinnamomi* infection has been observed within the Hunter-Central Rivers CMA, the proposed development could cause the spread of the species;
- **Invasion and establishment of exotic vines and scramblers:** Species listed under this KTP (i.e. Coastal Morning Glory and Japanese Honeysuckle) occur within the site, the proposal has the potential to further spread these species into the remaining habitat for the species;
- **Invasion, establishment and spread of *Lantana camara*:** *Lantana camara* is present in the Study Area, the proposed development could cause the spread of the species; and,
- **Invasion of native plant communities by Chrysanthemoides monilifera (bitou bush and boneseed)**: As the species occurs within the Study Area the proposal has the potential to spread the species within the site and into surrounding areas.

Conclusion:
As the species was not detected within the Study Area there is a low likelihood that the proposal will have a significant impact on the species. There will be impacts to the habitat of the species (1.8 ha), but due to the already degraded nature of these areas of habitat, this impact is not considered significant for this species.

References
OEH (2012). Zannichellia palustris - Profile, DECC website, Updated: September 2012, Available: http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10847

NSW Scientific Committee (2008). *Zannichellia palustris* (a submerged aquatic plant) – Endangered Species Listing. NSW Scientific Committee - final determination. OEH Website, Updated: February 2012, Available: http://www.environment.nsw.gov.au/determinations/ZannichelliaPalustrisEndSpListing.htm
Harden, G.J. (ed) (1993). Flora of New South Wales Volume 4. NSW University Press: Sydney.

Threatened Ecological Communities Assessment of Significance

The Threatened Ecological Communities (EECs) that occur within the Study Area discussed below.

10. Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions

(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,
Not applicable.

(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,
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

The community generally occurs below 20 m elevation and 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. The structure of the community may vary from open forests to low woodlands, scrubs or reedlands with scattered trees. The community has a dense to sparse tree layer, with *Casuarina glauca* (Swamp Oak) as the dominant species, other trees including *Acmena smithii* (Lilly Pilly), *Glochidion* spp. (Cheese Trees) and *Melaleuca* spp. (Paperbarks) (OEH 2012).

The proposed development will result in the removal of approximately 1.8 ha of this TEC within the Study Area; this represents a removal of 58% of the community. This is a significant impact on the TEC within the Study Area as the majority of the community within the site will be removed.

(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,

The area of the TEC that is to be retained within and adjacent to the site (1.3 ha within the site and 0.3 ha adjacent to the south) has the potential to be adversely modified through edge effects, weed dispersal, sedimentation and surface run-off. These impacts have the potential to significantly modify to composition of the community, these impacts are unlikely to place the local occurrence of the community at the risk of extinction, but there is the potential to impact on the condition and function of the community within, and directly adjacent to the site.

(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

The proposed development would result in the removal of approximately 1.8 ha of the TEC (58%). There is also the potential to impact on the remaining areas of the community (1.3 ha within Study Area and 0.3 ha directly adjacent) due to its close proximity to the proposed development site.

(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

The Study Area constitutes a small patch of vegetation on the edge of a larger area of bushland to the east. As the proposed development site is already located on the periphery of patch of vegetation the proposal will not isolate or fragment the remaining area of the community.

(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,

The area of the community to be removed occurs in the north of the site where the community is already modified and contains areas with no connecting canopy that are dominated by *Typha orientalis*. There areas that will be potentially modified due to indirect impacts are of better condition with limited weed infestations and connecting canopy. The impact on the community within the site will be significant, but it is unlikely to impact on the long-term survival of the community in the locality due to the small area of removal (1.8 ha) and modification (1.3 ha within site and 0.3 ha adjacent to Study Area).

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

No critical habitat is listed for the TEC.

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

No recovery plan or threat abatement plan has been prepared for this TEC.

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

The proposed activity may contribute to the following Key Threatening Processes (KTP) relevant to the community:

- **Anthropogenic climate change:** Modification of the environment by humans may result in future climate change;
- **Clearing of native vegetation:** The proposed development will remove approximately 1.8 ha of native vegetation;
- **Infection of native plants by *Phytophthora cinnamomi*:** *P. cinnamomi* infection has been observed within the Hunter-Central Rivers CMA, the proposed development could cause the spread of the species;

- **Invasion and establishment of exotic vines and scramblers:** Species listed under this KTP (i.e. Coastal Morning Glory and Japanese Honeysuckle) occur within the site, the proposal has the potential to further spread these species into the remaining area of the community;
- **Invasion, establishment and spread of *Lantana camara*:** *Lantana camara* is present in the Study Area, the proposed development could cause the spread of the species; and,
- **Invasion of native plant communities by Chrysanthemoides monilifera (bitou bush and boneseed)**: As the species occurs within the Study Area the proposal has the potential to spread the species within the site and into surrounding areas of the community.

Conclusion:

The proposed development will remove the majority of the community within the Study Area (58%); this is a significant impact on the community within the Study Area. The proposal also has the potential to impact on the remaining areas of the community through indirect impacts.

References

OEH (2012). *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* – Profile. OEH website, Updated: September 2012, Available: http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10945

11. Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South Coast bioregions

(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,

Not applicable.

(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,

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

The most widespread and abundant dominant trees within the community include *Eucalyptus robusta* (Swamp Mahogany) and *Melaleuca quinquenervia*. Other trees may be scattered throughout at low abundance or may be locally common at few sites, including *Callistemon salignus* (Sweet Willow Bottlebrush), *Casuarina glauca* (Swamp Oak) and *Eucalyptus resinifera* subsp. *hemilampra* (Red Mahogany), *Livistona australis* (Cabbage Palm) and *Lophostemon suaveolens* (Swamp Turpentine) (OEH 2012).

The proposed development will not directly impact on the extent of this TEC within the Study Area and hence is not likely to place the local occurrence at the risk of extinction.

(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,

The area of the TEC that is to be retained within and adjacent to the site (0.6 ha within the site and 1.1 ha adjacent to the south) has the potential to be adversely modified through edge effects, weed dispersal, sedimentation and surface run-off. These impacts have the potential to significantly modify to composition of the community, these impacts are unlikely to place the local occurrence of the community at the risk of extinction, but there is the potential to impact on the condition and function of the community within, and directly adjacent to, the site.

(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

The proposed development will not directly impact on the extent of the community. There is also the potential to indirectly impact on the community within the site (0.6 ha) and directly adjacent to the site (1.1 ha) due to its close proximity to the proposed development site.

(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

The Study Area constitutes a small patch of vegetation on the edge of a larger area of bushland to the east. As the proposed development site is already located on the periphery of patch of vegetation the proposal will not isolate or fragment the remaining area of the community.

(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,

Due to the small area of the community present within and adjacent to the site (1.7 ha) the area of Swamp Sclerophyll Forest that will potentially be modified is not of high importance to the long term survival of the community in the locality.

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

No critical habitat is listed for the TEC.

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

No recovery plan or threat abatement plan has been prepared for this TEC.

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

The proposed activity may contribute to the following Key Threatening Processes (KTP) relevant to the community:

- **Anthropogenic climate change:** Modification of the environment by humans may result in future climate change;
- **Clearing of native vegetation:** The proposed development will remove approximately 1.8 ha of native vegetation adjacent to the community;
- **Infection of native plants by *Phytophthora cinnamomi*:** *P. cinnamomi* infection has been observed within the Hunter-Central Rivers CMA, the proposed development could cause the spread of the species;
- **Invasion and establishment of exotic vines and scramblers:** Species listed under this KTP (i.e. Coastal Morning Glory and Japanese Honeysuckle) occur within the site, the proposal has the potential to further spread these species into the remaining area of the community;
- **Invasion, establishment and spread of *Lantana camara*:** *Lantana camara* is present in the Study Area, the proposed development could cause the spread of the species; and,
- **Invasion of native plant communities by Chrysanthemoides monilifera (bitou bush and boneseed)**: As the species occurs within the Study Area the proposal has the potential to spread the species within the site and into surrounding areas of the community.

Conclusion:

As the proposal will not directly impact on the extent of the TEC it is unlikely that there will be a significant impact on the Swamp Sclerophyll Forest within and adjacent to the site. The proposal has the potential to impact on the remaining areas of the community through indirect impacts.

References

OEH (2012). *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* – profile. OEH website, Updated: September 2012, Available: http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10786

Fauna Assessment of Significance

Threatened fauna species that were considered to possibly occur in the type of habitat represented both in the Study Area and in the locality are discussed below.

12. Wallum Froglet (*Crinia tinnula*)

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

The Wallum Froglet is one of a group of wallum-dependent frog species of coastal south-east Queensland and eastern New South Wales. All of the species in this group are wholly or largely restricted to Wallum or Wallum-equivalent habitat (Meyer et al. 2006).

The Wallum is a system of silicious sand plains and dunes that support varying vegetation types including eucalypt forests and woodland, rainforest and heathland (Coaldrake 1961).

Despite surveys which targeted this species, it was not detected in the Study Area. The proposed development will result in the removal of approximately 1.8 ha of vegetation that is potential breeding and foraging habitat for the species. Providing precautions are taken during the construction process to protect any potential populations (ecologist present during clearing) and the remaining vegetation is protected, it is considered unlikely that the development will place a local population at the risk of extinction.

(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,

Not applicable.

(c) in the case of an 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

Not applicable.

(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,

Not applicable.

(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

The proposed development would result in the removal of approximately 1.8 ha of potential habitat for the species. This represents a small to moderate removal of potential habitat for the species. Approximately 4 ha of the Study Area is not being disturbed, and of this area approximately 1 ha is potential habitat for the species. In addition approximately 2 ha of this undeveloped land will be rehabilitated as part of the offset strategy resulting in a greater area of potential habitat for *Crinia tinnula*.

(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

The Study Area constitutes a small patch of vegetation on the edge of a larger area of bushland to the east. The Study Area is already has limited connectivity to potential habitat in the north, south and west due to lack of connecting vegetation and the presence of a major road. Hence, the proposed development would not result in the fragmentation or isolation of habitat on the Study Area for this species.

(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,

The loss of this small to moderate area of potential foraging habitat as part of the proposal in context of the habitat that will be retained and rehabilitated under the offset strategy does not represent a significant reduction in important potential foraging available habitat for this species. The 'Freshwater Wetland Complex' present on site is considered to be artificial and therefore the removal of this habitat does not represent as significant reduction in important potential available breeding habitat for the species.

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

No critical habitat has been listed for this species.

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

The proposed development is not consistent with the objectives of National Recovery Plan for the Wallum Sedgefrog and other Wallum-dependent Frog Species (Meyer *et. al.* 2006) as it will remove potential habitat of this species.

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

The proposed development constitutes one key threatening process; 'Clearing of Native Vegetation'.

References

Coaldrake, J. (1961). *The Ecosystem of the Coastal Lowlands ("wallum") of Southern Queensland*. CSIRO Bulletin, No. 283.

Meyer, E., Hero, J.M., Shoo, L. & Lewis, B. (2006). *National recovery plan for the Wallum Sedgefrog and other wallum-dependent frog species.* Report to Department of the Environment and Water Resources, Canberra. Queensland Parks and Wildlife Service, Brisbane.

13. Little Lorikeet (*Glossopsitta pusilla*)

(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,

Little Lorikeets mostly occur in dry, open eucalypt forests and woodlands and have been recorded from both old-growth and logged forests in the eastern part of their range, and in remnant woodland patches and roadside vegetation on the western slopes (Higgins, 1999).

The proposed development will result in the removal of approximately 1.8 ha of vegetation that is potential habitat for these woodland bird species. Providing precautions are taken during the construction process to protect any potential populations (ecologist present during clearing) and the remaining vegetation is protected, it is considered unlikely that the development will place a local population at the risk of extinction.

(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,

Not applicable.

(c) in the case of an 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

Not applicable.

(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,

Not applicable.

(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

The proposed development would result in the removal of approximately 1.8 ha of potential habitat for the species. This represents a small to moderate removal of potential habitat for the species. Approximately 4 ha of the Study Area that constitutes potential habitat for these species is not being disturbed. In addition approximately 2 ha of this undeveloped land will be rehabilitated as part of the offset strategy resulting in a higher quality habitat for these woodland bird species.

(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

The Study Area constitutes a small patch of vegetation on the edge of a larger area of bushland to the east. The Study Area is already has limited connectivity to potential habitat in the north, south and west due to lack of connecting vegetation and the presence of a major road. Hence, the proposed development would not result in the fragmentation or isolation of habitat on the Study Area for this species.

(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,

The loss of this small to moderate area of potential habitat as part of the proposal in context of the habitat that will be retained and rehabilitated under the offset strategy does not represent a significant reduction in important potential available habitat for these species.

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

No critical habitat has been listed for these species.

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

There was no draft or final recovery plan in place at the time of survey for the Little Lorikeet. The proposed development does not conflict with the objectives of the Regent Honeyeater Recovery Plan 1993 - 2009. No threat abatement plans are applicable to either species.

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

The proposed development constitutes one key threatening process; 'Clearing of Native Vegetation'.

References

Franklin, D.C., Menkhorst, P.W. & Robinson, J.L. (1989). Ecology of the Regent Honeyeater *Xanthomyza phrygia*. *Emu* **89**:140-154.

Geering, D. & French, K. (1998). Breeding biology of the Regent Honeyeater *Xanthomyza phrygia* in the Capertee Valley, New South Wales. *Emu* **98**:104-116.
Ley, A.J. & Williams, M.B. (1992). The conservation status of the Regent Honeyeater near Armidale, New South Wales. *Australian Bird Watcher* **14**:277-281.

Oliver, D.L. (1998). Breeding behaviour of the endangered Regent Honeyeater *Xanthomyza phrygia* near Armidale, N. S. W. *Australian Journal of Zoology* **98**:97-103.

Webster, R. & Menkhorst, P. (1992). The Regent Honeyeater (*Xanthomyza phrygia*): population status and ecology in Victoria and New South Wales. *Arthur Rylah Inst. Tech. Rep. Ser.* 126, Department of Conservation and Environment, Melbourne.

Higgins, P.J. (Ed.) (1999). *Handbook of Australian, New Zealand and Antarctic Birds*, Volume 4, Parrots to Dollarbird. Oxford University Press, Melbourne.

14. Little Eagle (*Hieraaetus morphnoides*)

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

The Little Eagle occupies open eucalypt forest, woodland or open woodland. She oak or acacia woodlands and riparian woodlands of interior NSW are also used. The species nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter (DECCW, 2005).

The proposed development will result in the removal of approximately 1.8 ha of vegetation that is potential habitat for this species. Providing precautions are taken during the construction process to protect any potential populations (ecologist present during clearing) and the remaining vegetation is protected, it is considered unlikely that the development will place a local population at the risk of extinction.

(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,

Not applicable.

(c) in the case of an 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

Not applicable.

(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,

Not applicable.

(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

The proposed development would result in the removal of approximately 1.8 ha of potential habitat for this species. This represents a small to moderate removal of potential habitat for the species. Approximately 4 ha of the Study Area that constitutes potential habitat for these species is not being disturbed. In addition approximately 2 ha of this undeveloped land will

be rehabilitated as part of the offset strategy resulting in a higher quality habitat for this bird species.

(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

The Study Area constitutes a small patch of vegetation on the edge of a larger area of bushland to the east. The Study Area is already has limited connectivity to potential habitat in the north, south and west due to lack of connecting vegetation and the presence of a major road. Hence, the proposed development would not result in the fragmentation or isolation of habitat on the Study Area for this species.

(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,

The loss of this small to moderate area of potential habitat as part of the proposal in context of the habitat that will be retained and rehabilitated under the offset strategy does not represent a significant reduction in important potential available habitat for these species.

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

No critical habitat has been listed for the Little Eagle.

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

There was no draft or final recovery plan in place at the time of survey and no threat abatement plans are applicable to the species.

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

The proposed development constitutes one key threatening process; 'Clearing of Native Vegetation'.

References

DEC (2005) Threatened Species Profile – Little Eagle - *Hieraaetus morphnoides* – Profile. DEC website http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=20131
CSIRO.

Wetland Birds

15. Australasian Bittern (*Botaurus poiciloptilus*)

16. Australian Painted Snipe (*Rostratula australis*)

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

The Australasian Bittern occurs in reeds and marshes in terrestrial freshwater wetlands and, occasionally estuarine habitats feeding mainly at night on small mammals, birds, amphibians, eels, crustaceans and insects. The species breeds from October through to February and nests in stands of Phragmites, Typha, and rushes (*Juncus, Baumea* spp.). The nest is usually comprised of a well-constructed flat platform of rushes or reeds (Marchant & Higgins 1990). The Australasian Bittern is distributed across south-eastern Australia, including south-eastern South Australia, Victoria, eastern Murray-Darling Basin in NSW to south-east Queensland (Marchant & Higgins 1990; Garnett & Crowley 2000; Barrett et al. 2003).

The Australian Painted Snipe inhabits shallow, vegetated, temporary or infrequently filled wetlands, sometimes where there are trees such as River Red Gum (*Eucalyptus camaldulensis*) or Poplar Box (*E. populnea*) or shrubs such as Lignum (*Muehlenbeckia florulenta*) or samphire (Vestjens 1977; Leach et al. 1987). This species generally feeds at the water's edge and on mudflats, taking seeds and invertebrates, including worms, insects, molluscs and crustaceans. The polyandrous female lays 3-6 eggs, which are incubated by the male, in a shallow scrape nest (Lowe 1963; Marchant & Higgins 1993).

The proposed development will result in the removal of approximately 1.8 ha of vegetation; of this 0.44 ha is potential habitat for these wetland bird species. Providing precautions are taken during the construction process to protect any potential populations (ecologist present during clearing) and the remaining vegetation is protected, it is considered unlikely that the development will place a local population at the risk of extinction.

(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,

Not applicable.

(c) in the case of an 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

Not applicable.

(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,

Not applicable.

(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

The proposed development would result in the removal of approximately 1.8 ha of vegetation, with approximately 0.44 ha of this providing potential habitat for the species. This represents a small removal of potential habitat for these species. Approximately 4 ha of the Study Area is not being disturbed, and of this area approximately 1 ha is potential habitat for the species.

(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

The Study Area constitutes a small patch of vegetation on the edge of a larger area of bushland to the east. The Study Area is already has limited connectivity to potential habitat in the north, south and west due to lack of connecting vegetation and the presence of a major road. Hence, the proposed development would not result in the fragmentation or isolation of habitat on the Study Area for this species.

(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,

The 'Freshwater Wetland Complex' present on site is considered to be artificial and therefore the removal of this habitat does not represent as significant reduction in important potential available breeding habitat for the species.

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

No critical habitat has been listed for these species.

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

There was no draft or final recovery plan in place at the time of survey for these species. No threat abatement plans are applicable to the Australasian Bittern or the Australian Painted Snipe.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.
The proposed development constitutes one key threatening process to the Australian Painted Snipe; 'Clearing of Native Vegetation'.

References

Marchant, S. & Higgins, P.J. (Eds) (1990). *Handbook of Australian, New Zealand & Antarctic Birds, Vol 1*, Part A, Oxford University Press Oxford.
Barrett, G.W., Silcocks, A., Barry, S., Cunningham, R. & Poulter, R. (2003). *The New Atlas of Australian Birds.* Royal Australasian Ornithologists Union, Melbourne.

Garnett, S.T. & Crowley, G.M. (2000). *The Action Plan for Australian Birds 2000*. Environment Australia: Canberra.

Marchant, S. & Higgins, P.J. (Eds) (1993). H*andbook of Australian, New Zealand and Antarctic Birds, Volume 2: Raptors to Lapwings*. Oxford University Press, Melbourne.

Leach, G.J., Lloyd, C.G. & Hines, H.B. (1987*). Observations of the nest of the Painted Snipe Rostratula benghalensis in south-east Queensland*. Australian Bird Watcher 12: 15-19.

Lowe, V. T. (1963). *Observations of the Painted Snipe*. Emu 62:221-237.

Vestjens, W. J. M. (1977). *Status, habitats and food of vertebrates at Lake Cowal*. CSIRO Wildl. Res. Tech. Mem. 1:21-87.

17. Powerful Owl (*Ninox strenua*)

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,
The Powerful Owl is a large (60cm) forest owl that inhabits forest and woodlands of the coastal, escarpment, tablelands and western slopes in NSW (Kavanagh 2002). Habitat for the Powerful Owl comprises tall, moist productive eucalypt forests and a mosaic of wet and dry sclerophyll occurring on undulating, gentles terrain near the coast. Optimal habitat includes a tall, shrub layer and abundant hollows supporting high densities of arboreal mammals (DEC 2006).

During field surveys in summer 2012 Powerful Owl was observed in a tree on the ecotone between Swamp Oak Forest and Disturbed Land within the Development Area. The bird was detected when it responded to call playback and may have been drawn to the site from an adjoining area. This species has a large home range (300-1500 ha) and the Development Area (1.8 ha) represents a relatively small component.

The proposed development will result in the removal of approximately 1.8 ha of vegetation that is potential foraging habitat for the Powerful Owl. Providing precautions are taken during the construction process to protect any potential populations (ecologist present during clearing) and the remaining vegetation is protected, it is considered unlikely that the development will place a local population at the risk of extinction.

(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,
Not applicable.

(c) in the case of an 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

Not applicable.

(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,

Not applicable.

(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

The proposed development would result in the removal of approximately 1.8 ha of open forest habitat which is more likely to be used by this species for hunting and foraging than roosting or breeding. The absence of hollows in the Development Area means that it does not support arboreal mammals which are the preferred prey item for this species. The proposed represents a small removal of intermitmently used habitat for the species. Approximately 3 ha of the Study Area that constitutes more critical roosting habitat and contains hollows and associated arboreal mammals will be retained and protected.

(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

The Study Area constitutes a small patch of vegetation on the edge of a larger area of bushland to the east. The Study Area is already has limited connectivity to potential habitat in the north, south and west due to lack of connecting vegetation and the presence of a major road. Hence, the proposed development would not result in the fragmentation or isolation of habitat on the Study Area for this species.

(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,

The loss of this small to moderate area of potential habitat as part of the proposal in context of the habitat that will be retained and rehabilitated under the offset strategy does not represent a significant reduction in important potential available habitat for these species.

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

No critical habitat has been listed for the Powerful Owl.

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

No threat abatement plans are applicable to the species. The Recovery Plan for the Large Forest Owls is refers to the Powerful Owl, the proposed development conflicts with the plan as it would contribute to loss of foraging habitat for this species.

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

The proposed development constitutes one key threatening process; 'Clearing of Native Vegetation'.

References

Department of Environment and Conservation (2006). *Recovery Plan for the Large Forest Owls*: Powerful Owl *Ninox strenua* Sooty Owl *Tyto tenebricosa* Masked Owl *Tyto novaehollandiae*. DEC NSW, Sydney.

Kavanagh, R.P., (2002). Comparative diets of the Powerful Owl (*Ninox strenua*), Sooty Owl (*Tyto tenebricosa*) and Masked Owl *(Tyto novaehallandiae*) in southeastern Australia. In *Ecology and Conservation of Owls*. Newton I., Kavanagh R., Olsen J., and Taylor I. (Eds).

18. Wompoo Fruit-dove (*Ptilinopus magnificus*)

(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,

Within Australia, the species historically occurs from the Illawarra district of New South Wales, north to the tip of Cape York Peninsula. There are consistent although limited numbers of reports of the Wompoo Fruit-dove from the southern parts of its range (Garnett *et al.* 2000). The preferred habitat of this species is sub-tropical and tropical rainforest; however, the species has also been reported in low elevation moist eucalypt forest and brush box forests (Frith 1982).

The proposed development will result in the removal of approximately 1.8 ha of vegetation that is potential habitat for this species. Providing precautions are taken during the construction process to protect any potential populations (ecologist present during clearing) and the remaining vegetation is protected, it is considered unlikely that the development will place a local population at the risk of extinction.

(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,

Not applicable.

(c) in the case of an 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

Not applicable.

(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,

Not applicable.

(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

The proposed development would result in the removal of approximately 1.8 ha of potential habitat for this species. This represents a small to moderate removal of potential habitat for the species. Approximately 4 ha of the Study Area that constitutes potential habitat for the Wompoo Fruit-dove is not being disturbed. In addition approximately 2 ha of this undeveloped land will be rehabilitated as part of the offset strategy resulting in a higher quality potential habitat for this bird species.

(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

The Study Area constitutes a small patch of vegetation on the edge of a larger area of bushland to the east. The Study Area is already has limited connectivity to potential habitat in the north, south and west due to lack of connecting vegetation and the presence of a major road. Hence, the proposed development would not result in the fragmentation or isolation of habitat on the Study Area for this species.

(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,

The loss of this small to moderate area of potential habitat as part of the proposal in context of the habitat that will be retained and rehabilitated under the offset strategy does not represent a significant reduction in important potential available habitat for these species.

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

No critical habitat has been listed for this species.

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

No draft or final recovery plan was in place at the time of survey for this species. No threat abatement plans apply to the Wompoo Fruit-dove.

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

The proposed development constitutes one key threatening process; 'Clearing of Native Vegetation'.

References

Frith, H.J. (1982). *Pigeons and Doves of Australia.* Rigby: Sydney.

Garnett, S.T. & Crowley, G.M. (2000). *The Action Plan for Australian Birds 2000*. Environment Australia: Canberra.

Cave-dwelling Microchiropteran Bats

19. Little Bentwing-bat (*Miniopterus australis*)

20. Eastern Bentwing-bat (*Miniopterus oceanensis*)

21. Eastern Cave Bat (*Vespadelus troughtoni*)

(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,

Each species is known to use caves for roosting, but *Miniopterus australis* will occasionally use tree hollows for roosting (pers. comm. G. Hoye). Both *Miniopterus* species use the canopy for foraging (Dwyer 1995a, 1995b). Research on the home ranges of these species is limited but *Miniopterus* spp. is thought to exhibit a high fidelity to a particular foraging area that may change seasonally (pers. comm. G. Hoye).

All three species were detected during surveys conducted within the proposed Development Area, as these bats are cave-dwelling it is most likely that they were foraging on site. Therefore the proposed development will result in the removal of approximately 1.8 ha of vegetation that is foraging habitat for these species. Providing precautions are taken during the construction process to protect any potential populations (ecologist present during clearing) and the retained vegetation is protected, it is considered unlikely that the development will place a local population at the risk of extinction.

(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,

Not applicable.

(c) in the case of an 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

Not applicable.

(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,

Not applicable.

(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

The proposed development would result in the removal of approximately 1.8 ha of foraging habitat for these species. This represents a small removal of foraging habitat for the species. Approximately 3 ha of the Study Area that constitutes foraging habitat for these cave-dwelling bat species is not being disturbed.

(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

The Study Area constitutes a small patch of vegetation on the edge of a larger area of bushland to the east. The Study Area is already has limited connectivity to potential habitat in the north, south and west due to lack of connecting vegetation and the presence of a major road. Hence, the proposed development would not result in the fragmentation or isolation of habitat on the Study Area for this species.

(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,

The loss of this small to moderate area of potential habitat as part of the proposal in context of the habitat that will be retained and rehabilitated under the offset strategy does not represent a significant reduction in important potential available habitat for these species.

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

No critical habitat has been listed for this species.

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

No draft or final recovery plans were in place at the time of survey for these species. No threat abatement plans apply to these species.

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

The proposed development constitutes one key threatening process; 'Clearing of Native Vegetation'.

References

Dwyer, P.D. (1995a). Little Bentwing-bat *Miniopterus australis* (Tomes, 1858). *The Mammals of Australia*. Ronald Strahan (Ed) Reed New Holland.

Dwyer, P.D. (1995b). Common Bentwing-bat *Miniopterus schreibersii* (Kuhl, 1817). *The Mammals of Australia.* Ronald.Strahan (Ed) Reed New Holland.

Parnaby, H. (1995c). Eastern Cave Bat *Vespadelus troughtoni* (Kitchener, Jones and Kaputi, 1987). *The Mammals of Australia.* Ronald.Strahan (Ed) Reed New Holland.

22. East Coast Freetail-bat (*Mormopterus norfolkensis*)

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

The East-coast Freetail Bat occurs in a thin coastal band between the Sydney district and Brisbane. Little is known of the habits or the preferred habitat of this species, although it is apparent that it does inhabit dry sclerophyll forest and woodland, where it hunts for insects above the canopy or within clearings at forest edges. This species normally roosts in tree hollows or under loose bark on a variety of tree species (Churchill 1998; Allison & Hoye 1995).

The East Coast Freetail-bat was detected during surveys conducted within the proposed Development Area, as there are no hollow-bearing trees present on site it is most likely that the species was foraging in the area. The proposed development will result in the removal of approximately 1.8 ha of vegetation that is foraging/roosting habitat for this species. Providing precautions are taken during the construction process to protect any potential populations (ecologist present during clearing) and the remaining vegetation is protected, it is considered unlikely that the development will place a local population at the risk of extinction.

(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,

Not applicable.

(c) in the case of an 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

Not applicable.

(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,

Not applicable.

(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

The proposed development would result in the removal of approximately 1.8 ha of foraging habitat for this species. This represents a small to moderate removal of foraging habitat for the species. Approximately 4 ha of the Study Area that constitutes foraging habitat for this bat species is not being disturbed. In addition approximately 2 ha of this undeveloped land will be rehabilitated as part of the offset strategy resulting in a higher quality potential habitat for this bird species.

(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

The Study Area constitutes a small patch of vegetation on the edge of a larger area of bushland to the east. The Study Area is already has limited connectivity to potential habitat in the north, south and west due to lack of connecting vegetation and the presence of a major road. Hence, the proposed development would not result in the fragmentation or isolation of habitat on the Study Area for this species.

(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,

The loss of this small to moderate area of potential habitat as part of the proposal in context of the habitat that will be retained and rehabilitated under the offset strategy does not represent a significant reduction in important potential available habitat for these species.

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

No critical habitat has been listed for this species.

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

No draft or final recovery plans were in place at the time of survey for these species. No threat abatement plans apply to these species.

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

The proposed development constitutes one key threatening process; 'Clearing of Native Vegetation'.

References

Allison, F.R. & Hoye, G.A. (1995). Eastern Freetail-bat. *The Mammals of Australia.* Ronald Strahan (Ed). Reed New Holland.

Churchill, S. (1998). *Australian Bats*, Reed New Holland, Australia.

23. Greater Broad-nosed Bat (*Scoteanax rueppellii*)

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

The Greater Broad-nosed Bat occurs along the coast and ranges of eastern Australia, from northern Queensland to the New South Wales/Victorian border. Tree-lined creeks, and the junctions of woodland and cleared paddocks, are favoured hunting areas for the Greater Broad-nosed Bat, although it may also forage in rainforest environments, flying as low as one metre above the surface of a creek. The species normally roosts in tree hollows, but roosting records in the ceilings of old buildings also exist (Churchill 1998; Hoye & Richards 1995).

The proposed development will result in the removal of approximately 1.8 ha of vegetation that is potential foraging/roosting habitat for this species. Providing precautions are taken during the construction process to protect any potential populations (ecologist present during clearing) and the remaining vegetation is protected, it is considered unlikely that the development will place a local population at the risk of extinction.

(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,

Not applicable.

(c) in the case of an 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

Not applicable.

(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,

Not applicable.

(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

The proposed development would result in the removal of approximately 1.8 ha of potential habitat for this species. This represents a small to moderate removal of foraging habitat for the species. Approximately 4 ha of the Study Area that constitutes foraging habitat for this bat species is not being disturbed. In addition approximately 2 ha of this undeveloped land will be rehabilitated as part of the offset strategy resulting in a higher quality potential habitat for this bird species.

(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

The Study Area constitutes a small patch of vegetation on the edge of a larger area of bushland to the east. The Study Area is already has limited connectivity to potential habitat in the north, south and west due to lack of connecting vegetation and the presence of a major road. Hence, the proposed development would not result in the fragmentation or isolation of habitat on the Study Area for this species.

(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,

The loss of this small to moderate area of potential habitat as part of the proposal in context of the habitat that will be retained and rehabilitated under the offset strategy does not represent a significant reduction in important potential available habitat for these species.

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

No critical habitat has been listed for this species.

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

No draft or final recovery plans were in place at the time of survey for these species. No threat abatement plans apply to these species.

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

The proposed development constitutes one key threatening process; 'Clearing of Native Vegetation'.

References

Churchill, S. (1998). *Australian Bats*, Reed New Holland, Australia.

Hoye, G.A. & Richards, G.C. (1995). Greater Broad-nosed Bat *Scoteanax rueppellii* (Peters, 1866) *The Mammals of Australia*, Ronald Strahan (Ed) Reed New Holland.

24. Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)

The Eastern False Pipistrelle occurs in sclerophyll forests between the Great Dividing Ranges down to the coastal lowlands in eastern Australia. The species normally roosts in hollow eucalypt trunks, but have also been recorded roosting caves and old buildings (Churchill 1998).

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

The absence of eucalypts with hollows in the Development Area means the proposal will result in the removal of approximately 1.8 ha of potential foraging habitat for this species. Providing precautions are taken during the construction process to protect any potential populations (ecologist present during clearing) and the retained vegetation is protected, it is considered unlikely that the development will place a local population at the risk of extinction.

(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,

Not applicable.

(c) in the case of an 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

Not applicable.

(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,

Not applicable.

(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

The proposed development would result in the removal of approximately 1.8 ha of potential foraging habitat for this species. This represents a small to moderate removal of foraging habitat for the species. Approximately 3 ha of the Study Area that contains both foraging and roosting habitat for this bat species will not be disturbed.

(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

The Study Area constitutes a small patch of vegetation on the edge of a larger area of bushland to the east. The Study Area is already has limited connectivity to potential habitat in the north, south and west due to lack of connecting vegetation and the presence of a major road. Hence, the proposed development would not result in the fragmentation or isolation of habitat on the Study Area for this species.

(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,

The loss of this small to moderate area of potential foraging habitat as part of the proposal in context of the habitat that will be retained and protected does not represent a significant reduction in important potential available habitat for these species.

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

No critical habitat has been listed for this species.

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

No draft or final recovery plans were in place at the time of survey for these species. No threat abatement plans apply to these species.

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

The proposed development constitutes one key threatening process; 'Clearing of Native Vegetation'.

References

Churchill, S. (1998). *Australian Bats*, Reed New Holland, Australia.

Phillips, W. (1995). Eastern False Pipistrelle *Falsistrellus tasmaniensis* (Gould, 1858). *The Mammals of Australia.* Ronald.Strahan (Ed) Reed New Holland.

25. Grey-headed Flying-fox (*Pteropus poliocephalus*)

(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,

This species occurs along the eastern seaboard of Australia roosting in communal colony sites, which are used permanently, annually, or occasionally depending on food availability (Tidemann, 1995). Colonies can vary considerably in size from hundreds to many thousands of individuals, and fluctuate according to food resources (Parry-Jones & Augee, 1991; Tidemann, 1995).

The proposed development will result in the removal of approximately 1.8 ha of vegetation that is potential habitat for this species. No roosting sites for this species were detected. Providing precautions are taken during the construction process to protect any potential populations (ecologist present during clearing) and the remaining vegetation is protected, it is considered unlikely that the development will place a local population at the risk of extinction.

(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,

Not applicable.

(c) in the case of an 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

Not applicable.

(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,

Not applicable.

(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

The proposed development would result in the removal of approximately 1.8 ha of potential habitat for this species. This represents a small to moderate removal of potential habitat for this species. Approximately 4 ha of the Study Area, of which 2 ha constitutes potential habitat for the Grey-headed flying fox, is not being disturbed. In addition approximately 2 ha of this undeveloped land will be rehabilitated as part of the offset strategy resulting in a greater area potential habitat for this species.

(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

The Study Area constitutes a small patch of vegetation on the edge of a larger area of bushland to the east. The Study Area is already has limited connectivity to potential habitat in the north, south and west due to lack of connecting vegetation and the presence of a major

road. Hence, the proposed development would not result in the fragmentation or isolation of habitat on the Study Area for this species.

(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,

The loss of this small to moderate area of potential habitat as part of the proposal in context of the habitat that will be retained and rehabilitated under the offset strategy does not represent a significant reduction in important potential available habitat for these species.

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

No critical habitat has been listed for this species.

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

The clearing of potential foraging trees is not consistent with the Draft National Recovery Plan for the Grey-headed Flying-fox (DECC 2008). No threat abatement plans apply to the Grey-headed Flying-fox.

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

The proposed development constitutes one key threatening process; 'Clearing of Native Vegetation'.

References

Department of Environment and Climate Change NSW (2008). Draft National Recovery Plan for the Grey-headed Flying-fox *Pteropus poliocephalu*s. Prepared by Dr Peggy Eby. DECC NSW, Sydney.

Parry-Jones, K.A. & Augee, M. (1991). Food selection in Grey-headed flying foxes (*Pteropus poliocephalus*) occupying a summer colony site near Gosford, NSW. *Wildlife Research* **18**: 111-124.

Tidemann, C.R. (1995). Grey-headed flying fox, *Pteropus poliocephalus* (Temminck, 1825). *The Mammals of Australia*. Ronald Strahan (Ed) Reed New Holland.

26. Koala (*Phascolarctos cinereus*)

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

The Koala lives entirely on a diet of leaves of both eucalypt and non-eucalypt trees and it has been shown that within its range there are local and regional preferences for the tree species used for feeding. Examples of eucalypts used as feed trees are *E. camuldulensis*; *E. viminalis*; *E. ovata*; *E. teretecornis*; *E. microcorys*; *E. punctata*. Non-eucalypts recorded have been *Allocasuarina torulosa*; *Melaleuca quinquenervia*; and *Lophostemon confertus* (Martin & Handasyde 1995; Moore & Foley 2000; Phillips & Callaghan 2000; Phillips *et al.* 2000).

The proposed development will not result in the removal of any preferred or supplementary Koala habitat. In the east of the site both preferred and supplementary habitat occurs. The development may impact on any potential Koala residents through an increase in noise and dust but this is not considered to place a local population at the risk of extinction.

(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,

Not applicable.

(c) in the case of an 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

Not applicable.

(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,

Not applicable.

(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

The proposed development will not result in the removal of any habitat for the Koala. Erosion and sediment control along with noise and dust suppression will limit habitat modification to a low level.

(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

The Study Area constitutes a small patch of vegetation on the edge of a larger area of bushland to the east. The Study Area is already has limited connectivity to potential habitat in the north, south and west due to lack of connecting vegetation and the presence of a major road. Hence, the proposed development would not result in the fragmentation or isolation of habitat on the Study Area for this species.

(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,

The habitat will not be removed and modification will be minimal.

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

No critical habitat has been listed for this species.

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

The proposed development does not contradict the objectives of the Recovery Plan for the Koala (DECC 2008).No threat abatement plans apply to the Grey-headed Flying-fox.

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

The proposed development does not constitute a key threatening process for the Koala.

References

Martin, R.W.& Handasyde, K.A. (2002) Koala. *The Mammals of Australia.* Ronald Strahan (Ed) Reed New Holland.

Moore, B.D., & Foley, W.J. (2000) A review of feeding and diet selection in koalas (*Phascolarctos cinereus*), *Australian Journal of Zoology*, 48, 317–333.

Phillips, S. & Callaghan, J. (2000) Tree species preferences of koalas (*Phascolarctos cinereus*) in the Campbelltown area South-west of Sydney, New South Wales. *Wildlife Research* 27: 509-516.

Phillips, S., Callaghan, J. & Thompson, V. (2000). The tree species preferences of koalas (*Phascolarctos cinereus*) inhabiting forest and woodland communities on Quaternary deposits in the Port Stephens area, New South Wales. *Wildlife Research* 27: 1-10.

27. Squirrel Glider (Petaurus norfolcensis)

(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,

This species occurs on the coast and ranges of eastern Australia, from northern Queensland to the Victorian/ South Australian border, and also extends into the western slopes and plains. The Squirrel Glider inhabits dry sclerophyll forest and woodland, and is generally absent from the more densely vegetated coastal ranges. More recently, however, the species has been recorded in a number of coastal locations and confusion with the similar Sugar Glider is attributed as the main reason for the apparent lack of historical coastal records.

One of the reasons that the Squirrel Glider has been considered vulnerable in NSW is that its diet is specialised. It will eat insects and the occasional birds egg, however, the greater part of the diet is nectar, pollen and gum exudates particularly from wattles. The amount of habitat that supports these food resources has been significantly reduced. The Squirrel Glider requires hollows in standing trees for roosting and nesting purposes and home ranges from 2-3ha to 13ha have been reported (Quinn 1995; SWC 1996; Rowston 1998; Suckling 1995; Holland 2001; Smith 2002).

(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,

Although not recorded during field surveys in 2011/12, Squirrel Glider has been detected in forest on the other side of Nelson Bay Road east of the Study Area. The road may be a barrier for movement of this species between this known population and the Study Area. The Development Area does not contain critical resources required by this species such as trees with hollows or nectar producing wattles and therefore the development is not likely to result in the loss of the local population.

(c) in the case of an 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

Not applicable.

(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,

Not applicable.

(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

The proposed development will not result in the removal of any habitat for the Squirrel Glider. Trees with hollows that could potentially be used for shelter occur within parts of the study area that will be retained and protected under the proposal.

(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

The Study Area constitutes a small patch of vegetation on the edge of a larger area of bushland to the east. The Study Area is already has limited connectivity to potential habitat in the north, south and west due to lack of connecting vegetation and the presence of a major road. Hence, the proposed

development would not result in the fragmentation or isolation of habitat on the Study Area for this species.

(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,

No habitat will be removed and modification will be minimal.

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

No critical habitat has been listed for this species.

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

The proposed development does not contradict the objectives of the Recovery Plan for Squirrel Glider. No threat abatement plans apply

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

The proposed development does not constitute a key threatening process for Squirrel Glider.

References

Suckling, G.C. (2002) Squirrel Glider. *The Mammals of Australia.* Ronald Strahan (Ed) Reed New Holland.

Appendix 6: EPBC Act Assessments of Significance

Flora

Vulnerable Species

Species not identified within the Study Area

1. Earp's Gum (*Eucalyptus parramattensis* subsp. *decadens*)

2. Biconvex Paperbark (*Melaleuca biconvexa*)

3. Knotweed (*Persicaria elatior*)

4**. Magenta Lilly Pilly (*Syzygium paniculatum*)**

An action is likely to have a significant impact if there is a real chance or possibility that it will:

- Lead to a long-term decrease in the size of an important population;

As no individuals of these threatened species were identified within the Study Area the proposal will not lead to the long term decrease in the size of an important population.

- Reduce the area of occupancy of an important population;

As no populations of these species were identified within the Study Area the proposal will not impact on the area of occupancy of an important population of any of these threatened species.

- Fragment an existing population;

The proposal will not fragment any populations of these species as no individuals were identified within the Study Area.

- Adversely affect habitat critical to the survival of this species;

The proposal will remove 1.8 ha of already disturbed habitat for these species and potentially modify habitat within and adjacent to the site; approximately 2.9 ha within the site and 0.3 ha adjacent for *E. parramattensis* subsp. *decedens* and 1.9 ha within the site and 1.4 adjacent for all other species. Due to the small of habitat to be impacted, the level of disturbance already present within the site and as no individuals were identified, the habitat to be affected is not critical to the survival of these species.

- Disrupt the breeding cycle of an important population;

As these threatened species were not identified within the Study Area the proposal is unlikely to impact on the breeding cycle of these species.

- Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

The proposal will remove 1.8 ha of already disturbed habitat for these species and potentially modify habitat within and adjacent to the site; approximately 2.9 ha within the site and 0.3 ha adjacent for *E. parramattensis* subsp. *decedens* and 1.9 ha within the site and 1.4 adjacent for all other species. Due to the limited amount of habitat modification and removal, the proposal will not lead to the decline of these threatened species.

- Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat;

There is the potential impact on areas of retained habitat for these species through the spread of weed species that are already present within the Study Area. This impact will only be on potential habitat for these species, and will not impact on habitat being utilised by these species as no individuals were identified.

- Introduce disease that may cause the species to decline; or

The proposal has the potential to introduce *Phytophthora cinnamomi* and Exotic Rust Fungi of the order Pucciniales into areas of potential habitat for these species. This is unlikely to lead to the decline of any of these species as they were not identified within the Study Area.

- Interfere substantially with the recovery plan of this species.

The proposed action will not interfere substantially with the recovery of any of these species.

Species not detectable during survey period

5. Rough Doubletail *(Diuris praecox*)

6. Black-eyed Susan *(Tetratheca juncea*)

An action is likely to have a significant impact if there is a real chance or possibility that it will:

- Lead to a long-term decrease in the size of an important population;

The proposal will not directly impact on habitat for these species. It is unlikely that this impact will lead to the long term survival of any potentially occurring population of these species.

- Reduce the area of occupancy of an important population;

The proposal will not directly impact on habitat for these species. As there will not be any direct removal of habitat for these species it is unlikely that the proposal will reduce the area of occupancy of these species.

- Fragment an existing population;

As the proposal will not remove any Coastal Sand Apple – Blackbutt Forest, no fragmentation of potential habitat for these species will occur. Additionally, as the proposed development site is already located on the periphery of patch of vegetation the proposal will not isolate or fragment any adjacent areas of habitat.

- Adversely affect habitat critical to the survival of this species;

The proposal will not remove any habitat for these species. There is the potential to modify 1.0 ha of habitat within the site and 0.3 ha adjacent to the site. Due to the small nature of the area of habitat and the already degraded nature (high weed presence and tracks) the habitat affected is not critical to the survival of the species.

- Disrupt the breeding cycle of an important population;

As there will not be any direct impacts within the habitat for these species it is unlikely that the proposal will disrupt the breeding cycle of these species.

- Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

The proposal has the potential to modify approximately 1.0 ha of habitat within the site and 0.3 ha adjacent to the site. Due to the limited amount of habitat modification, the proposal will not lead to the decline of these threatened species.

- Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat;

The habitat for these species within the Study Area already contains large infestations of noxious weeds. There is the potential for to create further infestations of these species and others within the habitat for these species.

- Introduce disease that may cause the species to decline; or

The proposal has the potential to introduce *Phytophthora cinnamomi* into areas of habitat for these species.

- Interfere substantially with the recovery plan of this species.

The proposed action will not interfere substantially with the recovery of any of these species.

Endangered Species

7. Dwarf Kerrawang *(Rulingia prostrata)*

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:

- Lead to a long-term decrease in the size of a population;

As no *Rulingia prostrata* individuals were identified within the Study Area the proposal will not lead to the long term decrease in the size of a population.

- Reduce the area of occupancy of the species;

As a population of the species was not identified within the Study Area the proposal will not impact on the area of occupancy of a population of any of the threatened species.

- Fragment an existing population into two or more populations;

The proposal will not fragment any populations of the species as no individuals were identified within the Study Area.

- Adversely affect habitat critical to the survival of a species;

The proposal will remove 1.8 ha of already disturbed habitat for the species and potentially modify 2.9 ha of habitat within the site and 1.7 ha adjacent to the site. Due to the small area of habitat to be impacted, the level of disturbance already present within the site and as no individuals were identified, the habitat to be affected is not critical to the survival of the species.

- Disrupt the breeding cycle of a population;

As the threatened species were not identified within the Study Area the proposal is unlikely to impact on the breeding cycle of the species.

- Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

The proposal will remove 1.8 ha of already disturbed habitat for this species and potentially modify habitat within and adjacent to the site; approximately 2.9 ha within the site and 1.7 ha adjacent to the site. Due to the limited amount of habitat modification and removal, the proposal will not lead to the decline of the threatened species.

- Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;

There is the potential impact on areas of retained habitat for the species through the spread of weed species that are already present within the Study Area. This impact will only be on potential habitat for the species, and will not impact on habitat being utilised by these species as no individuals were identified.

- Introduce disease that may cause the species to decline; or

The proposal has the potential to introduce *Phytophthora cinnamomi* into areas of potential habitat for the species. This is unlikely to lead to the decline of any of the species as they were not identified within the Study Area.

- Interfere substantially with the recovery plan of this species.

The proposed action will not interfere substantially with the recovery of any of the species.

Fauna

Vulnerable Species

8. **Australian Painted Snipe (*Rostratula australis*)**

An action is likely to have a significant impact if there is a real chance or possibility that it will:

- Lead to a long-term decrease in the size of an important population;

The proposal will remove 1.8 ha of potential habitat for the species. There are no records of the species in the locality and the species was not detected during field surveys, hence it is unlikely that the proposal will lead to the long term decrease in the size on an important population.

- Reduce the area of occupancy of an important population;

As no individuals were identified within the Study Area and there are no records of the species in the locality, it is unlikely that the proposal will reduce the area of occupancy of an important population.

- Fragment an existing population;

As the proposed development site is already located on the periphery of patch of vegetation the proposal will not isolate or fragment any areas of habitat.

- Adversely affect habitat critical to the survival of this species;

The proposal will remove 1.8 ha of already disturbed habitat for the species and potentially modify 1.9 ha of habitat within the site and 1.4 ha adjacent to the site. Due to the small area of habitat to be impacted, the level of disturbance already present within the site and as no individuals were identified, the habitat to be affected is not critical to the survival of the species.

- Disrupt the breeding cycle of an important population;

As the threatened species were not identified within the Study Area and there are no records of the species in the locality, the proposal is unlikely to impact on the breeding cycle of the species.

- Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

The proposal will remove 1.8 ha of already disturbed habitat for this species and potentially modify habitat within and adjacent to the site; approximately 1.9 ha within the site and 1.4 ha adjacent to the site. Due to the limited amount of habitat modification and removal, the proposal will not lead to the decline of the threatened species.

- Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat;

There is the potential impact on areas of retained habitat for these species through the spread of weed species that are already present within the Study Area. This impact will only be on potential habitat for these species, and will not impact on habitat being utilised by these species as no individuals were identified.

- Introduce disease that may cause the species to decline; or

The proposed action is unlikely to introduce disease that will lead to the decline of the species.

- Interfere substantially with the recovery plan of this species.

The proposed action will not interfere substantially with the recovery of any of the species.

9. **Koala (*Phascolarctos cinereus*)**

An action is likely to have a significant impact if there is a real chance or possibility that it will:

- Lead to a long-term decrease in the size of an important population;

The proposal will not directly impact on any areas of potential habitat for the species. Hence it is unlikely that the proposal will lead to the long term decrease in the size on an important population.

- Reduce the area of occupancy of an important population;

As there is no direct impact within the areas of potential habitat for the species it is unlikely that the proposal will reduce the area of occupancy of an important population.

- Fragment an existing population;

As the proposed development site is already located on the periphery of patch of vegetation the proposal will not isolate or fragment any areas of habitat.

- Adversely affect habitat critical to the survival of this species;

The proposal will not directly impact on any areas of potential habitat for the species; the Swamp Mahogany – Paperbark Forest is preferred habitat and the Coastal Sand Apple – Blackbutt Forest is supplementary habitat for the species. There is the potential to modify areas of habitat within and adjacent to the site; 1.6 ha of habitat within the site and 1.4 ha adjacent to the site. Due to the small area of habitat to be impacted and the level of disturbance already present within the site the habitat to be affected is not critical to the survival of the species.

- Disrupt the breeding cycle of an important population;

As there will not be any direct impacts within the preferred or supplementary habitat for the Koala it is unlikely that the proposal will disrupt the breeding cycle of an important population.

- Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

The proposal has the potential to modify habitat for the Koala within and adjacent to the site; approximately 1.9 ha within the site and 1.4 ha adjacent to the site. Due to the small area of habitat that will potentially undergo modification, the proposal will not lead to the decline of the threatened species.

- Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat;

There is the potential impact on areas of retained habitat for these species through the spread of weed species that are already present within the Study Area.

- Introduce disease that may cause the species to decline; or

The proposed action is unlikely to introduce disease that will lead to the decline of the species.

- Interfere substantially with the recovery plan of this species.

The proposed action will not interfere substantially with the recovery of any of the species.

10. Grey-headed Flying-fox (*Pteropus poliocephalus*)

An action is likely to have a significant impact if there is a real chance or possibility that it will:

- Lead to a long-term decrease in the size of an important population;

The proposal will not directly impact on any areas of potential habitat for the species. Hence it is unlikely that the proposal will lead to the long term decrease in the size on an important population.

- Reduce the area of occupancy of an important population;

As there is no direct impact within the areas of potential habitat for the species it is unlikely that the proposal will reduce the area of occupancy of an important population.

- Fragment an existing population;

As the proposed development site is already located on the periphery of patch of vegetation the proposal will not isolate or fragment any areas of habitat.

- Adversely affect habitat critical to the survival of this species;

The proposal will not directly impact on any areas of potential habitat for the species; the Swamp Mahogany – Paperbark Forest and Coastal Sand Apple – Blackbutt Forest. There is the potential to modify areas of habitat within and adjacent to the site; 1.6 ha of habitat within the site and 1.4 ha adjacent to the site. Due to the small area of habitat to be impacted and the level of disturbance already present within the site the habitat to be affected is not critical to the survival of the species.

- Disrupt the breeding cycle of an important population;

As there will not be any direct impacts within the potential habitat for this species, and a Grey-headed Flying-fox roosting camp was not detected on the site, it is unlikely that the proposal will disrupt the breeding cycle of an important population.

- Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

The proposal has the potential to modify habitat for the Grey-headed Flying-fox within and adjacent to the site; approximately 1.9 ha within the site and 1.4 ha adjacent to the site. Due to the small area of habitat that will potentially undergo modification, the proposal will not lead to the decline of the threatened species.

- Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat;

There is the potential impact on areas of retained habitat for these species through the spread of weed species that are already present within the Study Area.

- Introduce disease that may cause the species to decline; or

The proposed action is unlikely to introduce disease that will lead to the decline of the species.

- Interfere substantially with the recovery plan of this species.

The proposed action will not interfere substantially with the recovery of any of the species.

Endangered Species

11. **Australasian Bittern (*Botaurus poiciloptilus*)**

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:

- Lead to a long-term decrease in the size of a population;

The proposal will remove 1.8 ha of marginal habitat for the species. This small removal of potential habitat is unlikely to the long term decrease in the size on an important population.

- Reduce the area of occupancy of the species;

Considering the large areas of available habitat surrounding Fullerton Cove (to the west and north of the site), the proposed removal of approximately 1.8 ha of habitat for this species is unlikely to reduce the area of occupancy of an important population.

- Fragment an existing population into two or more populations;

As the proposed development site is already located on the periphery of patch of vegetation the proposal will not isolate or fragment any areas of habitat.

- Adversely affect habitat critical to the survival of a species;

The proposal will remove 1.8 ha of already disturbed habitat for the species and potentially modify 1.9 ha of habitat within the site and 1.4 ha adjacent to the site. Due to the small area of habitat to be impacted, the level of disturbance already present within the site and as no individuals were identified, the habitat to be affected is not critical to the survival of the species.

- Disrupt the breeding cycle of a population;

As only marginal habitat for the species is present within the Study Area and the species was not recorded within the Study Area, it is unlikely that the proposal will impact on the breeding cycle of the species.

- Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

The proposal will remove 1.8 ha of already disturbed habitat for this species and potentially modify habitat within and adjacent to the site; approximately 1.9 ha within the site and 1.4 ha adjacent to the site. Due to the limited amount of habitat modification and removal, the proposal will not lead to the decline of the threatened species.

- Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;

There is the potential impact on areas of retained habitat for these species through the spread of weed species that are already present within the Study Area. This impact will only be on potential habitat for these species, and will not impact on habitat being utilised by these species as no individuals were identified.

- Introduce disease that may cause the species to decline; or

The proposed action is unlikely to introduce disease that will lead to the decline of the species.

- Interfere substantially with the recovery plan of this species.

The proposed action will not interfere substantially with the recovery of any of the species.

Migratory Species

12. Fork- tailed Swift (*Apus pacificus*)

13. Great Egret (*Ardea alba*)

14. Cattle Egret (*Ardea ibis*)

15. Latham's Snipe (*Gallinago hardwickii*)

16. White- throated Needletail (*Hirundapus caudacutus*)

17. Rainbow Bee- eater (*Merops ornatus*)

18. Black- faced Monarch (*Monarcha melanopsis*)

19. Satin Flycatcher (*Myiagra cyanoleuca*)

20. Rufous Fantail (*Rhipidura rufifrons*)

- *Substantially modify (including fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species:*

Rufous Fantail was the only one of these species recorded in the study area during field surveys. This species and three other woodland and forest birds (Rainbow Bee-eater, Black-faced Monarch, Satin Flycatcher) may use the Study Area for foraging and potentially nesting, predominantly during their Spring-Summer migration.

The Needletail and Swift species are aerial foragers which may be observed on occasion flying in the airspace over the study area.

Approximately 1.8 ha of potential habitat will be removed but it is not likely to represent important habitat for these species. The small size of the Cumbungi dominated Swamp Oak Forest within the Development Area make them unlikely to support Egrets or Latham's Snipe.

- *Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species:*

The proposed Development Area is not considered to represent important habitat for any of the above listed migratory species. Protection and management of the Retained Area will limit the spread of invasive species.

- *Seriously disrupt the lifecycle (Breeding, feeding, migration or re4sting behaviour) of an ecologicaly significant proportion of the population of a migratory species.*

The proposed actions will not disrupt the lifecycle of an ecologically significantly proportion of a population of any migratory species.

Appendix 7: Contributions and qualifications of Kleinfelder/Ecobiological staff

Name	Qualification	Title/Experience	Contribution
David Paull	M.Res. Sc.	Senior Ecologist 20 years experience in field ecology and assessment.	Project Management, amphibian surveys, owl call playback, spotlighting, Anabat analysis, BioBanking Assessment and report writing.
Kristy Peters	B. Park Mgt (Hons)	Senior Ecologist (Ornithologist) 5 years – Bird identification and Anabat analysis.	Bird surveys, report review
Shawn Capararo	B. Nat Res (Hons)	Senior Ecologist – GIS Specialist	Fauna surveys, report writing
Aaron Mulcahy	B. Env Sci. & Mgmt	Botanist	Flora surveys, vegetation community mapping
Gilbert Whyte	B. Biol Sc (Hons). PhD	Botanist	Flora surveys, habitat hollow survey
Samara Schulz	B.Env.Sci & Mgmt (Hons).	Botanist	Flora surveys, vegetation community mapping, report writing.
Chelayne Evans	B. Geog	Ecologist/GIS Support	GIS Mapping
Gayle Joyce	B.Sci (Forestry)	GIS Officer	GIS Mapping

Appendix 8: Licensing matters relating to the survey

Kleinfelder/ Ecobiological employees involved in the current study are licensed or approved under the *National Parks and Wildlife Act* 1974 (License Number: S12398, Expiry: March 2013) and the *Animal Research Act* 1985 to harm/trap/release protected native fauna and to pick for identification purposes native flora and to undertake fauna surveys.

Appendix D Supplementary information prepared by Urbis dated May 2012

29 May 2012

Ms Rachel Pleasant
Strategic Planner
Port Stephens Council
PO Box 42
RAYMOND TERRACE NSW 2324

Dear Rachel

Planning Proposal: 135A Fullerton Cove Road, Fullerton Cove

1 Introduction

I am writing to you in response to your e-mail dated 4 May 2012 and subsequent discussions between Wonona Christian (Port Stephens Council) and our client Anthony Iannuzzi (Woolworths). This letter contains supplementary information in support of Woolworth's recent request to rezone land at 135A Fullerton Cove Road to facilitate its development for a new supermarket anchored neighbourhood shopping centre.

This letter responds to planning issues identified by Council in relation to the proposal as follows:

- Additional justification for departure from established centres hierarchy as defined by the Port Stephens Planning Strategy.
- Further clarification of net community benefit associated with the proposal.

These are addressed in turn below. In addressing these matters further this letter demonstrates the clear alignment between the strategic planning context and the commercial drivers that are underpinning the selection of this particular site and which were listed in earlier advice provided to Council by letter dated 2 May 2012. This alignment reinforces that the Planning Proposal is capable of facilitating the delivery of better retail facilities that have been identified as being needed in this general locality through earlier Council led strategic planning processes.

2 Departure from Centres Hierarchy

- Strategic planning for the establishment and growth of centres in Port Stephens is set at both a regional and local level.
- At a regional level, the Lower Hunter Regional Strategy (LHRS) focuses on higher order "major regional"; "specialised" and "town" centres. There are also two "stand alone shopping centres" defined in the LHRS. Within the Port Stephens LGA, the LHRS identifies:
  - Raymond Terrace as a Major Regional Centre
  - Medowie and Nelson Bay as Town Centres
  - Newcastle Airport as a Specialised Centre

SYDNEY
GPO Box 5278 Sydney 2001
Level 21, 321 Kent Street
Sydney NSW 2000 Australia
t 02 8233 9900 f 02 8233 9966 e info@urbis.com.au w urbis.com.au Urbis Pty Ltd ABN 50 105 256 228

- Notably the LHRS does not identify any form of "town centre," within which pure retail activities tend to be concentrated, within the Stockton Bight, i.e. extending from Stockton to Nelson Bay.

- Within this geographic area, the LHRS clearly identifies the Fullerton Cove and Fern Bay localities as "existing urban areas". Whilst difficult to discern from the LHRS map, these existing urban areas clearly include lands that have Residential, Private Recreation and Non-Urban zonings under Port Stephens Local Environmental Plan 2000 (PSLEP 2000) in the vicinity of the site. In other words the LHRS defines "existing urban areas" as including the variety of residential land uses that surround the site irrespective of underlying zoning, i.e. mobile home villages, seniors housing and conventional residential estates.

- These uses, rather than zoning per se, provide an opportunity to assess the local retail and support service need and demand in this locality from a regional perspective. This is important and provides both an opportunity and a challenge given the proximity of the site to the Port Stephens / Newcastle LGA boundary.

- In this respect the LHRS states:

  "The hierarchy of centres also includes town centres and other mid and lower-order centres. These centres are integral to the network of centres within the Region and perform a similar and essential role on a more local scale. The future services, housing and employment role of those centres is not specifically addressed in the Regional Strategy but will be addressed in the local strategies prepared by individual Councils."(p.16)

- In other words there is an implicit expectation that lower order centres will be rightly planned by local Councils. However such planning may potentially not take account of the population catchments upon which centres will service and draw trade from when those catchments extend beyond LGA boundaries. The Planning Proposal highlights that the planned facility will draw trade from within the Newcastle LGA.

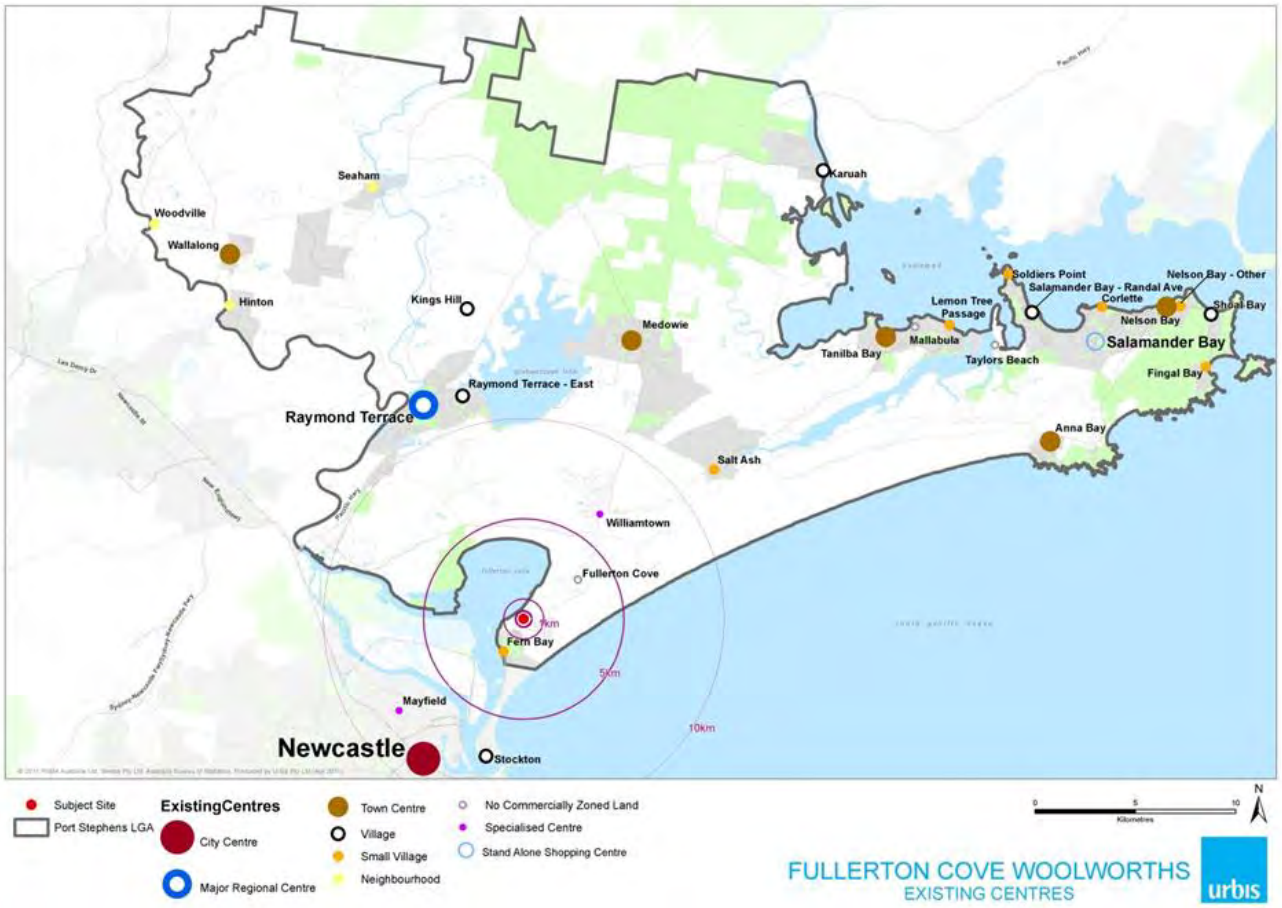
- The LHRS was released in 2007 and it is understood that the NSW Government has commenced the 5 year mandated review of the LHRS. However, details of this review are yet to be made known as Council would be aware.

- Notwithstanding this, it is understood that partly in response to the LHRS, Council in the intervening period has prepared:

  - The Port Stephens Commercial and Industrial Land Study (July 2010)
  - The Draft Port Stephens Community Settlement and Infrastructure Strategy (July 2010)
  - The Port Stephens Planning Strategy (PSPS)(December 2011)

- Importantly, and from a retail perspective Council's current centres hierarchy has been in place since at least July 2010 and was restated in the PSPS in December 2011. The following image has been adapted from both the PSPS and the LHRS to illustrate the existing centres hierarchy relative the proposed site.

Figure 1 – Existing Centres (Based on PSPS and LHRS)



- The PSPS defines "centres" as follows:

  "A centre is a concentration and / or combination of retail, commercial, civic, cultural and residential uses, ideally focused around transport facilities. The highest order of centre (i.e. Regional Centre) will contain the highest order of services (i.e. Police Local Area Command). The level of services provided declines as the centres progressively cater for a more immediate catchment (i.e. a smaller village centre will provide basic services, such as supply of milk and bread)."

- The LGAs centres range from the Major Regional Centre (Raymond Terrace) to smaller village centres (services are limited to a hotel or general store) and those which do not provide any local services or facilities consisting of a congregation of dwellings with no commercially zoned, or commercially occupied land. This is the case with the existing Fern Bay and Fullerton Cove centre locations depicted in Council's PSPS. In the case of the current location of the Fullerton Cove centre, the following additional observations are made:

  – The PSPS hierarchy acknowledges that there is no commercially zoned land at the location depicted.

- A site inspection and review of aerial photographs suggest that there is in fact no "*concentration or combination of…. uses".* At best there is a concentration of rural-residential uses on Fullerton Cove Road, approximately 1km north of the Woolworths site.

- At a regional strategic planning level, Fullerton Cove centre appears to be located within the Green Corridor.

- These factors were one of a number of factors taken into account as part of the sequential testing contained in the Planning Proposal submitted to Council.

- A close examination of the hierarchy also suggests that there are clear differences in the status, role and function of the centres in Council's hierarchy in spite of them in some instances having similar designations under state and / or local planning strategy. This is obviously reflective of the broad definition of what is a Centre under the PSPS and the varying stages in their evolution, but some notable observations are:

  - Medowie and Nelson Bay have regional designation as "Town Centres" under the LHRS whereas Anna Bay and Tanilba Bay do not.

  - There is an emerging "Town Centre" under the PSPS identified at Wallalong which is not recognised as a centre per se in the LHRS whilst the new growth areas within which it is located is recognised in the LHRS as being regionally significant.

  - Salamander Bay has a "stand-alone shopping centre" designation under the PSPS, containing the Salamander Bay Shopping Centre which is a double supermarket / double DDS anchored centre supporting approximately 80 speciality tenants. According to the Shopping Centre Council of Australia, this scale of retail facility is defined as a "Regional Centre". The trade area for a retail centre of this size would most likely extend across other higher order Town Centres as defined in the PSPS such as Anna Bay and Nelson Bay.

  - As suggested previously, pursuant to the PSPS the existing Fullerton Cove centre is located in a vacant rural location that bears no spatial relationship to the "existing urban areas" depicted in the LHRS for that locality.

- Reflective of these variances at the local level, the PSPS provides some guidance on how planning for development and growth of centres should occur. The key points to note from the PSPS are as follows:

  - It places a high priority on protecting the natural and rural character of the LGA and establishes planning and design principles for new villages, neighbourhoods and towns.

  - It <u>supports extensions to existing urban areas orientated or located towards transport corridor junctions to strengthen the public transport network</u> (our emphasis)

  - <u>New centres are to be complementary to and not undermine the existing centres hierarchy</u>. (our emphasis)

- In other words the PSPS does provide flexibility for Council to consider expansion of existing and emergence of new centres provided the underlying hierarchy is not challenged. This is reinforced by the following extracts from the PSPS:

  "The planned growth of centres will enable the people of Port Stephens LGA to have access to the services they need <u>as close as possible to where they live</u>, and that higher

level centres are able to develop a wide range and depth of services and commercial businesses."

- In response to this statement we note that, the following sites in our view, provide "*a concentration of residential uses*", in proximity to the site.
  - Seaside Boulevard located immediately to the south of the site involves the redevelopment of 205ha of land for residential use including the development of 947 residential lots, complemented by open space and ancillary uses including a neighbourhood centre.
  - Bayview Village which accommodates 400 mobile homes.
  - A second mobile home park is situated to the southwest on Nelson Bay Road. This site has development consent for 300 mobile homes.
  - Greenleaf Retirement Resort: a seniors living development situated to the west which is nearing completion. The estate will accommodate 235 units.
- This is depicted in Figure 2 below and as originally included in the Planning Proposal

Figure 2 – Existing Urban Development

- Further, Council can consider "minor" rezoning proposals on land that has not been identified for development which result in *"minimal / nil impact to the established commercial hierarchy, residential and employment land supply and growth foot prints."*

- Therefore, to determine whether or not the proposal is “minor”, it needs to satisfy the test of “minimal / nil” impact on:
  - Commercial hierarchy
  - Residential and employment land supply
  - Growth footprints
- In respect of the second and third factors first, the proposal does not impact on residential and employment land supply. In fact it is worth noting that if land was to be considered for rezoning within the nearby Seaside Estate, it could conceivably derogate from this objective, resulting in the loss of zoned residential land supply. In respect of the growth footprint, it is understood that Council in adopting the PSPS in December 2011, resolved to identify an “eastern growth corridor”. Whilst we understand that Council is to commence a study phase to “prove-up” this corridor, the site broadly falls within it, notwithstanding our acknowledgment that it also currently falls with the Green Corridor under the LHRS. This factor is discussed further in Sections 3 and 4 of this document.
- Turing to the impact on “commercial hierarchy” it is interesting to note that this appears to be a somewhat narrower concept than an assessment of impact on “centres hierarchy” taking into account Council’s broader definition of what constitutes a Centre as previously outlined. It is also worth noting that in a LHRS context this also means that the proposed Centre does not derogate from the Major Regional Centre status of Raymond Terrace or on the existing Town Centres of Medowie and Nelson Bay. This is in our view important given the proximity of the site to Newcastle LGA. In the respect it is also appropriate to assess impacts on Centres beyond the LGA boundary, with the closest / most directly accessible nominated centre in the LHRS being Mayfield Town Centre. This was reflected in the Economic Impact Assessment submitted as part of the planning proposal.
- In assessing the economic impacts of the proposed centre the following approach was adopted:
  - Market assessment, including a review of the likely future demand for retail floor space within a defined main trade area (MTA). The Main Trade Area generally includes the suburbs of Fullerton Cove, Stockton, Fern Bay, Kooragang, Tomago and Williamtown. Its extent has been limited by competitive supermarket facilities to the north at Medowie, to the north-west at Raymond Terrace and to the south in Newcastle
  - Assessment of the turnover potential of the proposed centre based on the concept design details.
  - Assessment of the possible impact on the trading performance of other centres, particularly those centres located in the vicinity of the MTA (noting that, with the exception of Stockton Town Centre, there are no competing centres within the MTA at present).
- The analysis confirms that there is sufficient existing capacity within the MTA to accommodate the development of a new retail centre of the scale and type proposed without adversely impacting the viability of the LGAs existing retail centres.
- The population of the MTA is estimated to be 7,730 residents and is expected to experience growth associated with the development of urban release areas increasing to a population of 10,480 by 2026. A significant proportion of this growth will occur proximate to the site.

- A significant proportion of residents within the MTA are aged 60 years and over (30 per cent). These residents currently must travel considerable distances by local standards to access supermarket facilities.

- The existing IGA supermarket in Stockton is the only existing supermarket within the MTA. The supermarket comprises a retail floor space of 600sqm and largely services the local convenience and top-up shopping needs of the Stockton population but is also the only existing retail provider for the local residents of Fern Bay and Fullerton Cove. As a result local residents are required to travel to long distances by local standard to larger centres at Mayfield, Medowie and Raymond Terrace to meet their basic weekly shopping needs (more than a 26km round trip).

- As a result of the lack of supermarket facilities retail spending is being diverted outside the MTA with only around 20 per cent of supermarket spending being retained within the MTA.

- The provision of a new retail centre in this location is intended to complement the existing centres hierarchy. The retail centre envisaged for the site will specifically cater to the day-to-day and weekly convenience shopping needs of residents within the MTA. That is, it will provide a convenient and accessible location for residents to buy most of their food and groceries.

- The scale of retail centre proposed for the site will trade from some nearby centres (most notably the existing IGA supermarket in Stockton), but not to the extent that the proposal will impact adversely on the economic viability of this or other centres.

- The assessment highlights that the existing population within the MTA is sufficient to support the proposed retail centre in the short to medium term. Additionally, approved residential development within the immediately surrounding area will generate further demand for additional retail floor space within the local area. Notably a full-line supermarket at the site would retain a significant portion of spending currently being directed to supermarkets outside the MTA (and outside the LGA).

- Overall, impacts on retailers in the area are considered to be reasonable and within the bounds of normal competition. The proposed development is unlikely to affect the viability of any of the existing centres or limit the provision of additional floor space at these centres in the future.

- With respect to the Williamtown Defence and Airport Related Employment Zone – DAREZ (the Newcastle Airport "Specialised Centre" in the LHRS), it is understood that this 90ha site that will be redeveloped as a business park with some provision for ancillary/small scale retailing. Interest has also been expressed by private developers for bulky goods facilities in this location.

- A specialised centre by its very nature is a unique activity node providing services that are intended to service the entire LHR. The planning objectives for this zone are embodied in its very title, i.e. "Defence and Airport Related" with a focus on commercial / business office activities that leverage off airport activities, be it civil or defence related. Any form of retailing that tends to occur within and around airports is generally either one or both of:

  - Providing small scale convenience based services catering for the local workforce and would potentially include uses such as a convenience store selling a limited range of grocery items and snack foods, dry cleaner, and café and restaurants/fast food;

  - Higher order specialist retail offers that are attractive to travellers and the quantum and mix of such retail is directly linked to the quantum and mix of passenger movements through the airport itself.

- Any future proposition to broaden the retail offer at such a significant destination as Newcastle Airport will generate its own impacts in higher order Centres such as Medowie and Raymond Terrace.

- The Planning Proposal for Fullerton Cove is pitched at a completely different local residential market and based on a supermarket anchor. There is no prospect that the Planning Proposal will undermine the DAREZ Specialised Centre.

3 Assessment of Net Community Benefit

- The Department of Planning and Infrastructure's "Guide to Preparing Planning Proposals" details that Planning Proposals should assess the net community benefit. Notably, the Guide defers to the Department's September 2009 Draft Centres Policy which outlines the method for conducting the net community benefit test and subsequent evaluation criteria used for determining the net community benefit. The Draft Policy states:

  The assessment should only include costs and benefits that have a net impact on community welfare (i.e. welfare effects)….evaluated against a base case.

- In this case, the "base case" is in our view best defined by:

  - The existing pattern of land use and land use zoning;
  - The existing centres hierarchy set under both LHRS and PSPS;
  - The projected population in MTA;
  - Zero employment;
  - Minimum travel time to full-line supermarket facilities – 15 minutes one way (28km return trip); and
  - Existing environmental values

- Given that the economic assessment contained in the Planning Proposal demonstrates a market capacity to absorb the additional proposed quantum of floor space without impacting on Council's hierarchy or the hierarchy established under the LHRS, the negative community impact, or "disbenefit", associated with potential to undermine the economic sustainability of these other centres is offset to a level which is within the range of reasonableness. As such a case can be put forward that there is a need for additional zoned land to support retail activity in the MTA.

- Therefore the question then can be asked what other positive and negative benefits (externalities) can be derived from the proposed centre in the location as outlined in the Planning Proposal. This can be measured both:

  - qualitatively via stakeholder engagement and feedback and
  - quantitatively in terms of factors such as additional employment and reduced dependency on vehicle trips for day to day convenience shopping and access to a local meeting point for residents to enjoy social interaction that is within a reasonable walking distance, i.e 800m, which is considered reasonable for centre of this scale.

- As part of the preparation of the PSPS, it is understood that in 2009 Council undertook a community visioning process titled Port Stephens Futures Strategy. It is understood that a key

finding of this process was a recognised need from the community for “reasonable facilities that match the population” within the Fern Bay and Fullerton Cove locality. The Planning Proposal at a broad level aligns with this community feedback as the scale of facility proposed will draw on a local trade catchment that includes the Fern Bay area.

- In terms of wider quantifiable benefits, the Planning Proposal:

  – Includes opportunity for local employment in the order of 150 jobs compared to the current 0 jobs under the existing base case. This includes approximately 100 permanent jobs during the operational stage and 50 jobs during construction. Given that Woolworths is the proponent for the Planning Proposal, ability to forecast this potential employment outcome can be made with a great degree of certainty.

  – Provides opportunity for increased retail choice and shopper convenience, which in turn will reduce the number of required trips to other centres, reduce travel times, and the costs associated with travelling, and the amount of carbon released into the atmosphere. Figure 3 below was included in the Planning Proposal and highlights travel time and distances based on GIS modelling of traffic and road conditions.

Figure 3 – Drive Time to Shopping Centres

(Please note that this map supersedes Figure 10 within the Planning Proposal report and corrects an error in the travel time distances previously calculated)

  – Enhances sustainability and the promotion of existing public transport provision through increased demand for services to and from the site. Hunter Valley Buses currently run routes

136 and 137 past the site both on Nelson Bay Road and Fullerton Cove Road providing local public transport connectivity between all adjacent residential areas around the site as well as beyond to Raymond Terrace, Stockton, Newcastle, and Nelson Bay. This may have the potential to be enhanced or expanded dependent on travel preferences by local residents.

- Relates to land that is of sufficient size that enables flexibility in siting and design that can allow for management and protection and potential enhancement of key vegetation and environmental values of the site, notwithstanding the entire site, including areas of cleared and filled land, falling within the Green Corridor (as previously identified in the flora and fauna report which accompanies the Planning Proposal report).

- Retains existing residentially zoned land and the opportunity already afforded to satisfy housing need and demand in the locality. Notably the developers of the adjacent Seaside Village have expressly stated that they do not favour any form of retail development occurring within the estate. This has been previously furnished to Council.

- Does not expose the community to any cost associated with the upgrading of trunk infrastructure to support the development. Any infrastructure upgrades will be at full cost to the proponent and would be of a type normally associated with this type of development irrespective of location. This would include upgrading of local power, road and water/sewer reticulation to service the development.

- Provides for a physical separation of potentially incompatible land uses between retail and residential uses. The immediate local road network and remnant vegetation corridors provide an opportunity to enable these uses to co-exist in close proximity to each other yet facilitate the effective management of amenity issues such as noise, lighting, and traffic impacts and environmental impacts.

- Will not place any unanticipated demands on planned social infrastructure. A review of the State Infrastructure Strategy and the Port Stephens Community Strategic Plan all identify future urban growth in this locality but no community infrastructure projects such as community centres, libraries, public health care facilities or educational facilities are proposed.

- Presumably this reflects new developments being required to provide facilities to support incoming populations on a case by case basis. This being the case it is arguable that the identified need for improved retail facilities in this locality mentioned previously is being met by this proposal

- It is understood that Council's Section 94A Contribution Plan (CP) applies a flat rate contribution charge of 1% of development cost for any retail development valued at more than $200,000.00. The Planning Proposal would facilitate a retail development costing approximately $10m thereby potentially generating some $100,000 in revenue to Council that could be directed towards the items listed in the works schedule of the Contribution Plan.

4 Site Selection and its Contribution to Net Community Benefit

- By letter dated 4 May 2012 Urbis provided an assessment of the commercial drivers and updated sequential test for supporting this site as the preferred location to establish a supermarket anchored neighbourhood shopping centre. This earlier letter is attached for ease of reference.

- The analysis provided in this earlier letter confirmed that the site is the only site that satisfies the commercial drivers for establishing a centre of this nature in this locality. Subject to the effective management of the environmental values that exist on part of the site, its rezoning can be supported for the reasons outlined above.

- Importantly, given that the site represents the only site that is commercially attractive to provide for a centre of the type and scale proposed, there is a need to recognise that the potential community benefits are essentially only achievable from this one site. In other words there is a potential community opportunity cost that is attached to this Planning Proposal by not proceeding.

- As touched on earlier, the site is equally served by an established pedestrian network that links Seaside Estate with the emerging seniors housing development located on the opposite corner of the site. Pedestrian refuges are provided within the approaches to the round-a-bout on the Nelson Bay Road / Fullerton Cove Road / Seaside Boulevard intersection. When assessed against the pattern of residential land uses adjacent to the site as depicted in Figure 1, any one of the residential precincts near the site will have to cross one of these roads if they are to access retail facilities by foot / cycle and irrespective of which "quadrant" of the round-a-bout a retail facility was sited within. Furthermore, the environment corridors that diagonally extends through this round-a-bout act to prevent a closer positioning of any future centre from a walkability perspective. From a community benefit perspective, the closer positioning of the centre would impact the community benefit generated by the preservation and management of these environmental corridors and the land use compatibility issues also mentioned earlier.

- In reassessing the site's suitability for retail development, it is also appropriate to ensure that the Planning Proposal does not derogate from Council's Rural Lands Strategy (RLS) dated February 2011. Whilst this document clearly informed the PSPS adopted by Council later that year, it is important to document that there are no rural land use strategies specifically relating to the site that may be undermined by the Planning Proposal.

- Our review of the RLS confirms that:

  - The site is designated as rural landscape and occupies land within the Fern Bay – Anna Bay locality which consists of predominantly rural residential land use and a low level of agricultural uses.

  - The site is occupied by existing rural residential development and is partially cleared of vegetation.

  - The designation does not seek to prevent future development but does seek to maintain the rural landscape character of the area.

  - The Strategy recognises that communities should have an adequate level of facilities and services to ensure a good quality of life for all residents.

  - The scale of development proposed, its locational relationship with existing settlements and the ability to manage the ecological values of the site would not compromise the objectives of the Strategy, and further, would provide a benefit to the local community which would otherwise be foregone.

- The Planning Proposal document contains the pro-forma evaluation of the net community benefits attached to the rezoning. It is considered that the comments against the evaluation criteria remain largely valid however can be looked upon more robustly having regard to the further assessment of impact on centres hierarchy and net community benefit contained in this letter.

5 Summary

This letter has been prepared to expressly respond to the planning issues raised by Council in their preliminary review of the planning proposal to rezone land at 135A Fullerton Cove Road, Fullerton Cove. The assessment reinforces the suitability of the site to accommodate the proposed use. Whilst it is acknowledged that the Planning Proposal does depart from Council's existing hierarchy under the

PSPS, it does not derogate or undermine it in any way. The type of retail facility proposed can be sustained by the forecast population in its MTA, which extends into the Newcastle LGA. From a LHRS perspective, there is no risk to the centres hierarchy set under that document. The proposal, subject to the effective management of the environmental values that exist on the site (as outlined in the flora and fauna report submitted with the Planning Proposal report) is capable of delivering a net community benefit based on the assessment contained in this document. Importantly and by doing so, it will enable delivery on a Council documented community need for better retail facilities in this part of the Port Stephens LGA.

I look forward to Council progressing its assessment of the Planning Proposal, but can be contacted on (02) 8233 9963 if you have any questions.

Yours sincerely,

Norelle Jones
Senior Consultant - Urban Planning

cc. Anthony Iannuzzi - Woolworths

Enc.

2 May 2012

Ms Wonona Christian
Port Stephens Council

Dear Wonona,

Fullerton Cove Economic Analysis

Further to the recent meeting and discussions between Council and Woolworths, Urbis is pleased to provide additional information, as requested, on the 'key drivers' underpinning Woolworths' site selection from a retail perspective. We trust that this will assist in the assessment of the Planning Proposal for 135A Fullerton Cove.

Supermarket Minimum Operating Requirements

Woolworths have advised that as a minimum they are seeking to achieve the following outcome at the subject site:

- A supermarket of a minimum size of 3,800 sq.m;
- A 175 sq.m Woolworths liquor store; and
- 100 sq.m specialty retailing to facilitate a café / ancillary use; as well as
- Expansion potential for around an additional 1,550 sq.m retailing; and
- Parking provision at a minimum rate of 5 cars per 100 sq.m.

The subject site, which measures 6.71 hectares, would comfortably accommodate a development of this scale, indeed the development could be accommodated within the 3 hectare portion of the site that is proposed to be rezoned. This would allow for an appropriate configuration of retailing, circulation, car parking, customer access and goods and servicing access.

Key Operational Drivers for Site Location

Given the significant withdrawal from the property development market of private developers since the Global Financial Crisis (GFC) in 2007/08 due to the lack of debt funding, many business operators have needed to "wear the shoes of the developer" to ensure that continued growth and market demand is met.

Whilst investor demand has remained steady, the supply of investment grade assets has shifted from the private developer to individual businesses / sectors such as the retail sector. In order for this process to occur the success of supermarket and neighbourhood shopping centre developments are heavily reliant upon site selection and its associated site characteristics such as trade area fundamentals around population growth and Socio Economic profile. These fundamentals all impact on the viability and sustainability of a shopping centre and the resultant ability to sell the completed property for an acceptable yield to a future developer.

SYDNEY
GPO Box 5278 Sydney 2001
Level 21, 321 Kent Street
Sydney NSW 2000 Australia

t 02 8233 9900 f 02 8233 9966 e info@urbis.com.au w urbis.com.au Urbis Pty Ltd ABN 50 105 256 228

The performance of any retail centre will therefore largely depend on the successful implementation of design features that maximise the following:

- **Location** – the choice of location for a retail centre needs to have consideration for the likely Trade Area required for the type of centre. The proposed development, which is relatively small in scale, will perform a neighbourhood shopping centre role within a Main Trade Area (MTA) with a population of 7,730. The population is projected to increase to 10,480 by 2026 (an increase of approximately 2.1% per annum).

  Population growth is one of the most vital components underpinning supermarket site selection processes. National full line supermarkets within single supermarket based shopping centres need to generate turnover at appropriate levels in order to be sustainable.

  It is common for national supermarket operators to withstand lower levels of profitability and turnover for a short period of time until they establish a presence within a trade area. The most effective way of assessing the profitability and overall success of a supermarket is the level of productivity being generated by that subject store. Across Australia, national full line supermarkets operating within single supermarket based shopping centres produce an average level of turnover of around $11,000 to $11,500 per sq.m (including GST).

  Gross occupancy cost ratio - which is the ratio of total gross rent as a percentage of the total gross turnover being generated by the supermarket - is the most effective and accurate way to determine the success and sustainability of any supermarket. National supermarket operators rely on low occupancy costs. In parallel, successful supermarkets generally underpin the performance of other retailers within a successful shopping centre by acting as the 'anchor' tenant which generates high shopper footfall and associated sales.

  There is currently only one existing supermarket provided within the defined main trade area, namely a small IGA supermarket of 600 sq.m provided at Stockton, some 7.6 km south of the proposed Woolworths development. This IGA supermarket will continue to serve the local convenience and top up shopping needs of the Stockton population.

  The Preliminary Economic Impact Statement prepared with the planning proposal estimates that only around 20% of supermarket spending is currently being retained within the defined Main Trade Area. It is likely that a high proportion of this expenditure leakage is being directed to higher order centres within the Newcastle LGA. The addition of the proposed full line Woolworths supermarket at Fullerton Cove would increase the retention to around 80%, providing a convenient full line supermarket to the surrounding population and resulting in more expenditure from Port Stephens residents being retained within the LGA. The subject site therefore offers good trading prospects moving forward.

- **Car Parking** – in suburban and non-metropolitan areas where there is typically lower provision of public transport, the majority of customers undertake their grocery shopping by car and require convenient car parking access to be able to load their purchases into their vehicles. At-grade car parking is generally preferable:

  1. From a customer perspective, as shoppers typically prefer to park where they can see the main entrance to the shop, and favour the convenience of at-grade parking when compared to negotiating multi-level car parks; and

  2. From a construction perspective, the cost of construction multi-level parking can be significant, and is typically an important factor in the financial viability of a retail scheme. By way of example the cost per car park (on grade) is approximately $3,000 / Car space compared to Basement/underground parking costs of $50,000 / Car Space.

  3. From a retailer perspective, in most neighbourhood and supermarket based centres the best performing retailers within shopping centres are often those located closest to car parking, as this maximises their convenience. At-grade parking maximises shopper accessibility to centre

access points and removes potential vertical movement pinch-points (e.g. stairs, lifts and escalators)

4. On grade car parking is vital for the convenience factor of neighbourhood shopping centres. As a very broad measure, from our experience the average customer spends approximately 30-40 minutes per visit and spends approximately $30-$40 at the supermarket plus $10-$20 at the other specialty stores within the shopping centre. The ease of parking, the removal of awkward ramps and columns etc. allow for the "in and out" convenience to be realised.

Securing a site that is large enough to provide at-grade parking and servicing is therefore of vital importance from a supermarket operators perspective and decisions to provide alternative forms of car parking e.g. basement will only be considered as an alternative where at grade cannot be achieved.

- **Exposure** – shopping centres need to obtain the highest level of exposure to passing and local trade in order to maximise its utilisation by a wide cross section of the community. Nelson Bay Road currently carries some 1,640 to 1,690 vehicles per hour (two-way) in the weekday afternoon peak period. In the Saturday peak period traffic flows are 1,130 to 1,210 per hour two-way. Therefore, in addition to trade from the Main Trade Area, the traffic flows on Nelson Bay Road suggest that it should be possible to attract passing trade from motorists travelling to and from outlying areas such as Williamstown Airport, Medowie, Anna Bay and Fisherman's Bay. This would likely include a proportion of tourists from beyond the region, and if these people are accessing self-catered accommodation, a new supermarket at the subject site would be strategically located to capture a proportion of this trade.

  Recognising that a negotiated design outcome for the site would most likely require the retention of perimeter vegetation, appropriately designed and suitably located directional signage should be sufficient to ensure that a retail development could achieve adequate exposure to Nelson Bay Road Traffic.

  Given that only a portion of the site will be rezoned and used for the development of the shopping centre there is consequently surplus land which can be utilised for rest areas with seating benches, tables to serve the needs of passing tourists.

- **Accessibility** – a retail centre needs to be highly accessible to its catchment. The subject site is located in an emerging community and residential precinct and the subject site is conveniently accessible from both Nelson Bay Road and Fullerton Cove Road. The site would be easily accessible and identifiable to Main Trade Area residents, particularly in the adjacent residential, tourist and seniors developments of Fern Bay. In comparison to each of the alternative sites noted later in this report, the subject site offers the most accessibility with the least potential impact on the amenity of surrounding residential areas.

- **Quality of Design and Management** – the quality of a retail centre will affect its attractiveness to potential customers and therefore its performance. As such consideration needs to be given to the choice of finishes that create a theme, differentiate the centre from its competitors and result in a character that will have enduring appeal. The subject site provides an opportunity to ensure that centre design is integrated with the prevailing character of the area by incorporating existing vegetation and sensitive building materials and finishes where appropriate.

  The overall layout of any shopping centre is vital to its success. Sightlines and access to individual specialty shops being easy and direct is extremely important. Shops within a centre that lack visibility can often be those that perform poorly. Given the subject property has ample site area an optimum design can be achieved. For example a traditional "L" shape common mall could be achieved which will result in passing pedestrian traffic walking past each specialty shop on their way to the supermarket.

- **Tenant Mix** – this factor is one of the strongest, if not the strongest driver of success within a retail environment. Anchor tenants such as a supermarket in a neighbourhood centre context are the

major driver of customer visitation, with the specialty tenants needing to respond to the offer provided by the anchor tenant. The provision of a Woolworths supermarket is likely to be a strong drawcard for Main Trade Area residents and the inclusion of a small range of specialty retail with a focus on cafes and liquor would complement the grocery focus of the centre. National retailers tend to support full line national supermarkets compared to local retailers who tend to support and are located within neighbourhood centres anchored by a weaker supermarket such as IGA or Foodworks etc.

We consider that the subject site has the potential to deliver a positive outcome from a retail operator perspective when considering each of the key factors listed above. The sales analysis in the Preliminary Economic Impact Statement in our view reflects the market potential of the site, and the provision of a new supermarket would significant reduce the travel distances for local residents when undertaking food shopping, resulting in reduced expenditure leakage to higher order centres within the Newcastle LGA..

Review of Sites within Port Stephens LGA

Section 5.2 of the Urbis Planning Proposal report sets out a preliminary assessment of the suitability of other sites to accommodate a similar scale of retail development within the Main Trade Area. In the Table below we consider these sites (and others that we have subsequently reviewed) from a commercial perspective having regard to the factors discussed above.

We note that the **Port Stephens Planning Strategy 2011** suggests there may be potential for retailing within the adjacent "Seaside" development (on the eastern side of Nelson Bay Road) it notes that the final location of site has not been determined by the developer and the amount of commercial land may need to be increased to accommodate increased demand. The Strategy states that:

"Should opportunity and demand arise for additional commercial/retail activity to be attracted to the area [Fern Bay], the location will need to support the existing identified commercial areas as per the established Commercial Hierarchy."

Accordingly, we have included an assessment of the potential for retail development within the Seaside Village development to the east of the subject site.

TABLE 1 – SUBJECT SITE: ANALYSIS

SUBJECT SITE	COMMENTARY
Site Location	135A Fullerton Cove Road, Fullerton Cove Refer to Figure 1.
Site Area (ha)	6.1ha Only part of the site would be rezoned to accommodate the future retail use, requiring an area of approximately 3ha to support the scale of retail development envisaged.
Land Tenure	Single Parcel. Single ownership.
Location	At the centre of the Main Trade Area which contains only one existing supermarket - a small IGA supermarket of 600 sq.m provided at Stockton, some 7.6 km south of the subject site. The site is easily accessible from Nelson Bay Road and Fullerton Cove Road and is easily accessible and identifiable to Main Trade Area residents, particularly in the adjacent residential, tourist and seniors developments of Fern Bay.
Potential Layout	The proposed rezoning of the 3 ha portion of the site would allow for an optimum configuration of retailing, circulation, car parking, customer access and goods and servicing access on a single level.
Exposure	Suitably located directional signage and minimal building exposure should be sufficient to ensure that a retail development could achieve adequate exposure to Nelson Bay Road Traffic.
Accessibility	The subject site is easily accessible from both Nelson Bay Road and Fullerton Cove Road. The site is easily accessible and identifiable to Main Trade Area residents, particularly in the adjacent residential, tourist and seniors developments of Fern Bay. Local residents would have the benefit of being able to walk to the shops to undertake top-up retailing, as well as driving and parking for larger shopping trips.
Other matters for consideration	The proposal represents a significant opportunity to enhance the retail offer for existing and incoming residents of the southern extent of the Port Stephens LGA. New retail development of the scale proposed could occur at the site without challenging the current hierarchy of Centres in the locality / sub-region. At the same time it could also deliver significant benefits to both the existing local community and add to the desirability of the area for incoming residents and visitors.
Highest and Best Value Use	Retail (Neighbourhood Centre)

(Preliminary)	

FIGURE 1 – SUBJECT SITE

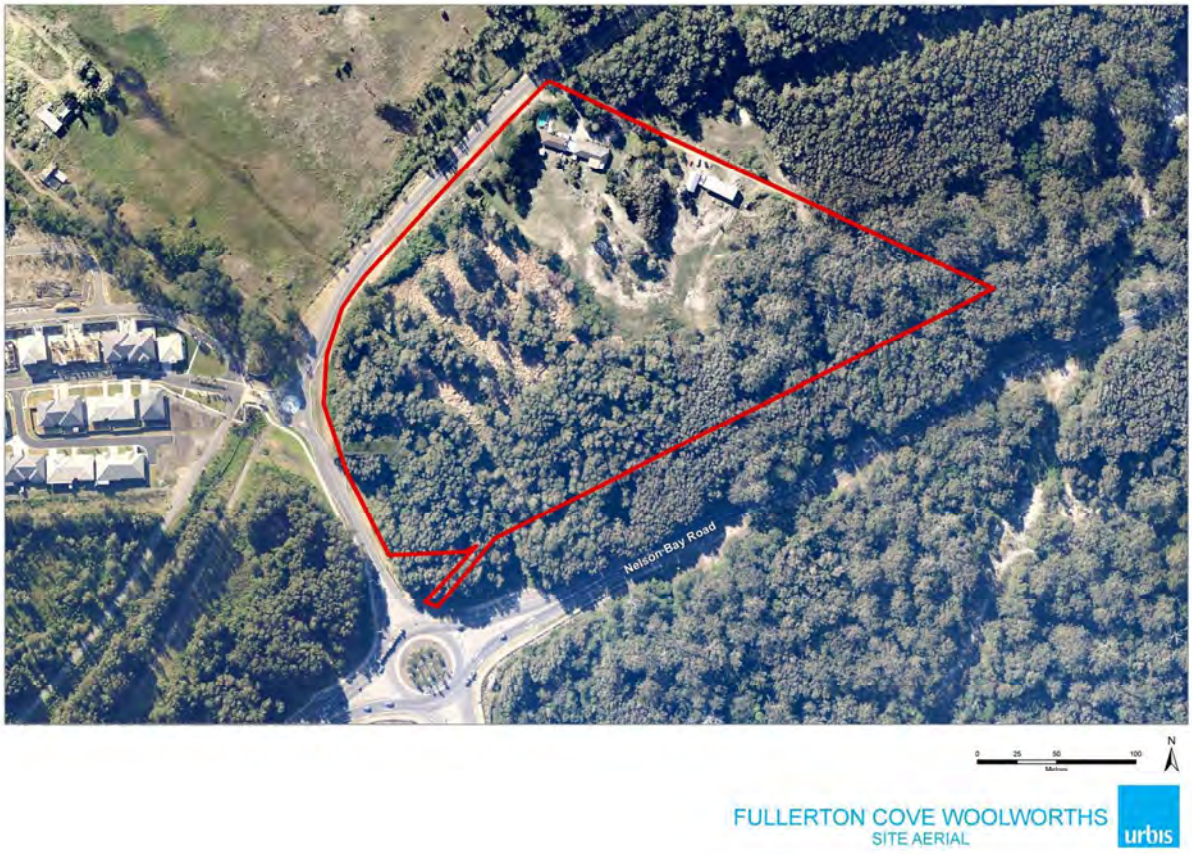


TABLE 2 – FULLERTON COVE LAND PARCELS: ANALYSIS

FULLERTON COVE	COMMENTARY
Site Location	Refer to Figure 2
Site Area (ha)	Multiple lots each of 1 hectare or larger
Land Tenure	Fragmented landholdings. Lots over 1ha are not necessarily contiguous.
Location	The Fullerton Cove sites are approximately 4.3 kilometres north of the subject site. The sites are mainly semi-rural agricultural lots, some of which contain low density residential dwellings. These lands are in the northern part of the Main Trade Area, and are removed from areas of population growth around Fern Bay and Stockton. A Supermarket in this location will trade at lower productivity rates and the location would likely suffer from a lack of interest from national retailers.
Potential Layout	Most sites are too narrow to be configured appropriately for a typical retail offering needed to accommodate circulation, car parking, customer access and goods and servicing. In the unlikely case that a site is large enough for the proposed development, the overall design of the shopping centre will not be optimised and this will therefore affect productivity, specialty shop tenancy mix, gross rentals achievable and ultimately end value. Site amalgamation would therefore be required. There would be potential for some of the sites located between Cox Lane and George Street to be developed in the event that land ownership can be consolidated.
Exposure	The sites along Fullerton Bay Road will not receive the same exposure to Nelson Bay Road as the subject site. The exception to this would be the two sites located on the southern side of Cox Lane, which are in closer proximity to Nelson Bay Road, however these site are not of sufficient size to accommodate the development and are on the periphery of the township in vegetated areas.
Accessibility	South bound traffic access the Fullerton Cove sites via the Fullerton Cove Road and Nelson Bay Road intersection, 2.2km north of Cox Lane. Similarly north bound traffic can only access via a Cox Lane slipway, and re-join Nelson Bay Road at the intersection 2.2km north. Both access points would require significant signage to attract passing motorists.
Other matters for consideration	Retail development is not permissible under any of the zones applicable to the sites identified in Fullerton Cove. Rezoning would therefore be required. Most sites have fragmented land ownership which complicates any attempt to

	consolidate and develop a suitably sized site.
Highest and Best Value Use (Preliminary)	Residential or non-intensive light industrial uses. In our view the Fullerton Cove sites do not provide a realistic opportunity for supermarket development.

FIGURE 2 – FULLERTON COVE LAND PARCELS

TABLE 3 – FERN BAY PUBLIC SCHOOL: ANALYSIS

FERN BAY: PUBLIC SCHOOL SITE	COMMENTARY
Site Location	Refer to Figure 3
Site Area (ha)	Approx. 1 hectare
Land Tenure	Single parcel of land. Currently in operational use as a public school
Location	The Fern Bay site is located 2.4km from the subject site. The site currently contains Fern Bay Public School, which is located adjacent to residential lands and a golf course. The site would require signage along Nelson Bay Road as it is located on Vardon Street and would not be easily visible to passing traffic. Lack of access to passing trade is a significant deterrent to supermarket operators.
Potential Layout	The site is 1 ha in size, and not of a sufficient scale to accommodate the proposed development.
Exposure	The site has limited exposure along Nelson Bay Road and would require signage to attract passing traffic along Nelson Bay Road.
Accessibility	The site is easily accessible by local residents. Passing traffic while unable to directly access the site from Nelson Bay face no access impediment turning into Vardon Road on which the site is located from Nelson Bay Road.
Other matters for consideration	The site is currently occupied by the Fern Bay Public School and zoned 2A Residential. – There would be significant demolition and relocation costs associated with redevelopment of the school site as well as potential disruption to school services. Retail development is not permissible under any of the zones applicable to the sites identified in Fullerton Cove. Rezoning would therefore be required. In addition to the school site Council is proposing to rezone a residential block of land measuring approximately 2,000 sq.m on the corner of Nelson Bay Road and Vardon Road. The size of the site means that it could only provide very limited retailing (a small strip of retailing) which would most likely be reliant on on-street parking. Due to this site's location in a residential area there are likely to be a number of residential interface issues that need to be addressed even for small scale retailing.

Highest and Best Value Use (Preliminary)	Continued use as a public school. The site performs an important education role and is too small to accommodate supermarket development. In our view the Fern Bay Public School site does not provide a realistic opportunity for supermarket development. The site proposed by Council to be rezoning to accommodate retail uses may be suitable for small strip retailing, but is too small to accommodate supermarket development and presents a number of residential amenity issues that may require buffer treatments, further reducing the net developable area of the site.

FIGURE 3 – FERN BAY PUBLIC SCHOOL

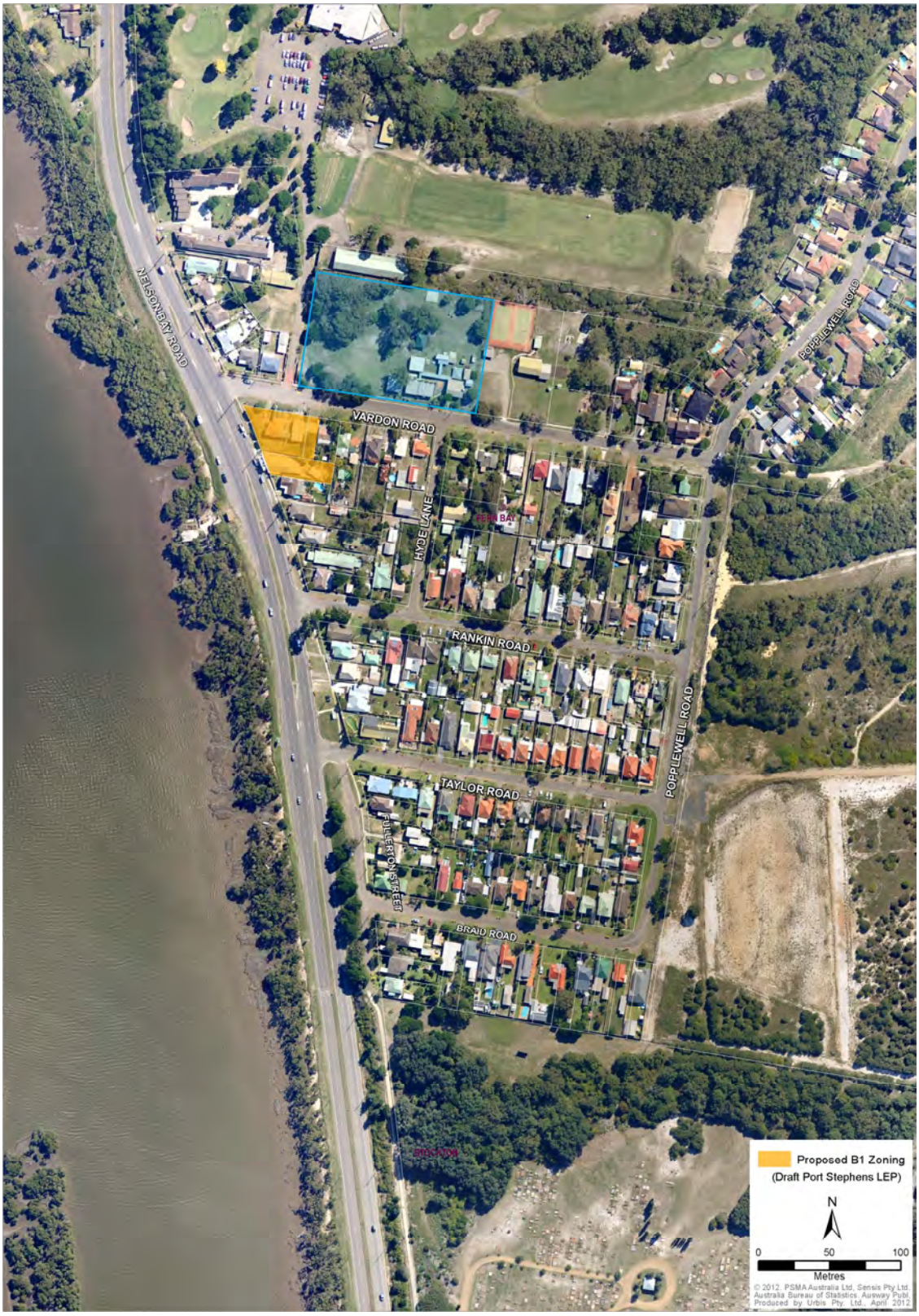


TABLE 4 – STOCKTON TOWN CENTRE: ANALYSIS

STOCKTON TOWN CENTRE	COMMENTARY
Site Location	Refer to Figure 6
Site Area (ha)	-
Land Tenure	Multiple parcels of small lots with fragmented ownership.
Location	The Stockton Town Centre is located approximately 7.8km south of the subject site, in the Newcastle LGA. The sites likely to be considered are currently zoned local centre, and occupied by local shops or zoned residential and are currently occupied by houses. Supermarket development within Stockton Town centre has the potential to divert spend from Port Stephens residents into the Newcastle LGA.
Potential Layout	Supermarket development would require large scale site amalgamation and demolition. At present there are no sites large enough to accommodate the proposed development.
Exposure	Stockton Town Centre is a local retail destination, but is located at the southern tip of a peninsula likely to receive only limited passing trade.
Accessibility	Stockton town centre is accessible to local Stockton residents, however it requires a car journey for residents in the vicinity of the subject site and beyond. By contrast, the subject site is located adjacent to a residential growth area with a focus on seniors living. Seniors in particular are likely to respond positively to convenient retailing that does not require a prolonged car journey.
Other matters for consideration	Due to its location at the tip of the peninsula, Stockton is a location that can be easily bypassed. It lacks exposure and is a sub-optimal supermarket destination. It is also located in the Newcastle LGA and new retail development would have the potential to draw expenditure from the Port Stephens LGA.
Highest and Best Value Use (Preliminary)	Continued use as local/neighbourhood shops. In our view without large scale site amalgamation and detailed masterplanning, Stockton town centre does not provide a realistic opportunity for supermarket development.

FIGURE 4 – STOCKTON TOWN CENTRE

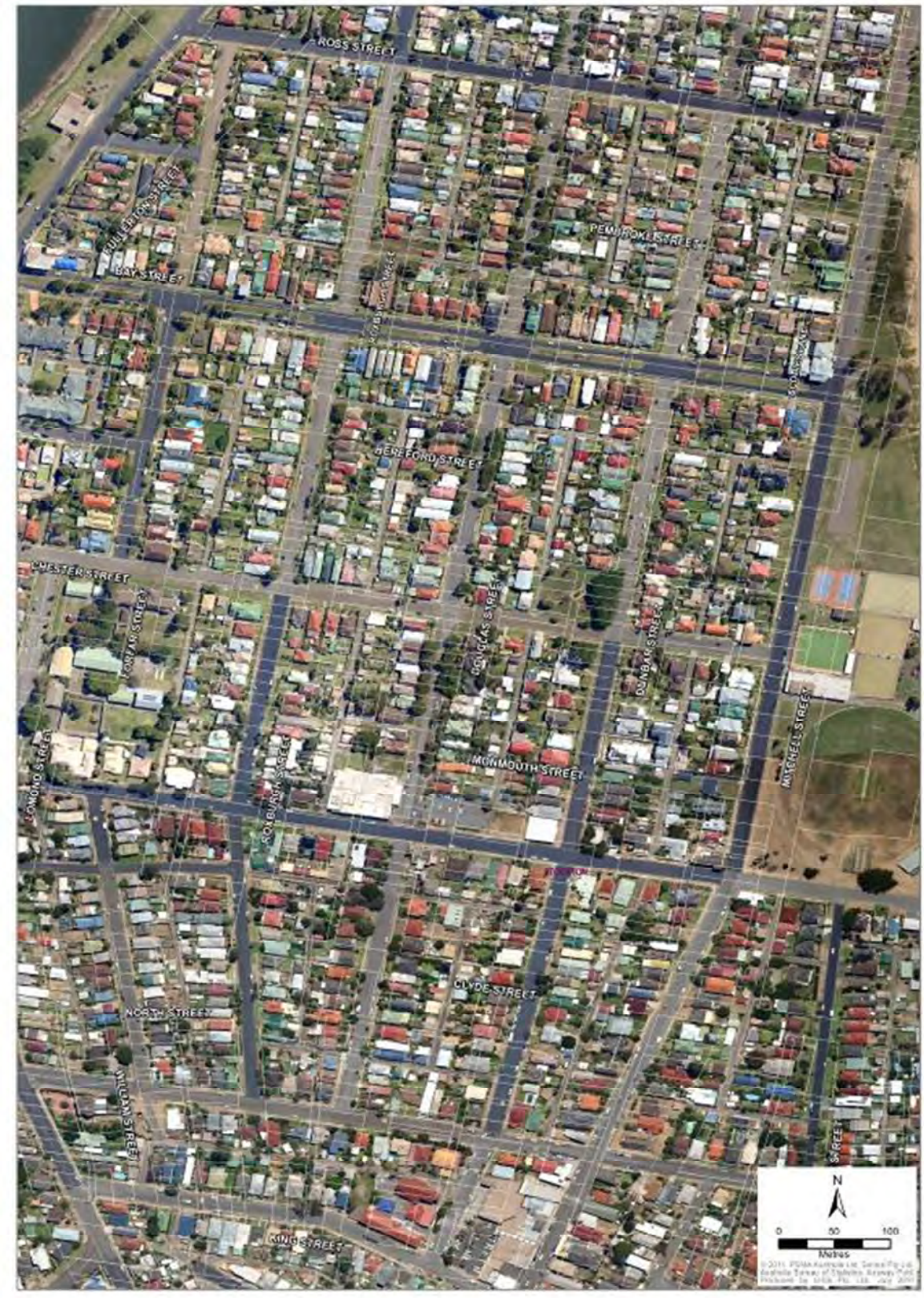


TABLE 5 – STOCKTON: NORTHERN EDGE

NORTHERN EDGE OF STOCKTON	COMMENTARY
Site Location	Refer to Figure 5
Site Area (ha)	3 separate sites of 1.2 to 1.4 hectares
Land Tenure	Three fragmented land parcels in separate ownership.
Location	The northern edge of Stockton is around 5km south of the subject site. Adjacent development is mainly residential, with the identified sites currently used for recreational purposes or vacant. Two of the sites are on the coastal foreshore and are unlikely to be suitable for retail development. None of the sites are located on Nelson Bay Road. The sites are located in the Newcastle LGA, and retail development could potentially draw additional spend from Port Stephens LGA residents.
Potential Layout	None of the sites are of a sufficient scale to accommodate the proposed development.
Exposure	All three sites are located off Nelson Bay Road, and as such do not have direct exposure to passing traffic.
Accessibility	Easily accessible to Stockton residents (within the Newcastle LGA), but 5km south of the residential growth occurring around the subject site.
Other matters for consideration	Retail development is not permissible under any of the zones applicable to the sites identified in Fullerton Cove. Rezoning would therefore be required. These sites are also located in the Newcastle LGA and new retail development would have the potential to draw expenditure from the Port Stephens LGA.
Highest and Best Value Use (Preliminary)	Recreational and residential uses. In our view the Stockton North sites do not provide a realistic opportunity for supermarket development.

FIGURE 5 – STOCKTON: NORTHERN EDGE

TABLE 6 – SEASIDE VILLAGE, FERN BAY

FERN BAY: SEASIDE VILLAGE	COMMENTARY
Site Location	Seaside Boulevard, Seaside Village, Fern Cove Refer to Figure 6
Site Area (ha)	To be determined. Vegetated land zoned 2A Residential would need to be cleared as part of a future stage of Seaside Village, and provision made to accommodate a retail component. We note that Council proposes to rezone some of the residential lots on the southern side of seaside Boulevard to a B1 zone which would permit retail development. The amount of land proposed to be rezoned measures approximately 8,000 sq.m.
Land Tenure	Single Parcel. Single ownership. Following discussions, we understand that the developer would prefer to maximise the residential yield of the site and build additional dwellings rather than retail development, hence a final location for retail development has not been determined. Correspondence from the developer (attached) confirms that they have no plans to include a supermarket within their site; rather they support Woolworths rezoning proposal as a means of benefitting the local community.
Location	Immediately opposite the subject site, but setback from Nelson Bay Road within the Seaside Village subdivision. If the land proposed to be rezoned by Council at Seaside Village were to be used for retail development instead of residential it would only deliver a site of around 8,000 sq.m and would mean that the residential development potential of this land would be lost. It would also retain residential lots to the side and rear of the site, and it would be highly undesirable from a sales perspective to have dwellings abutting and facing the rear of a retail strip. In actual fact a retail development could also reduce the residential development potential of this adjoining land with significant economic impact on the overall residential scheme. From an overall marketing perspective, maintaining Seaside Boulevard as a pleasant tree lined, high amenity entry point to the estate is likely to be an important selling point, particularly if there is also potential for new retail development with walkable links close by at the subject site.
Potential Layout	Presumably a sufficiently sized site could be found within the landholding to accommodate a retail development; however this would reduce the residential

	yield of the site as a whole. As noted above, if the land proposed to be rezoned by Council were to be used for retail development instead of residential it could result in a loss of 8,000 sq.m land for residential development, and could also reduce the development potential of land to the rear as well.
Exposure	The site does not have direct frontage to Nelson Bay Road. As with the subject site, suitably located directional signage should be sufficient to ensure that a retail development could achieve sufficient exposure to Nelson Bay Road Traffic.
Accessibility	A retail development would be easily accessible for residents of the Seaside Village development. From a design perspective for Seaside Village it could be detrimental to the overall amenity of the scheme to have shopper traffic and goods delivery vehicles accessing the site via Seaside Boulevard, as this is an important gateway to the residential community. The subdivision layout has been set up to provide a high quality amenity and potential noise and disruption from traffic could compromise this outcome. Retail provision has not formed part of the overall design concept, and attempting to 'retrofit' a neighbourhood shopping centre onto the subdivision masterplan is neither a feasible nor a desirable outcome in terms of accessibility, residential amenity and overall financial viability.
Other matters for consideration	The developer does not intent to provide supermarket floorspace at Seaside Village. Woolworths are therefore not in a position to negotiate an option on land in the estate notwithstanding the previous comments.
Highest and Best Value Use (Preliminary)	Residential

FIGURE 6 – SEASIDE VILLAGE, FERN BAY

Conclusion

Having regard to the above we make the following observations about the relative suitability of the subject site and other sites identified to satisfy the key commercial investment criteria for a new neighbourhood centre development:

- Fundamentally we have been unable to identify any alternative suitably sized sites within the Main Trade Area to accommodate a neighbourhood centre development with at-grade car parking. A site of at least 3 hectares would be required;
- Whilst there may be some potential to amalgamate parcels of land at Fullerton Cove adjacent to Fullerton Cove Road (Figure 2), the risk from a time and cost perspective is significant when weighed against the prospect of proceeding with the subject site, which is a single parcel of land and capable of being configured to accommodate the proposed development.

  The Fullerton Cove lands (Figure 2) also lack the locational and accessibility attributes of the subject site, and provide no access to Nelson Bay Road. Given the prevailing character of the locality, land would be more likely to be developed for residential uses in the future.

  These sites, together with land at Stockton (north) (Figure 5) and Fern Bay Public School (Figure 3) would also require amendments to the planning controls and significant demolition costs, so there is also a degree of planning risk associated with these sites.
- In addition, a number of sites are physically constrained through a combination of containing existing viable uses (e.g. Stockton Town Centre, Fern Bay Public School) or by potential impact of Coastal Zone regulations (e.g. Stockton North). These elements would be further constraints to achieving a sustainable development outcome.

Potentially there may be scope to provide sufficient land within the Seaside Village development adjacent to the subject site (Figure 6) to accommodate a neighbourhood centre development. Seaside Village shares many of the positive attributes of the subject site in terms of location and access to Nelson Bay Road.

The Seaside Village developer does not intent to provide supermarket floorspace within the estate, but supports Woolworths proposal for a neighbourhood centre on the subject site.

If a 3 hectare site were to be provided within the development this would likely result in a significant loss of residential dwelling potential which could otherwise be achieved. The land owner's preference is to maximise the dwelling yield on the site, and this would explain the fact that a site for retail development has yet to be formally identified.

From a design perspective for Seaside Village it could be detrimental to the overall amenity of the scheme to have shopper traffic and goods delivery vehicles accessing the site via Seaside Boulevard (the major access point to the estate), as this is an important gateway to the residential community. This is a master planned estate that has not factored into its design the siting and design layout of a neighbourhood scaled shopping centre. It has been set up to provide a high quality residential amenity and potential noise and disruption from traffic and general retail operations and activity could compromise this outcome.

If the land proposed to be rezoned by Council at Seaside Village were to be used for retail development instead of residential it would only deliver a site of around 8,000 sq.m whilst reducing the residential development potential of this land and potentially land to the side and rear which would be highly undesirable from a residential sales perspective by virtue of abutting and facing the rear of a retail strip.

Taking these matters into account, Urbis is of the opinion that the subject site offers the best commercial opportunity from those sites identified above of delivering a site that can be successfully

developed to provide a neighbourhood shopping centre. The addition of a Woolworths supermarket would increase spending retention within the Port Stephens LGA and would provide convenience-based retailing to the surrounding population and passing trade.

This advice also serves to reinforce the net community benefit arguments that were put forward in the original Planning Proposal document. Council is in receipt of strategic planning advice that identifies the need for additional retail facilities in this area to cater for the existing and forecast population. What this assessment has done is identify that there is limited opportunity to plan for the provision of the type of supermarket based neighbourhood centre proposed in the locality. The rezoning of alternate sites identified is in the majority of cases not going to deliver a commercially attractive site capable of delivering a supermarket based centre. To do so would deliver a less than optimal planning and land use outcome. This is because, unless the site rezoned is commercially attractive, those existing and future residents of Fullerton Cove will simply have to continue to have to travel some distance to carry out their weekly grocery shop.

Yours sincerely,

David Wilcox
Senior Consultant
Enc. Fern Bay Seaside Village Letter to The Mayor, Port Stephens Council, 21 February 2012

Sydney
Tower 2, Level 23, Darling Park
201 Sussex Street Sydney, NSW 2000
t +02 8233 9900
f +02 8233 9966

Brisbane
Level 7, 123 Albert Street
Brisbane, QLD 4000
t +07 3007 3800
f +07 3007 3811

Melbourne
Level 12, 120 Collins Street
Melbourne, VIC 3000
t +03 8663 4888
f +03 8663 4999

Perth
Level 1, 55 St Georges Terrace
Perth, WA 6000
t +08 9346 0500
f +08 9221 1779

Australia • Asia • Middle East
w urbis.com.au **e** info@urbis.com.au