Terrestrial Flora and Fauna Study, South Forster

Report
for
Coastplan Consulting Pty Ltd

Quality Assurance Statement				
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GLOSSARY

TERMS	DEFINITION
Alluvial soil	Juvenile soils formed by deposition from still or moving water. Little pedological development beyond some accumulation of organic matter at the surface.
Alluvium	Unconsolidated deposit of gravel, sand or mud formed by water flowing in identifiable channels. Commonly well sorted and stratified.
Arboreal	To live in, or be connected with, trees.
Biological diversity	The variety of all life forms, comprising genetic diversity (within species), species diversity and ecosystem diversity.
CAMBA	China-Australia Migratory Bird Agreement.
Canopy	The uppermost layer of foliage formed by the crowns of trees.
Concept design	Initial functional layout of a concept, such as a road or road system, to provide a level of understanding to later establish detailed design parameters.
Core Koala Habitat	Core Koala habitat is defined under SEPP 44 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 historic records of a population."
Cumulative impact	The sum effect on the environment resulting from the successive effects of several different impacts.
Ecologically sustainable development	Using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.
Ecosystem	A functional unit of energy transfer and nutrient cycling in a given place such as a forest or estuary; it includes all the relationships within the biotic community and between the biotic components of the system.
Endangered Ecological Community (EEC)	An ecological community specified in Part 3 of the NSW Threatened Species Conservation Act 1995. An ecological community is listed as endangered if, in the opinion of the Scientific Committee: it is likely to become extinct in nature in NSW unless the circumstances and factors threatening its survival cease top operate, or it might already be extinct.
Environmental Impact Assessment (EIA)	The process used to ensure that the environmental, economic and social impacts of projects are considered in the planning stages. EIA is undertaken for all RTA road and bridge proposals to ensure that environmental impacts are considered to the fullest extent possible in accordance with the Environmental Planning and Assessment Act 1979. The assessment is usually in the form of a review of environmental factors (REF), or if the RTA considers that the environmental impacts of the proposal are likely to be significant, an environmental impact statement (EIS). It should be noted that an EIS may or may not be preceded by a REF.

TERMS	DEFINITION
EP&A Act	Environmental Planning & Assessment Act 1979.
Floodplain	Large flat area of alluvium adjacent to a watercourse, characterised by frequent active erosion and aggregation by channeled and overbank stream flow.
Floristic	Refers to the species composition of a plant community.
Habitat	The place where an organism lives; habitats are measurable and can be described by their flora and physical components.
Hydrology	The study of rainfall and surface water run-off processes.
Introduced species	Plants and animals not native to Australia and known or thought to have been brought in by humans.
JAMBA	Japan-Australia Migratory Bird Agreement.
Locality	The local area defined as within a 10 km radius of the subject site.
Potential Koala Habitat	Potential Koala habitat is defined under SEPP 44 as "areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15 % of the total number of trees in the upper or lower strata of the tree component."
pH	A measure of the degree of acidity or alkalinity expressed on a logarithmic scale of 1-14, on which 1 is most acid, 7 is neutral and 14 is most basic (alkaline).
Quaternary sediments	Sediments deposited during the geological period of time from the present to two million years ago.
Rehabilitation	The restoration of a landscape and especially the vegetation following its disturbance.
Remnant vegetation	Native vegetation remaining after widespread clearing has taken place.
Road corridor/ reservation	The strip of land along which a road is to be constructed.
Sediment	Material of varying sizes that has been or is being moved from its site of origin by the action of wind, water or gravity.
Sedimentation basin	An area where run-off is ponded to allow sediment to be deposited. The longer the period that the run-off is held, the smaller the size of the sediment deposited. Such basins have to be cleaned regularly.
State Environmental Planning Policy Number 14 (SEPP 14)	Policy prepared under the Environmental Planning & Assessment Act 1979 for the protection of identified coastal wetlands in NSW.
State Environmental Planning Policy Number 26 (SEPP 26)	Policy prepared under the Environmental Planning & Assessment Act 1979 for the protection of identified littoral rainforest in NSW.
Study area	Refers to adjoining habitats within 500m of the subject site.

TERMS	DEFINITION
Subject site	Refers to the lots which constitute the subject lands for the project
Stormwater	Rainwater which runs off urban and agricultural catchments, following rain events. This untreated water is carried in stormwater channels and discharges into creeks, rivers, lakes, harbours and oceans.
Study area	The area to which technical investigations or assessments have been undertaken. Includes areas adjoining or proximal to the subject site.
Threatened species	Refers to species listed under either Schedule 1 or 2 of the NSW Threatened Species Conservation Act 1995
TSC Act	NSW Threatened Species Conservation Act 1995
Wetland	Land either permanently or temporarily covered by water. These areas are usually characterised by vegetation of a moist soil or aquatic type.

EXECUTIVE SUMMARY

A Terrestrial Flora and Fauna study was undertaken to determine the ecological attributes of for Pt Lot 20 DP 22631, Lot 148 DP 651471 & Lot 37 DP 1023220 Pipers Creek, The Lakes Way Forster. This study provides information on the significant ecological features for inclusion in the rezoning process commenced for the subject site.

The study was undertaken over a period of approximately 12 months with particular targeted studies undertaken during appropriate seasons or weather conditions for targeted species or species group.

Despite the previous and existing land use of the subject site and the disturbed nature of the vegetation within the subject site, the field surveys undertaken by Conics detected the occurrence of six (6) Threatened Fauna Species and the occurrence of one (1) Threatened Flora Species listed under the Threatened Species Conservation Act 1995. The most significant of these include the occurrence of 'a population Squirrel Gliders (*Petaurus norfolcensis*) and the identification of a highly significant population of Trailing Woodrruff (*Asperula asthenes*).

The ecological signficiance of the site is such that a large proportion of the site is suitable for future development if appropriate mitigation and amelioration measures are included in the development design. As such a suite of development principles for any future development on the subject site were developed to avoid, minimise or in some cases improve the existing habitats for Threatened species. The principles include:

- Provision of a Habitat linkage;
- Management of Edge effects;
- Stormwater Management;
- Landscaping principles; and
- Management and Monitoring.

The study concluded that future development of the site can occur with appropriate mitigation and management without significantly impacting on the ecological values of the site or surrounding areas.

1.0 INTRODUCTION

1.1 BACKGROUND

Conics - Environment and Climate Change (Conics) has been commissioned by Coastplan Consulting Pty Ltd to prepare a Terrestrial Flora and Fauna Study to provide information for inclusion in the rezoning process for Pt Lot 20 DP 22631, Lot 148 DP 651471 & Lot 37 DP 1023220 (hereafter referred to as the subject site) Pipers Creek, The Lakes Way Forster.

The subject site is currently zoned 1(c) Future Urban investigation pursuant to the Great Lakes Local Environmental Plan 1996 and has subsequently been identified within the Forster/Tuncurry Conservation and Development Strategy as containing lands for rezoning appropriate for a mix of commercial /bulky goods and residential / tourist facilities (Great Lakes Council 2004).

The subject site is approximately 24 hectares in area and is located approximately 5 kilometres south of the CBD of Forster. The subject site is bounded by Pipers Creek to the west, The Lakes Way to the north, a tourist development to the north and residential development to the south. Several commercial developments along The Lakes Way occur immediately adjacent to the site. Land on the eastern side of The Lakes Way across from the Subject site consists of residential development and a large shopping centre.

The site is characterised by cleared areas of land and patches of swamp sclerophyll forest and sclerophyll woodland with varying degrees of disturbance. Areas of the site have been subject to earthworks and filling in recent years.

There have been numerous flora and fauna studies undertaken within land holdings around the subject site as well as vegetation surveys within Booti Booti National Park (NP) to the south. From these investigations, various ecological reports have been prepared and subsequently, the ecological attributes of the land within the vicinity of the subject site have been documented and the findings of these studies have been summarised in this report.

These reports have assisted in determining the habitat value of the vegetation communities in the vicinity of the subject site. In addition, these reports have assisted with determining the potential or known occurrence of Threatened flora and fauna species in the areas surrounding the subject site.

As the reports have assisted with evaluating the ecological attributes of the land, surrounding the subject site, the potential impacts of the proposed development upon the flora and fauna and habitat value, both within and adjoining the subject site can be more accurately assessed. Subsequently, the potential impact upon Threatened flora and fauna occurring within the (10 km radius) may be minimised or alleviated through appropriate and ecologically sensitive design of any future development.

1.2 PURPOSE OF REPORT

This report summarises the findings of the ecological investigations undertaken within the Study area. The report describes the ecological attributes including the occurrence of Endangered Ecological Communities and Threatened species in the locality. This report identifies the ecological constraints of the subject site, thereby providing information relevant for the rezoning to guide future development of the subject site. In addition, this report identifies development principles for minimising the impacts of the proposed development upon Threatened species known or considered likely to occur within the locality.

1.3 OUTLINE OF THE REPORT

The report is structured as follows:

Section 2 – provides a description of the Subject site and Study area;

Section 3 - describes the fauna and flora survey methodology undertaken in the Study area;

Section 4 - describes the results of the fauna and flora surveys;

Section 5 – discusses the ecological attributes of the subject site and development principles;

Section 6 – discusses the potential impacts of the development and recommends mitigation measures to reduce or alleviate impacts on the surrounding habitats; and

Section 7 – provides a conclusion and recommendations in relation to the future development site in accordance with the proposed development principles on the fauna and flora of the Study area.

2.0 DESCRIPTION OF THE PROPOSAL & STUDY AREA

2.1 DESCRIPTION OF THE SUBJECT SITE

The subject site is defined Pt Lot 20 DP 22631, Lot 148 DP 651471 & Lot 37 DP 1023220, The Lakes Way, Forster (Figure 1). The subject site is a irregular shaped holding bounded by the Pipers Creek Foreshore to the west, The Lakes Way and some commercial developments to the east, a tourist facility to the north and existing residential development to the south.

2.2 DEFINITION OF THE STUDY AREA

The Study area is defined as the land within the subject site, and also the areas within a distance of approximately 500 m from each boundary of the subject site in which technical investigations or assessments have been undertaken.

2.3 SUBJECT SITE SETTING AND ATTRIBUTES

The majority of the subject site was historically cleared of the remnant vegetation communities and the remaining vegetation within the subject site is highly disturbed given the historic and existing use of the land.

A small number of remnant trees are located on an old beach dune within the eastern portion of the subject site; however, the tree component within the remainder of the subject site is generally restricted to isolated trees and stags and it is unlikely that any regrowth trees would establish into a mature trees given the current practices on the land. The subject site is also bounded by regenerating foreshore vegetation along Wallis Lake and, a small linear strip of regenerating vegetation is contained within the road reserve adjoining the Lakes Way.

Topography

Topographically, the site is situated on a broad Aeolean sand plain derived from aged wind-blown sands on the eastern shores of Wallis Lake. It is generally flat, with a gentle slope of 1 to 2 degrees towards the west. The northwestern corner of the site contains filling encroaching from an adjacent site. The surface of this part of the site is unvegetated and the exposed fill is mainly sandy, but with some visible concrete, timber, and minor plastic exposed.

The remainder of the site has been stripped to allow filling and consists of broad, low-lying stripped areas separated by mounds of the stripped topsoil. The surface exposes sand with sparse grass cover. The surrounding areas contain some well established large trees.

Site drainage is judged to primarily occur via infiltration into the predominantly sandy surface soils. Trafficability is restricted by the sandy nature of the surface soils.

2.4 LOCAL GEOLOGY AND HYDROGEOLOGY

Reference to the 1:100,000 Bulahdelah geology map indicates the site to be underlain by Quaternary Alluvium. The Forster 1:25,000 Acid Sulfate Soil Risk Map indicates the site to be located within an area of Estuarine sand plain with an elevation of approximately 1m and a high probability of acid sulfate soils (See Figure 2). Groundwater is likely to be within 1m of the natural ground surface and would have a very low gradient but with an overall flow towards Wallis Lake to the west of the site.

2.4.1 Geology & Soils

The Study area is located on a Pleistocene-age beach dune ridge system, and is classified as 'Qpes, Estuarine sandy backbarrier deposits' in accordance with the Bulahdelah 1:100 000 geological series sheet 9333. A strip approximately 300m wide, located along the western edge of the Study area (extending east from the edge of Wallis Lake) is classified as 'Qhem, Estuarine basin muds and intertidal deposits'

3.0 STUDY METHODOLOGY

3.1 DESKTOP REVIEW AND BACKGROUND RESEARCH

The desktop component of the study involved database searches of the records held on the Department of Environment and Conservation, Atlas of NSW Wildlife database and a review of Flora and Fauna surveys and assessments that have previously been conducted in the locality (10 km radius). The principal sources of information for this Literature Review were as follows:

Database and Internet-based Searches

- The Atlas of NSW Wildlife, (Department of Environment and Conservation, 2008);
- EPBC Act online Database (search undertaken October 2008);
- "Bionet" (NSW Government, 2008); and
- NSW Threatened Species Website (Department of Environment and Conservation, 2008).

Review of Previous Assessments undertaken in the locality

- Threatened Species Assessment and Koala Habitat Assessment – Proposed Filling of Lots 1-7 DP 249361, The Lakes Way South Forster (Ecotone Ecological Consultants Pty Ltd, 1997);
- Eight Part Test Lots 1-7 DP 249361, The Lakes Way South Forster (ERM Mitchell McCotter Pty Ltd, 1997);
- Section 5A Assessment, Lakes Way Watermain Replacement Stage 3 (Terra Consulting 2003);
- Species Impact Statement for the Proposed Residential Development at Lots 103, 142 & 178 the Lakes Way, Forster (Ecotone Ecological Consultants Pty Ltd, 2003);
- Sweet Pea Road to Green Point Drive Watermain Replacement – Ecological Investigations (Environmental Resources Management Australia Pty Ltd, 2001); and
- Species Impact Statement. Proposed Aged Residential Housing, Lot 192, DP 1037212, Chapmans Road, Tuncurry. (Cumberland Ecology, 2008).

Site Maps

- Site aerial photography (1;10000);
- Forster 1:25000 Topographic map;
- Newcastle 1:250000 Geological Series Sheet;

Other

- Forster -Tuncurry Conservation and Development Study, (Great Lakes Council, 2002);
- Draft Great Lakes Council Vegetation Strategy – Eastern Portion, (Great Lakes Council, 2003)
- Great Lakes Council Draft Local Environmental Study Consultant's Brief;

- Griffith et al. Vegetation and flora of Booti Booti National Park and Yahoo Nature Reserve, lower North Coast of New South Wales (2002); and
- Draft Threatened Biodiversity Survey and Assessment Guidelines (DEC, 2004).

Liaison with Great Lakes Council.

Liaison with Great Lakes Council's environmental officer (Natural Systems and Estuaries Branch) was undertaken in order to obtain information on the locations of Threatened flora and fauna species, Endangered Populations, and Endangered Ecological Communities within the local government area, particularly within the locality (10 km radius) of the subject site. In addition, ecological studies undertaken in the locality and other ecological matters relevant to the subject site were discussed.

Council was also consulted regarding survey design for targeting particular threatened species considered to potentially occur within the habitats at the subject site. Any variation to the survey requirements in accordance with LES brief were consequently discussed with Council's environmental officer.

3.2 FLORA SURVEYS

3.2.1 Aerial photo interpretation and mapping

Native vegetation is typically mapped by aerial photo interpretation (API) wherein preliminary stratification of photo patterns or types (generally analogous to vegetation communities) is made with reference to diagnostic features such as colour, texture, crown architecture and topographic position (Griffith *et al* 2000).

3.2.2 Botanical Survey

A plot based botanical survey was undertaken to inventory the flora on the subject site. Sample sites are typically stratified by either environmental variables (geology, slope, aspect, elevation above sea level) for rugged mountainous environments or by photo pattern for North Coast floodplain/sandplain environments where vegetation types are influenced much more by slight changes in elevation (<0.5 m) and variations in groundwater hydrology than by coarse environmental variables.

A total of eleven (6) 400 m^2 plots were undertaken across the subject site. All vascular taxa observed within or overhanging the plot were recorded and assigned to one of six foliage cover classes. The plot based survey was supplemented with Random Meander traverses (Cropper, 1993) across the range of subject site habitats to target locally occurring TSC listed taxa and to opportunistically record taxa not observed in plots.

The structural classification used for vegetation mapping and description follows Walker and Hopkins (1990). Subformation names for vegetation types other than rainforest are adapted from the classification proposed by Beadle and Costin (1952). Botanical nomenclature follows Harden (1st, 2nd editions 1990-1993, 2000, 2002), *PlantNet* (BGT, 2006) and *MOBOT Angiosperm Phylogeny* websites (Stevens, 2005). The vegetation communities are named after dominant indicator species of the tallest stratum and most could be considered as 'associations' as defined by Beadle (1981).

Plant taxa not identified in the field were collected and subsequently identified using standard botanical texts (Harden, ibid) and compared with the digital voucher specimen collection held at the NSW National Herbarium (*PlantNet*).

Assessment of conservation values of vegetation communities recorded was made with reference to (Griffith and Wilson, 1996); Griffith *et al* (2000), NSW NPWS (1999); RFA (2000) and Great Lakes Council (2005).

The survey methodology was generally consistent with provisions prescribed in the *Threatened Biodiversity Survey and Assessment Guidelines Working Draft* (DEC 2004) and Great Lakes Shire Consultants Brief for LES Preparation

3.2.3 Targeted Searches

A population of the TSC/EPBC listed herb, *Asperula asthenes*, is known to occur in the *Melaleuca quinquenervia* Swamp Foprest on the eastern boundary of the subject site (Mathew Bell pers comm..). As a result, a targeted search was undertaken in conjunction with the general botanical survey to detect any occurrence of the species throughout other habitats of the site. Targeted searches for additional Threatened taxa previously recorded in the locality and considered as a potential occurrence on the subject site were also undertaken via Random Meander Searches in suitable habitat. Taxa targeted included *Lindernia alsinoides, Allocasuarina defungens*, and *Allocasuarina simulans*.

Targeted survey methodology for determination of population area and size generally followed DEC (2004) and Cropper (2003.

3.3 FAUNA SURVEYS

3.3.1 Introduction

The fauna survey program was comprised of two distinct survey periods conducted in Spring (23rd to 26th September 2008) and Summer (11-27 February 2009).

The Spring survey consisted of:

- Spotlighting surveys (3 nights);
- Call playback surveys (3 nights);
- Mistnetting (2 nights);
- Avifauna surveys (3 mornings);
- Reptile and amphibian surveys.;

The Summer survey consisted of:

- Terrestrial Elliott and Cage trap Surveys;
- Arboreal Elliott and Cage trap Surveys
- Anabat Surveys;
- Spotlighting;
- Pitfall trap surveys;
- Harp Netting
- Mist Net survey; and Radio-tracking

3.3.2 Avifauna Surveys

Specific bird surveys were undertaken on three mornings for a period of 1 hour, additionally all bird species observed or recorded from calls heard during other survey methods were recorded. In total approximately 5.5 hours of avifauna surveys were conducted across the stiudy area.

3.3.3 Small Mammal Surveys

Terrestrial Elliott Traps

Within the Study area, four trap lines of 25 Small (Type A) Elliott traps, spaced approximately 10 m apart, were set for a period of four nights. In total, 400 terrestrial small Elliott trap nights were conducted within the Study area.

Four lines of 10 Large (Type B) Elliott traps, spaced approximately 20 m apart, were set for on the ground for a period of four nights. In total, 160 terrestrial large Elliott trap nights were conducted within the Study area.

Arboreal Elliott Traps

Four arboreal (Tree) trap lines of were used to target arboreal and scansorial mammals occurring within the Study area. These arboreal trap lines consisted of 10 Type B Elliott traps. Each trap was placed on platforms that were attached to trees and spaced approximately 10 m to 20 m apart (depending on tree availability). In total 40 large Elliott traps were set for a period of four nights, giving a total of 160 arboreal Elliott trap nights.

Subsequent arboreal trapping was also undertaken in order to recapture study animlas for the radio-tracking program and during this recapture program an additional 120 arboreal Elliott trap nights were undertaken.

Hair Traps

Four lines of hair traps, consiting of one small terrestrial, one large terrestrial and one arboreal tree trap were established for a period of 15 nights. In total, 450 ground hair trap nights were conducted within the Study area.

One line of 15 hair traps were attached to trees and spaced between approximately 10 to 25 m apart depending upon tree availability. These hair traps were also set for a period of 15 nights, which gives a total of 225 hair traps targeting arboreal species.

All hair samples collected were sent to a specialist consultant, Ms Barbara Triggs, (specialist analyst consultant) for identification.

Bait Used

All Elliott and hair traps were baited with a standard mixture of rolled oats, peanut butter, honey, and vanilla essence.

3.3.4 Large Mammal Surveys

12 cage traps were set at various locations within the Study area for a period of four nights. Six of the cage traps targeted herbivorous/frugivorous mammals and were baited with pieces of apple. The other six cage traps targeted larger predators such as feral cats and were baited with chicken wings. A total of 24 cage trap nights targeted herbivorous/frugivorous mammals, while a total of 24 cage trap nights targeted carnivorous species.

3.3.5 Reptile and Amphibian Surveys

Specific reptile or amphibian surveys were conducted throughout appropriate areas for a period of two person hours. These surveys involved searches of leaf litter decorticating bark fallen timber, and rotting logs. Amphibians were also targeted during the spotlighting surveys conducted around the drainage channels and low points. In addition, all species observed or heard calling incidentally during other surveys were recorded.

3.3.6 Pitfall traps

Pitfall traps were used to target reptiles and amphibians and were constructed at 4 locations throughout the Study area. Each pit trap line consisted of 5 pitfalls spaced approximately 5 metres apart. Each pitfall trap was approximately 25 cm in diameter and 40 cm in depth. Each pitfall trap line was connected by a drift fencing approximately 30 cm in height. The pitfall traps were checked every morning and left out for 4 nights.

3.3.7 Targeted Wallum Froglet Searches

Targeted surveys for the Wallum Froglet (*Crinia tinnula*) were undertaken within the subject site. In the Spring survey, call playback for the Wallum froglet was completed at several locations on the site both at night and during brief showers in the daytime.

3.3.8 Fauna Transect Surveys

Fauna transect searches were conducted through all habitat types occurring within the Study area, targeting signs of fauna species including tracks, scats, nest sites, whitewash and owl pellets and chewed Allocasuarina fruit. Species targeted during these surveys included the Glossy Black Cockatoo, Square–tailed Kite, Powerful Owl, Masked Owl, Koala, the Tiger Quoll and feral predators. All herbivore scats observed were identified in the field.

3.3.9 Call Playback Surveys

Call playback surveys were conducted in accordance with standard methods. After an initial five-minute listening period, calls of the species were broadcast for a period of approximately five minutes, followed by a five minute listening period.

Call playback surveys were undertaken within the east of the subject site on three (3) separate nights. Calls played each night were Powerful Owl (*Ninox strenua*), Masked Owl (*Ninox novaehollandiae*), Grass Owl (*Tyto capensis*) and Barking Owl (*Ninox connivens*). Calls of the Squirrel Glider were not played as the spotlighting surveys had previously confirmed this species occurrence within the subject site.

3.3.10 Spotlighting Surveys

After completion of the call playback surveys, the dune forest community and adjoining vegetation was searched by spotlight by two personnel for 30 mins each night for any species that approached the broadcast site without eliciting calls. A total of 3 person hours spotlighting was therefore undertaken within the subject site.

3.3.11 Koala Habitat Assessment (SEPP 44 Assessment)

The objective of State Environmental Planning Policy No. 44 - Koala Habitat Protection (SEPP 44) is to encourage the conservation and management of habitat areas for Koalas to ensure their current distribution is maintained. In accordance with SEPP 44, an assessment was undertaken to determine the occurrence of Koala habitat within the subject site.
A SEPP 44 assessment involves:

- Determination of whether the subject site occurs within the Local Government Areas (LGA's) listed on Schedule 1 of SEPP 44;
- Determination of potential Koala habitat within the Subject site;
- Determination of core Koala Habitat; and
- Consideration of the need for a Koala Plan of Management.

SEPP 44 Definitions

Potential Koala Habitat
Potential Koala habitat is defined under SEPP 44 as "areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15 % of the total number of trees in the upper or lower strata of the tree component."

Core Koala Habitat

Core Koala Habitat is defined by SEPP 44 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 historic records of a population."

In accordance with SEPP 44, an assessment was undertaken to determine both the occurrence of Koala habitat and Koala activity levels within the Study area

Potential Koala Habitat Quadrats

A total of three (3) quadrats (20 m x 20 m) were used to determine the occurrence of *Potential Koala habitat* within the Study area. The tree species that comprised the upper and lower strata within each quadrat were documented and tallied. The percentage of each species within the upper and lower strata was then calculated to determine if at least 15 % of either strata level was comprised by feed trees listed under Schedule 2 of SEPP 44.

Koala Scat Searches

Preliminary assessment determined that some of the habitats at the Study area contain *potential Koala habitat* pursuant to SEPP 44. In addition, the habitats were identified to contain a variety eucalypts that are known to be utilised by the Koala. Specific Koala scat searches were therefore undertaken within the Study area to evaluate the level of Koala activity and to determine if the Study area contains *core Koala habitat*.

The scat searches were undertaken in general accordance with the Spot Assessment Technique as ascribed in Phillips, S. and Callaghan, J., (1995). The methodology involved searching the basal circumference of least 20 trees for Koala scats that are known to, or likely to be utilised by Koalas. Each tree was searched for two (2) to three (3) minutes, or until a Koala scat was found, whichever came first. A total of three (3) sample sites using this method were surveyed in the Study area.

3.3.12 Tree Surveys

The trees occurring within the subject site were tagged onsite (with metal tags) and surveyed by Lidbury, Summners & Whiteman Consulting Surveyors, Planners and Engineers. Only trees with a DBH > 30 cm were surveyed tagged for the tree survey.

Radio tracking

During the trapping surveys undertaken by Conics, four (4) Squirrel Gliders (Petaurus norfolcensis) were captured and radio tracked in order to ascertain foraging areas and denning habitats for the species within the study area.

Collar type radio transmitter LTM (Titley electronincs) weighing less than 5% body weight was attached to each of the animals prior to release at the capture location during the following night. Collar tpe ransmitters were fitted to one (1) glider from each of the four (4) trapping sites and two of the gliders tracked were females, and two were males.One sub-adult male and one adult female were captured during the Elliott

trapping program on non consecutive days. The male was re-captured on 18 October 2006 and the female was glider was recaptured on 25 October 2006. The gliders were released following removal of the collar transmitters. Table 2.1.below provides the dates and radio-transmitter frequencies of each of the two Squirrel Gliders tracked.

3.3.13 Weather Conditions, Lunar Phase and Dates

The prevailing weather conditions and moon phase during each of the fauna surveys were described and recorded.

4.0 RESULTS

4.1 LITERATURE REVIEW

A number of Threatened flora and fauna species have been recorded within the locality as identified both from the database searches and the review of previous assessments. A number of other Threatened flora and fauna species are considered likely to occur within the locality due to the occurrence of potential habitat on the subject site. A number of endangered ecological communities have been recorded in the locality. Appendix E - C contains information regarding each of these species or Endangered Ecological Communities and an assessment of their likelihood of appearance on the subject site.

4.2 FLORA

4.2.1 Threatened Flora

Results from the desktop review revealed a total of 10 Threatened plant taxa and a number of Endangered Ecological Communities (EEC's) have been previously in the Forster area. Following an initial site reconnaissance, and desktop review, a total of three (3) Threatened plant taxa and two (2) EEC's were considered as having the potential to occur on the subject site based on the habitats present, and were targeted during the flora surveys.

Table E.1 in Appendix E - C lists the Threatened species and Endangered Ecological Communities (EEC) that are known to occur, or considered as potentially occurring within the locality. An assessment of the likely occurrence of these species within the Study area is also provided in Table E.1.

4.2.2 Vegetation Communities

The botanical survey yielded four (4) vegetation communities supporting a total of one hundred and ninety three (193) plant taxa from sixty (60) families. Eight (8) exotic species were recorded during the surveys (representing 9% of total). Exotic species are indicated throughout the report followed by an asterisk (*).

A floristic list has been compiled and is included in Appendix A - D. The list is provided as a two way table denoting a foliage cover class per taxon per quadrat. Taxa recorded opportunistically during site traverses are indicated in the list with an "X".

Summary descriptions of the vegetation communities recorded on the subject site are provided below. A Vegetation Map showing the distribution of vegetation communities recorded across the subject site is provided as Figure 4.1.

Vegetation Community 1: *Coastal Blackbutt (Eucalyptus pilularis) – Smooth barked Apple (Angophora costata) Tall Dry Sclerophyll Open Woodland (disturbed Coastal Dune Forest)*

This vegetation community occurs on well drained podzolised sands of Pleistocene backbarrier dunal deposit origin on a north-south low ridge along the western edge of the lakes way. The community grades downslope modified Swamp Sclerophyll Forest and cleared areas.

Upper Stratum (height 10 - 15 m; projected foliage cover <10 - 25%)
Eucalyptus pilularis, Angophora costata +/- Eucalyptus robusta

Mid Stratum (height 2 - 3 m; projected foliage cover 10 %)
Acacia longifolia subsp. longifolia, A. ulicicfolia, A. floribunda, Woollsia pungens, Platysace linearifolia.

Lower Stratum (height to 1 m; projected foliage cover 60 -80%)
Lomandra longifolia var longifolia, Setaria gracilis, Chlorus gayana* Pteridium esculentum, Pomax umbellata, Bossiaea heterophylla. Andropogon virginicus*, Imperata cylindrical.*

Extent of Disturbance

High. The community has been largely cleared on the subject site to an Open Woodland structure with only limited representation of understorey elements evident. This former Coastal Dune Forest has largely been cleared with remaining patches subject to filling weed invasion roading and associated edge effects.

Equivalent Vegetation Types

- Map Codes 35561, 35562 *Eucalyptus pilularis-Angophora costata* Dry Sclerophyll Forest and Woodland (Griffith et al 2000);
- DEC North C*oast Map Code 3506 Eucalyptus pilularis-Angophora costata/C. gummifera/E. planchoniana* Dry Sclerophyll Forest and Woodland (Griffith and Wilson 1996);
- Forest Type 41 Blackbutt-Bloodwood/Apple (NSW Forestry Commission NSW 1989).

Bioregional Conservation Status

This vegetation type is common on the large coastal sand masses of the North Coast bioregion. Locally, this community has a local extant area of 68 hectares in Booti Booti NP (Griffith et al 2000). An extant area of 2,600 ha is reported in a number of NSW North Coast reserves for a closely related community (including *Corymbia gummifera*, and *Eucalyptus planchoniana*) in the bioregion (Griffith and Wilson 1996; NRAC data, undated).

Great Lakes Council (2005) assign a moderate to high conservation value note that this community type has and state that Hager and Benson (1994) classify this community as adequately conserved in the North Coast Bioregion.

Vegetation Community No. 2

Broad leaved Paperbark (Melaleuca quinquenervia) – Swamp Oak (Casuarina glauca) +/ - Livistona australis, Tall Swamp Sclerophyll Forest.

This community is the dominant remnant vegetation community occurring within the study area and is a gradational community which varies in overstorey dominance depending upon soil fertility and salinity. This community occurs on podzolised sands aolian and marine tide delta sands. This community represents two highly modified swamp sclerophyll forest vegetation communities that have been subject to historical clearing, these being Swamp Mahogany (*Eucalyptus robusta*), Cabbage Palm (*Livistona australis*) – Broad leaved Paperbark (*M. quinquenervia*) and Swamp Oak (*Casuarina glauca)* – Broad leaved Paperbark (*Melaleuca quinquenervia)*. Due to the disturbed nature and small patch size this community has been mapped as a complex Swamp sclerophyll forest community. Prior to site disturbance, there would have been a gradual transition (ecotone) from the Swamp Oak – Paperbark swamp forest eastward to the Swamp Mahogany – Paperbark swamp forest as soil and groundwater salinity decreased.

Griffith et al., (2000) describes similar communities as "an example of a subtle shift in dominance from Casuarina glauca to Melaleuca quinquenervia over areas which are too small to separate at the mapping scale employed". It is expected that such shifts in dominance may be a response to changes in microtopography or hydrology and that the dominant canopy species often seem to co-occur.

Upper Stratum (7-12 m height; projected foliage cover 50 – 90 %)

Casuarina glauca, Melaleuca quinquenervia, Livistona australis, Eucalyptus robusta.

Lower stratum (1 m in height, projected foliage cover 60 – 80 %)

Baumea juncea, Baumea rubiginosa, Juncus kraussii ssp. australiensis, Entolasia marginata, Isolepis nodosa, Fimbrystylis dichotoma, Imperata cylindrica var major, Phragmites australis, Cissus opaca, Samolus repens, Galium liratum, Blechnum indicum, Baloskion tetraphyllum ssp. meiostachyum, Bacopa monnieri, Gahnia clarkei, , Viola hederacea, Goodenia gracilis, Lobelia anceps, Imperata cylindrica var *major* and *Leptinella longipes. Pennisetum clandestinum*, Pasture weeds included *Axonopus fissifolius**, *Andropogon virginicus** and *Paspalum dilatatum**.

Equivalent Vegetation Types

- North Coast Vegetation Mapping Project Map Code 4099 Casuarina glauca – Melaleuca quinquenervia Swamp Sclerophyll Woodland/Forest (Griffith and Wilson, 1996), considered a composite of Map Codes 4005 and 4003;
- Modified component of Map Codes 40981, 40982 Eucalyptus robusta-Melaleuca quinquenervia and Map Codes 40991, 40992 Melaleuca quinquenervia – Casuarina glauca swamp sclerophyll forest and woodland (Griffith et. al.2002);
- *Eucalyptus robusta - Melaleuca quinquenervia* swamp sclerophyll forest (floodplain/sandplain occurrences) are reserved locally in Booti Booti NP and Yahoo NR with an extant area of 28.5 hectares (Griffith et al 2000).
- Community No. 37 Melaleuca quinquenervia – Baumea juncea swamp sclerophyll shrubland of Griffith et. al. (2003); and

- Composite of Forest Type No.s 30/31/32 Swamp Mahogany/Swamp Oak/Paperbark (NSW Forestry Commission 1989).

Extent of Disturbance

High- the majority of the community has been subject to numerous disturbances through clearing, tracks, altered hydrological regimes, weed invasion, feral animal intrusion and filling. Only the larger remnant patches represent the pre disturbance community.

Bioregional Conservation Status

Although this community is floristically and structurally similar to TSC-listed EECs, 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 East Corner bioregions, the edaphic, topographical and locational descriptors of the scientific committee's determination of these EEC's are not consistent with the sites charactereistsics. These communities due to their occurrence on podsolised Pleistocene Aeolian and marine tidal delta sands correspond with Swamp Sclerophyll Forest and Swamp Oak Floodplain Forest communites on sandplains in accordance with Kieth and Scott (2005). The soils investigation and geomorphological information for the site support this assessment. (Orogen 2007).

Great Lakes Council (2005) note that this community type has a high conservation value and state that Hager and Benson (1994) regard Swamp Mahogany dominated communities as inadequately reserved.

This composite swamp sclerophyll forest community is reserved in many of the North Coast bioregion conservation reserves that sample vegetation on Quaternary sediments, including Bundjalung NP, Yuraygir NP, Hat Head NP, Myall Lakes NP, Moonee Beach NR, Limeburners Creek NR and Lake Innes NR (I Mamott, *pers. obs*.; Griffith *et al*., 2000; Myerscough and Carolin 1986). It is noted, however, that floodplain occurrences of this composite community have been largely cleared (I. Mamott *pers. obs.;* Griffith *et al*., 2000; Adam *et al*., 1985).

Special Attributes

This community contains habitat for the TSC/EPBC listed herb, *Asperula asthenes*, recorded in the east of the subject site.

Vegetation Community 3: *Introduced Grassland with Scattered trees*

This vegetation community occurs in the highly disturbed areas of the siute and contains only scattered native trees with a high modified understorey.

Upper Stratum (height 10 - 15 m; projected foliage cover <10 %)
Scattered *Eucalyptus pilularis, Angophora costata +/- Eucalyptus robusta*

Mid Stratum (height 2 - 3 m; projected foliage cover 10 %)
Acacia longifolia subsp. longifolia, A. ulicicfolia, A. floribunda.

Lower Stratum (height to 1 m; projected foliage cover 60 -80%)
Setaria gracilis, Chlorus gayana* Pteridium esculentum, Pomax umbellata, Bossiaea heterophylla. Andropogon virginicus*, Imperata cylindrical, Axonopus fissifolius** and *Paspalum dilatatum**.

Extent of Disturbance

Very High. The community is a result of previous clearing, earthworks and pasture improvement.
Bioregional Conservation Status

This vegetation type is a derived community as a result of historical clearing, pasture improvement and other anthropogenic threats. The conservation significance of the community is considered low due to the high disturbance levels.

4.2.3 Threatened Species

One taxa listed under the TSC and EPBC Acts was recorded in the Swamp Scelerophyll Forest during the present survey, this being *Asperula asthenes*, an annual herb. Counts undertaken during the study estimated the population size of the taxon to be approx. 6-10 individuals, concentrated in an area less than $10m^2$ on the eastern boundary of the site.

The population area of *Asperula asthenes* recorded on the subject site during the present study is shown in Figure 4.

4.3 FAUNA

4.3.1 Threatened Fauna

The desktop review identified that 29 Threatened fauna species listed under the *TSC Act 1995* and/or the *EPBC Act 1999* have been recorded within the locality. While not recorded within the locality, it is also considered that another five (5) Threatened fauna species may occur within the subject site given the habitats occurring within the Study area. The Threatened fauna species known or considered to potentially occur within the locality are shown in Appendix A – C.

4.3.2 Compilation of species Recorded in the Locality

A comprehensive list of fauna species recorded by previous studies undertaken within the locality is provided in Appendix B A number of these species were also detected within the Study area during the surveys undertaken for this report. Details of the fauna species detected during this study is provided in Appendix B.

4.4 FAUNA

The fauna surveys conducted within Study area and adjacent areas recorded a total of 82 vertebrate fauna species, including six species listed under the *TSC Act*. Figure 4.1 shows the location of all Threatened species and recorded signs of within the Study area and environs.

The six (6) Threatened fauna species recorded at the Study area by the field surveys were the Squirrel Glider (*Petaurus norfolcensis*), Osprey (*Pandion haliaetus*) Grey-headed flying fox. (*Pteropus policephalus*), Eastern Freetail bat (*Mormopterus norfolkensis*) and the Little and Common Bentwing bats (*Miniopterus australis and M. schriebersii*).

In addition, previous surveys Orogen detected an the Wallum Froglet (*Crinia tinnula*) however subsequent targeted surveys for the species in ideal conditions for the species breeding failed to detetctedt he species within the study area.

4.4.1 Avifauna Surveys

A total of 46 bird species were recorded within the subject site, however none of the species observed are listed as Threatened. A full species list of the birds recorded within the subject site is shown in Appendix C.

4.4.2 Small Mammal Surveys

Terrestrial Elliott Traps

A total of seven (3) fauna species were captured during the terrestrial Elliott trap surveys. Of these, two (2) species are introduced the .

The species captured by the terrestrial Elliott trap surveys were:

- Swamp Rat (*Rattus lutreolus*);
- Black Rat (*Rattus rattus*); and
- House Mouse (*Mus musculus*);.

Arboreal Elliott Traps

Only one (1) mammal species, the Squirrel Glider (*Petaurus norfolcensis)* was captured during the arboreal Elliott trapping conducted within Study area. The Squirrel Glider (*Petaurus norfolcensis*) is listed as a Threatened species under the TSC Act.

Hair trap Surveys

Only two mammal species were recorded the Black Rat (*Rattus rattus*) and a Brushtail Possum species (*Trichosururs sp*.).

4.4.3 Large Mammal Surveys

Cage Trap Surveys

A total of one mammal species, the introduced Black Rat (*Rattus rattus)* was captured during the cage trapping surveys conducted within Study area. No Threatened species were detected by the cage trapping surveys.

4.4.4 Fauna Transect Surveys

There were no signs of Threatened species activity recorded during the fauna transect surveys undertaken within the Study area.

4.4.5 Reptile and Amphibian Surveys

There were three (3) reptile and six (6) amphibian species detected during the specific reptile and amphibian surveys conducted during within the Study area. No Threatened species under the TSC Act during the Conics surveys.

Pitfall Traps

A total of two reptile species, the Robust Ctenotus (*Ctenotus robustus*) and were captured by the pitfall trapping surveys.

A total of five amphibian species were captured by the pitfall traps. These were the Common Eastern Froglet (*Crinia signifera*), Dusky Toadlet (*Uperoleia fusca*), Smooth Toadlet (*Uperoleia laevigata*), and Eastern Banjo Frog (*Limnodynastes dumerilii*). Of these, only the Wallum Froglet is listed as Threatened under the TSC Act.

4.4.6 Call Playbacks and Spotlighting Surveys

There was no response heard to the call playback surveys.

One bird species, the was observed perched in a tree during the spotlighting surveys. In addition, a total of four (4) amphibian species were identified during the call playbacks and spotlighting, including the Wallum Froglet which was heard calling occasionally during these surveys.

There were numerous Grey-headed Flying-fox (*Pteropus poliocephalus*) observed foraging amongst the trees within and adjoining the subject site during the call playback and spotlighting surveys. In particular, this species was foraging amongst the canopies of *Melaleuca quinquenervia* and *Eucalyptus robusta* which were in flower at the time of these surveys (May).

The Grey-headed Flying-fox are listed as a Threatened species under the *TSC Act*. The Grey-headed Flying-fox is also listed as Threatened under the *EPBC Act*.

4.4.7 Opportunistic Results

Opportunistic sightings within the Study area included:

- Eastern Grey Kangaroo (*Macropus giganteus*) – observed foraging in the subject site;
- Swamp Wallaby (*Wallabia bicolour*) - observed foraging in the subject site;
- Red-necked Wallaby (*Macropus rufogriseus*) – observed foraging in the subject site; and
- Dingo (*Canis lupus*) – observed in the subject site during one morning when checking traps.

4.4.8 SEPP 44 Results

Potential Koala Habitat Quadrat Results

The three (3) Koala habitat quadrats were located in woodland communities within the eastern section of the subject site. Data presented in Table 4.5 indicates that one (1) of the three (3) Koala habitat quadrats was identified to contain Potential Koala habitat pursuant to SEPP 44. The quadrat that contained potential Koala habitat is located near the western boundary of Lot 1 DP 249361. The dominant tree species in this quadrat was Swamp Mahogany (*E. robusta*) which is a listed feed tree on Schedule 2 of SEPP 44.

The dominant trees in the other two (2) quadrats were *Eucalyptus pilularis* and *Angophora costata* and these not are listed on Schedule 2 of SEPP 44. These results demonstrate that all areas within subject land contain potential Koala habitat.

Table 4-1. Results of Potential Koala Habitat Quadrats

Quadrat Number	Number of Trees in Quadrat	Tree Species	% of Trees Species in Upper Strata	% of Trees Species in Lower Strata	Potential Koala Habitat Pursuant to SEPP 44
1	*29*	*Eucalyptus robusta* ^	*7*	-	*No*
		Angophora costata	*93*	-	
2	*10*	*Eucalyptus pilularis*	*100*	-	*No*
3	*9*	*Eucalyptus robusta* ^	*78*	-	*Yes*
		Eucalyptus pilularis	*22*	-	

^ = Listed as a feed tree on Schedule 2 of SEPP 44.

Spot Assessment Technique Results

During specific Koala scat searches using the Spot Assessment Technique, three (3) surveys sites, totalling 65 trees, were searched for Koala scratches and scats. The results of the Koala Spot Assessments are provided in Table 4.6.

None of the trees searched were found with Koala scats around the base.

Table 4-2. Results of Koala Scat Searches

Spot Assessment Site Number	Tree Species	No of Trees Searched at Spot Sample Site (A)	No of Trees with Koala Scats (B)	Activity Levels (A/B)
Site 1	*Eucalyptus robusta* ^	*4*	*0*	*0%*
	Eucalyptus resinifera	7	0	0%
	Angophora costata	10	0	0%
Site 2	*Eucalyptus robusta* ^	1	0	0%
	Eucalyptus pilularis	20	0	0%
Site3	*Eucalyptus robusta* ^	20	0	0%
	Eucalyptus pilularis	3	0	0%

^ = Listed as a feed tree on Schedule 2 of SEPP 44.

4.5 Fauna Corridors and Key Habitats

The site is not mapped as containing any regional or subregional wildlife corridors or key habitats (NSW NPWS, 2008). The nearest of these corridors and key habitats occur in the forested connections to the east of the subject site within and adjoining Booti Booti National Park. Key habitats in the locality also occur within and adjoining Booti Booti National Park to the south.

The Great Lakes Conservation and Development strategy also does not identify the site as containing any local corridors.

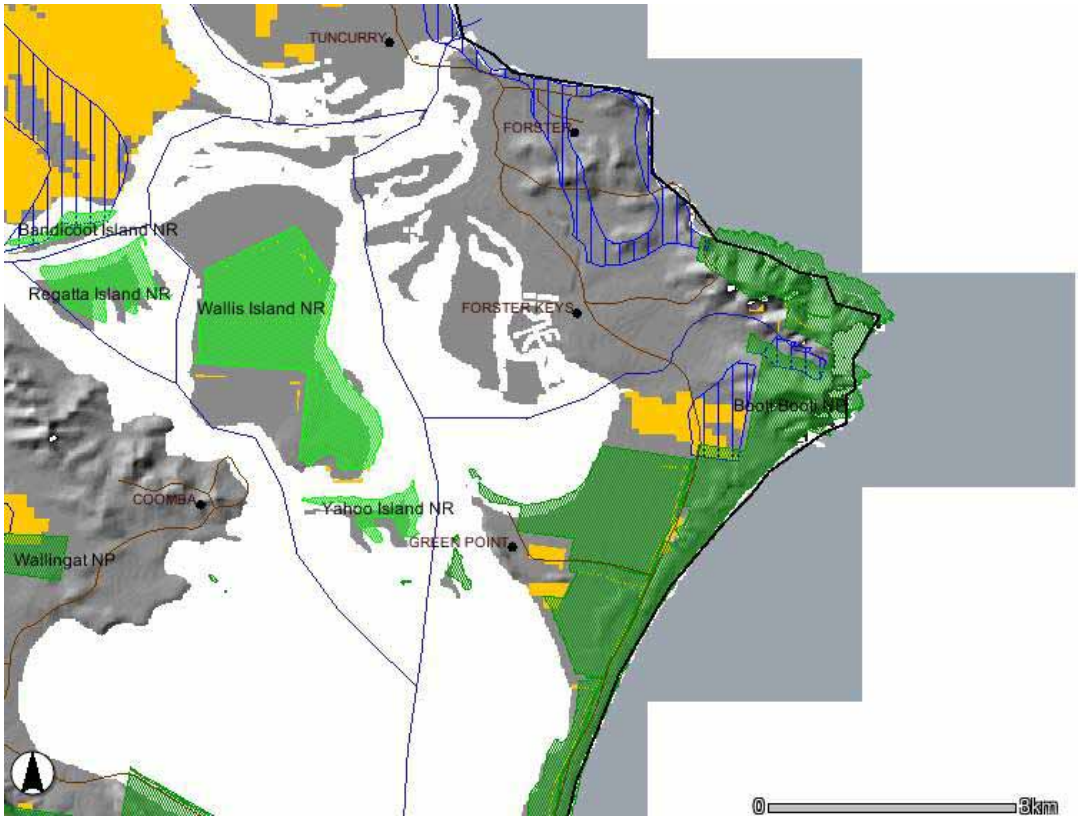

Figure 6: Key habitats and corridors (NPWS 2008)

4.6 WEATHER

The weather conditions experienced during the surveys is provided in Appendix F.

5.0 DISCUSSION OF ECOLOGICAL ATTRIBUTES OF THE SUBJECT SITE AND DEVELOPMENT PRINCIPLES

5.1 THREATENED FLORA SPECIES AND ENDANGERED ECOLOGICAL COMMUNITIES

5.1.1 Trailing Woodruff (*Asperula asthenes*)

The Endangered Herb Trailing Woodruff (*Asperula asthenes*) is the species of highest conservation significance identified within the study area, as the population identified is only known population in the locality (*M.Bell pers comm*). The population of the species recorded within the study site occurs in the eastern boundary of the subject site, which is subject to edge effects and is prone to ongoing deleterious impacts. As the population is only small (less than 10 plants), without this ongoing management, this species is likely to become extinct onsite.

As a result, any future development of the area will provide an opportunity for restoration management practices for the species which (after approval for the relevant agency) could lead to an increase in the size and extent of the population.

In order to achieve an increase in the population it is considered that a propagation and translocation trials be conducted. As the species' habitat is widespread there are opportunities associated with the development of the subject site for the revegetation of currently disturbed areas, which could include the planting of propagated stock from the existing population. The most appropriate areas would be within the foreshore reserve adjoining the property as this area is in crown ownership and offers protection from edge effects with and human intrusion able to controlled. In order for this to occur the Department of Environment, and Climate change, Council and Department of Environment Water Heritage and the Arts must be consulted and relevant approvals obtained.

5.2 THREATENED FAUNA SPECIES

5.2.1 Squirrel Gliders

The subject site was found to be utilised by a number of Squirrel Gliders, which were captured in the Swamp Sclerophyll forest s of the subject site. The radio tracking results determined that the majority of the sites habitats are utilised by the species however that the site only forms part of the home ranges of a number of the study animals. As such the study determined that habitats outside the study area are known habitat for the species and that the individuals of this species on the subject site are considered to be part of a metapopulation known to occur in the Forster area.

The majority of the sites utilization was the large Swamp Sclerophyll forest remnant in the central portion of the site and more importantly the foreshore area of Pipers Creek; however individual trees in the road reserve were also used.

The results of the radio-tracking study therefore provided important information in regards to the forsaking areas dens site locations and corridor linkages utilised within and adjoining the study area.

This information has important implications for the future development design within the subject site.

Based on the study it is clear that the majority of the central forest remnant should be retained and linked to other habitat areas to the west and south of the site. The utilization of the single trees and the recorded movements between separated scattered trees also suggests that future revegetation and landscaping for movement purposes can be limited to single trees however that important corridor and foraging areas such as in the pipers Creek foreshore should be enhanced and managed for conservation purposes.

The enhancement of such areas can also satisfy offsetting principles where degraded small patches of Swamp Sclerophyll forest currently exits. It may be possible to retain trees within lots and ensure their long term survival through the application of building envelopes and the identification of individual trees in covenants, through the retention within road reserves or through other design scenarios. Discussion on the results of Radio tracking study

The results of the radio-tracking identified the occurrence of four widely distributed den sites for the Squirrel Glider within the study area, with only one of these identified within the proposed development area. These results, which are based on only 4 nights of radio tracking of four animals, indicate that the hollow bearing trees within the proposed development represent only a small percentage of the known or potential den sites in the adjoining connected forest matrix of the locality. With consideration of the limited nature of the trapping program and radio-tracking study and, the identification of hollow bearing trees within the habitats of the other remnant forest areas in the locality, it is reasonable to extrapolate that numerous other den sites occur I the locality. Therefore the proposed development is unlikely to impose a deleterious impact on the species which would place the viability of the local population at risk of extinction.

The majority of movements recorded during the radio-tracking were considered to be small in relation to the foraging ranges of the species which is known to be up to approximately 800m – 1km from the den site as the largest movements recorded were less than 500m (REFS). The small distances moved by the individuals are likely to be due to the limited number of hours undertaken tracking each individual per night however, these results could also reflect an abundance of food resources during within close proximity of the den sites during the study period. There is no direct evidence of this abundance of food resource.

5.2.2 Wallum Froglet

Specific surveys undertaken by Conics failed to confirm the presence of the Wallum Froglet on the subject site. However, the habitat assessment determined that a portion of the site is appropriate for the species.

These habitats identified are the small areas of the sedgelands in the adjoining foreshore reserve and potentially, on occasion the constructed pond areas. It is considered that higher quality Wallum Froglet habitat is fairly continuous along the eastern zone of Wallis Lake from Green Point to South Forster, and that the Wallum Froglet on the subject site is part of a much larger regional population. In addition areas to the west of the Lakes Way within Booti Booti NP to the south-east of the subject site provide additional breeding and foraging habitat.

Given the limited extent of potential habitat of the Wallum Froglet on the subject site, it is considered possible to develop the majority of the subject site while still maintaining viable Wallum Froglet habitat areas in the foreshore area of the Pipers Creek. In addition, it is possible to create corridors in the foreshore area to enhance connectivity with Wallum Froglet habitats to the north and south of the subject site.

5.2.3 Grey-headed Flying-fox

There were numerous Grey-headed Flying-fox observed foraging amongst the trees within and adjoining the subject site during the nocturnal surveys. However the subject site is considered to only contain foraging habitat during the flowering period of the overstorey trees throughout the subject site. The vegetation within subject site is unlikely to be utilised as a communal camp site by the species.

5.2.4 Microchiropteran Bats

The site is considered to provide foraging and potential roosting habitat for the Threatened Microchiropteran bats in the locality. These habitat trees where practicable, should be incorperated within appropriate open space areas and road reserve corridors of any future development of the subject site. Where this is not practicable hollow bearing trees should be re-erected in adjoining areas such as the foreshore reserve.

5.3 DEVELOPMENT PRINCIPLES

A suite of development principles has been formulated for the future development of the subject site based on the ecological attributes of the subject site and the adjoining lands. These development principles include measures to enhance and maintain Threatened species habitats within and adjoining the subject site.

5.3.1 Provision of a Habitat Linkage

To ensure that future development of the subject site does not isolate or fragment populations of Threatened species any future development of the subject site should enhance the current habitat linkage in the foreshore area of Pipers Creek. This habitat linkage is currently used by Squirrel Gliders. This corridor should also provide habitat area for the translocation of *Asperula asthenes.* Any such corridor should however be designed and managed for assisted revegetation of Swamp Oak-Swamp Chlorophyll Forest.

5.3.2 Retention of Remnant vegetation, habitat trees and offsets.

The habitat trees in the site are considered to be important for both foraging and denning/roosting habitats for Threatened Microchiropteran bats and arboreal and scansorial mammals recorded or considered likely to occur within the subject site. A number of these trees were found to contain hollows suitable for bat roosts and a number of these trees are known to be utilised by Squirrel Gliders for denning purposes however the majority of these are within the foreshore reserve or the larger remnant areas.

As large areas of the subject site has previously been cleared of overstorey species the remaining habitat areas of significance should be incorporated in the development design. Small disturbed remnant areas of vegetation that are required to be cleared should be offset in the foreshore reserve through revegetation and to create contiguous linkages along this reserve to the habitats occurring to the south and north. .

These trees are also considered likely to provide an important corridor function for the population of the Squirrel Glider in South Forster to access to the habitats of Booti Booti NP. As a result the retention of these trees is considered important to maintain the movement patterns of the Squirrel Glider in the study area.

Any future residential development of the subject site should as a priority, be formulated to include the retention of the majority of these trees within the development layout. It is considered possible for these trees to be retained through:

- Section 88b positive covenants if trees are located in individual lots; or
- Retention of trees in large road reserves or associated with medium to high density developments.

Associated with the retention of the trees, additional landscape planting of scattered Eucalypts should be undertaken 15 -20 m apart to ensure the continuation of the Squirrel Glider traversing the subject site to the habitats to the north and south. These tree plantings could be undertaken as streetscaping, within open space areasor carparking areas or in other areas depending upon the design of the development.

5.3.3 Management of Edge Effects

In order to reduce the potential for edge effects on adjoining habitats, any future development of the subject site should be designed to avoid impacts or minimise the potential of edge effect impacts. The current edge effects are considered severe due to the disturbed nature of the subject site which allows feral animal and weed intrusion. As a result, any future development of the subject site that is appropriately designed has the potential to reduce the current impacts and avoid additional effects associated with increases in human habitation.

A number of design principles that can be implemented in future development of the subject site include:

- A subdivision design with no lots directly abutting or adjoining habitats;
- The positioning of roads and walking paths/bicycle paths at the interface of vegetated areas and development areas;
- The provision of boardwalks and fencing to minimise human intrusion into sensitive ecological areas; and
- Landscaping with mulch or regular slashing of grassed areas to create a management buffer ensuring weed control.

5.3.4 Stormwater Management

As the Endangered Ecological Communities occurring on the subject site and the Wallum Froglet are dependant upon the existing hydrological and water quality parameters, any future development of the subject site must be designed with appropriate stormwater management to avoid any significant changes to the quality, volumes or ph of the waters received in areas retained for ecological purposes.

Any such changes to hydrological regimes can lead to changes in floristic composition of the vegetation communities, increased opportunity for the establishment of introduced flora species as a result of increased nutrients, or the changes of water quality parameters which can result in the habitat becoming inappropriate for Wallum Froglet breeding.

As a result, minimal measures for stormwater management should include:

- the minimisation of water discharge through measures such as water capture in water tanks for dwelling houses;
- Grassed swales and wetland detention basins;
- maintenance of the ph between 3.5 and 5.3 except during periodic storm events;
- No net increase in water volumes which result in extended inundation of wetland habitats through implementation of measures such as infiltration cells or water harvesting in residential areas through mandatory installation of water tanks should; and
- No increase in pollutants or nutrients discharged into ecological areas.

Appropriate implementation of stormwater controls and management has been proven to be successful in residential development for the continuing occurrence of Swamp Sclerophyll Forest and wetland communities and the Wallum Froglet. As such it is proposed that the design phases of any future development involve a specialist Amphibian consultant with expertise in the design of stormwater systems and monitoring of Wallum Froglet populations in association with urban development.

5.3.5 Landscaping Principles

The landscaping of any future development on the subject site should only utilise indigenous species to provide additional habitat for nectivorous species. These species must exclude hybrids and cultivars or other non-indigenous natives that can lead to an increase in populations of large and aggressive honeyeaters.

5.4 MANAGEMENT AND MONITORING

The management and monitoring of areas retained for Threatened species and Fauna Corridors and would include but not be limited to:

- Weed monitoring and control;
- Management of Asset Protection Zones adjoining areas of regeneration; and
- Monitoring of Asperula asthenes and Wallum Froglet.

As these management programs will be required to be undertaken frequently and in perpetuity, it is unlikely that Council will accept the burden of the various management regimes. As a result it is recommended that funding and/or potentially a research scholarship be obtained by the developer/landholder.

6.0 CONCLUSION

The Terrestrial Flora and Fauna Study identified the occurrence of three Threatened Fauna Species, one Threatened flora species and the occurrence of one vegetation community analogous with two Endangered Ecological Communities listed under the Threatened Species Conservation Act 1995.

As a result, some high conservation areas of the site have been identified for retention and a suite of development principles for any future development on the subject site were developed to avoid, minimise or in some cases improve the existing habitats for Threatened species. The principles include:

- Provision of a Habitat linkage;
- Retention of Habitat trees;
- Management of Edge effects;
- Stormwater Management;
- Propagation and translocation of *Asperula asthenes*
- Landscaping principles and revegetation of areas as offsets; and
- Management and Monitoring.

With the development principles proposed, the future development of the subject site is considered to in accordance with Ecologically Sustainable Development principles and will not have the potential to significantly impact any Threatened species occurring on the site. Further it is considered that future development of the site if appropriately designed can result in the enhancement and improved management of ecologically important habitats adjoining the site through the creation of linkages in the foreshore corridor providing additional habitat for Threatened species.

The proposed Woolworths site is relatively unconstrained as, this portion of the site is largely cleared and devoid of significant vegetation. The progression of the development of this commercial site must however be undertaken in accordence with the relevant development principles as detailed in this report. Specifically, the management of the Trailing Woodruff must be considered in the development layout. Should the development encroach on this species' habitat, the measures detailed must be implemented prioir to the construction of the development. Issue of connectivity can also be addressed during the detailed design of the proposed development allowing the movement of signicant fauna around the site with additional movement opportunites to be provided in landscaping where practicable.

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Appendix A.

Flora Species List

CLASS/FAMILY	SCIENTIFIC NAME	COMMON NAME	PRELIMINARY SURVEY	Q1	Q2	Q3	Q4	Q5	Q6	RANDOM MEANDER
LYCOPSIDA										
SELAGINELLACEAE	*Selaginalla uliginosa*		x	4						x
FILICOPSIDA										
BLECHNACEAE	*Blechnum indicum*	Swamp water fern	x	2	2					x
DENNSTAEDTIACEAE	*Pteridium esculentum*	Bracken	x	1			2			x
DICKSONIACEAE	*Calochlaena dubia*	Common ground fern								x
MAGNOLIOSIDA *MAGNOLIIDAE*										
ALLIACEAE	*Agapanthus praecox**	Lily of the Nile	x							
AMARYLLIDACEAE	*Crinum pedunculatum*	Swamp lily		2						
ARACACEAE	*Livistona australis*	Cabbage palm	x		5			3	4	x
COMMELINACEAE	*Commelina cyanea*	Native wandering jew								x
	*Tradescantia fluminensis**	Wandering jew							2	
CYPERACEAE	*Baumea articulata*	Jointed twig rush		2						
	Baumea juncea	Bare twig rush	x	6				2	5	x
	Carex appressa	Tall sedge							2	x
	Chorizandra cymbaria									x
	Cyperus difformis	Rice sedge								x

CLASS/FAMILY	SCIENTIFIC NAME	COMMON NAME	PRELIMINARY SURVEY	Q1	Q2	Q3	Q4	Q5	Q6	RANDOM MEANDER
	Ficinia nodosa	Knobby club rush								x
	Gahnia clarkei	Tall saw-sedge	x	2					2	x
IRIDACEAE	*Gladiolus undulatus**	Wild gladiolus								x
JUNCACEAE	*Juncus articulatus**	Jointed rush				3				x
	Juncus continuus			3					3	x
	Juncus kraussii	Sea rush	x							
	Juncus usituatus	Common rush								x
LOMANDRACEAE	*Lomandra longifolia*	Spiny-headed mat rush	x	2					2	x
LUZURIAGACEAE	*Geitonoplesium cymosum*	Scrambling lily								x
MUSACEAE	*Strelitzia nicolai**	Giant Strelitzia								x
ORCHIDACEAE	*Cymbidium sp.*	Epiphytic orchid								x
	Pterostylis baptistii	King Greenhood	x							
PHILYDRACEAE	*Philydrium anuginosum*	Frogmouth	x							x
PHORMIACEAE	*Dianella caerulea*	Blue flax lily	x	1				1		x
POACEAE	*Aira cupaniana**	Silvery hairgrass								x
	*Andropogon virginicus**	Whisky grass	x		2		5			x
	*Avena fatua**	Wild oats	x					1		x

CLASS/FAMILY	SCIENTIFIC NAME	COMMON NAME	PRELIMINARY SURVEY	Q1	Q2	Q3	Q4	Q5	Q6	RANDOM MEANDER
	*Axonopus fissifolius**	Narrow-leaved carpet grass								x
	*Briza minor**	Shivery grass	x			2				x
	*Briza maxima**	Quaking grass				2		2		x
	*Chloris gayana**	Rhodes grass	x			3				
	*Cortaderia selloana**	Pampas grass	x				1			x
	Cynodon dactylon	Common couch	x			3				x
	Deyeuxia quadriseta									x
	Dichelachne crinita	Longhair plume grass								x
	*Echinochloa crus-galli**	Barnyard grass						1		x
	Entolasia marginata	Bordered panic		x						x
	Eragrostis brownii	Browns lovegrass		x			1	1		x
	Eragrostis leptostachya	Paddock lovegrass								x
	Hemarthria uncinate	Matgrass							2	x
	Imperata cylindrica var. *major*	Blady grass	x	1			3			x
	Lachnagrostis filiformis	Blowngrass								x
	Panicum simile	Two-colour panic	x	3						
	*Paspalum dilatatum**	Paspalum	x			2	2			x

CLASS/FAMILY	SCIENTIFIC NAME	COMMON NAME	PRELIMINARY SURVEY	Q1	Q2	Q3	Q4	Q5	Q6	RANDOM MEANDER
	*Paspalum wettsteinii**	Broad-leaved paspalum						1		x
	*Pennisetum clandestinum**	Kikuyu	x					2		
	Phragmites australis	Common reed	x				3			x
	*Poa annua**	Winter grass	x					1		
	*Setaria gracilis**	Slender pigeon grass	x			5				x
	*Sporobolus africanus**	Parramatta grass	x			1				
RESTIONACEAE	*Baloskion tetraphyllum* subsp. *melostachyum*	Plume rush	x	3						x
	Empodisma minus									x
	Leptocarpus tenax			3						
UVULARIACEAE	*Tripladenia cunninghamii*		x							x
MAGNOLIOPSIDA - LILIIDAE										
ACANTHACEAE	*Thunbergia alata*	Black-eyed Susan	x							x
APIACEAE	*Actinotus helianthi*	Flannel flower	x							
	Centella asiatica	Pennywort	x	1					2	x
	Hydrocotyle bonariensis		x			2	2			
APOCYNACEAE	*Parsonsia straminea*	Common silkpod								x
ARALIACEAE	*Polyscias sambucifolia*	Elderberry panax								x

CLASS/FAMILY	SCIENTIFIC NAME	COMMON NAME	PRELIMINARY SURVEY	Q1	Q2	Q3	Q4	Q5	Q6	RANDOM MEANDER
	Schefflera actinophylla	Umbrella tree								x
ASPARAGACEAE	*Asparagus aethiopicus**	Asparagus fern						1		
	*Asparagus asparagoides**	Bridal creeper						1		
ASTERACEAE	*Ageratina adenophora**	Crofton weed	x							x
	*Bidens pilosa**	Cobblers pegs	x			2		2		
	*Brachyscome decipiens**	Field daisy	x				1			
	Brachyscome sp.									x
	Chrysanthemoides monilifera subsp. *Rotunda**	Bitou bush								x
	Circium vulgare	Spear thistle								x
	*Conyza bonariensis**	Flaxleaf fleabane	x			2	2			x
	*Eclipta platyglossa**							1		
	Hypochaeris radicata	Catsear						1		
	Senecio madagascariensis	Fireweed	x			2				x
	*Soliva sessilis**	Bindyi						2		
	Taraxacum officinale	Dandelion					1			
CASUARINACEAE	*Casuarina glauca*	Swamp oak	x					5		x
CHENOPODIACEAE	*Suaeda australis*									x

CLASS/FAMILY	SCIENTIFIC NAME	COMMON NAME	PRELIMINARY SURVEY	Q1	Q2	Q3	Q4	Q5	Q6	RANDOM MEANDER
CLUSIACEAE	*Hypericum gramineum**	Small St Johns wort								x
CONVOLVULACEAE	*Dichondra repens*	Kidney weed	x							x
	*Ipomoea cairca**	Coastal morning glory	x							x
	*Ipomoea indica**	Morning glory	x					2		x
	Polymeria calycina	Swamp bindweed	x						2	x
CUNONIACEAE	*Schizomeria ovata*	Crabapple							1	
DILLENIACEAE	*Hibbertia aspera*	Rough guinea flower								x
	Hibbertia dentata	Trailing guinea flower								x
	Hibbertia obtusifolia	Hoary guinea flower								x
	Hibbertia scandens	Golden guinea flower	x							x
DIOSCOREACEAE	*Dioscorea transversa*	Native yam								x
ERICACEAE–STYHELIOIDEAE	*Leucopogon ericoides*	Pink beard-heath	x							
EUPHORBIACEAE	*Drypetes deplanchei*	Yellow tulip	x							
	Glochidion ferdinandi	Cheese tree	x						1	
	Homalanthus populifolius	Bleeding heart	x					1	3	
	*Ricinus communis**	Caster oil plant								x
EUPOMATIACEAE	*Eupomatia laurina*	Bolwarra								x

CLASS/FAMILY	SCIENTIFIC NAME	COMMON NAME	PRELIMINARY SURVEY	Q1	Q2	Q3	Q4	Q5	Q6	RANDOM MEANDER
FABACEAE-CAESALPINIOIDEAE	*Senna pendula* var. *glabrata**	Winter senna	x					3		x
	*Senna septemtrionalis**	Smooth cassia	x					3		x
FABACEAE – FABOIDEAE	*Daviesia ulicifolia* subsp. *Stenophylla*	Gorse bitter pea	x							x
	*Erythrina sykesii**	Coral tree	x							
	Glysine clandestina					1				
	Gompholobium virgatum var. *virgatum*	Leafy wedge pea				1				
	Hardenbergia violaceae	Purple coral pea	x							x
	Kennedia rubicunda	Dusky coral pea				1				x
	Pultenaea blakelyi									x
	Pultenaea villosa	Hairy bush pea	x	1						x
	Swainsona galegifolia	Smooth Darling pea	x			2				x
	*Trifolium repens**	White clover	x					2		x
FABACEAE – MIMOSOIDEAE	*Acacia elongata*	Swamp wattle	x	2						x
	Acacia floribunda	White Sally	x							x
	Acacia irrorata	Green wattle	x							x
	Acacia longifolia subsp. *longifolia**	Sydney golden wattle					1			x
	*Acacia podalyriifolia**	Queensland silver wattle								x

CLASS/FAMILY	SCIENTIFIC NAME	COMMON NAME	PRELIMINARY SURVEY	Q1	Q2	Q3	Q4	Q5	Q6	RANDOM MEANDER
	Acacia suaveolens	Sweet wattle					1			x
	Acacia ulicifolia	Prickly Moses	x							x
GENTIANACEAE	*Centaurium tneuiflorum**									x
	Schenkia tenuiflorum	Spike Centaury								x
LAURACEAE	*Endriandra sieberi*	Hard corkwood	x		1					
	*Cinnamomum camphora**	Camphor laurel	x							
LOBELIACEAE	*Pratia purpurascens*	White root	x							x
MALVEACEAE	*Sida rhombifolia**	Paddy's lucerne	x							
MENISPERMACEAE	*Stephania japonica*	Snake vine								x
MENYANTHACEAE	*Villarsia exaltata*	Yellow marsh flower		2						
MORACEAE	*Maclura cochinchinensis*	Cockspur thorn	x		1				1	x
MYRTACEAE	*Angophora costata*	Smooth-barked apple	x							x
	Baeckea imbricata									x
	Callistemon citrinus	Crimson bottle brush	x							
	Eucalyptus pilularis	Coastal blackbutt	x							x
	Eucalyptus robusta	Swamp mahogany	x	2						x
	Eucalyptus saligna	Sydney blue gum								x

CLASS/FAMILY	SCIENTIFIC NAME	COMMON NAME	PRELIMINARY SURVEY	Q1	Q2	Q3	Q4	Q5	Q6	RANDOM MEANDER
	Gossia bidwillii	Python tree	x	2						
	Leptospermum juniperinum	Prickly tea-tree		x					1	x
	Melaleuca linariifolia	Flax-leaved paperbark							1	x
	Melaleuca quinquenervia	Broad-leaved paperbark	x	2	3			3	5	x
OCHNACEAE	*Ochna serrulata**	Micky mouse plant	x						1	
OLEACEAE	*Notelaea venosa* var. *venosa*	Smooth mock olive								x
PHYLLANTHACEAE	*Breynia oblongifolia*	Coffee bush	x							x
PHYTOLACCACEAE	*Phytolacca octandra**	Inkweed						1		x
PITTOSPORACEAE	*Pittosporum revolutum*	Rough-fruited Pittosporum								x
	Pittosporum undulatum	Sweet pittosporum	x						2	
PLANTAGINACEAE	*Plantago lanceolata*	Lambs tongue	x					2		x
POLYGONACEAE	*Rumex crispus**	Curled dock						1		
ROSACEAE	*Rubus moluccanus*	Molucca bramble	x		1					
	Rubus parvifolius	Native raspberry								x
	*Rubus discolor**	Blackberry	x			2				x
RUBIACEAE	*Asperula asthenes*		x							
RUTACEAE	*Acronychia oblongifolia*	Common Acronychia								x

CLASS/FAMILY	SCIENTIFIC NAME	COMMON NAME	PRELIMINARY SURVEY	Q1	Q2	Q3	Q4	Q5	Q6	RANDOM MEANDER
	Sarcomelicope simplicifolia								1	
SAPINDACEAE	*Dodonaea triquetra*	Large-leaf hop-bush	x							x
	Cupaniopsis anacardioides	Tuckeroo	x						1	x
SCROPHULARIACEAE	*Lindernia procumbens**	Chickweed	x					2		x
SMILACACEAE	*Smilax glyciphylla*	Sweet sarsparilla								x
SOLANACEAE	*Solanum maurtianum**	Wild tobacco tree								x
	*Solanum nigrum**	Black-berry nightshade								x
TROPAEOLACEAE	*Tropaeolum majus**	Nasturtium	x							
VERBENACEAE	*Lantana comara**	Lantana	x	2			2	2	3	x
	*Verbena bonariensis**	Purpletop	x		2	2				x
VIOLACEAE	*Viola betonicifolia*	Native violet	x					3		

* asterisk indicates exotic species; **Bold text** indicates Threatened species;

Appendix B.

Fauna species Detected During the Surveys

Mammal Species Recorded Within the Study Area During the Surveys			
COMMON NAME	SCIENTIFIC NAME	TYPE OF RECORD	COMMENTS
Squirrel Glider *	*Petaurus norfolcensis*	*E*	Numerous captures each day in arboreal Elliott traps.
Swamp Rat	*Rattus lutreolus*	*E*	Common capture in ground Elliott traps throughout subject site except trap line B.
Black Rat	*Rattus rattus*	*E*	Abundant on site
House Mouse	*Mus musculus*	*E*	Limited captures in western section of subject site (trap line C only).
Fox	*Vulpes vulpes*	*Obs*	Observed within south east corner of the subject site during one morning while checking Elliott traps.
Grey-headed Flying-fox	*Pteropus poliocephalus*	*Obs*	Numerous observations of foraging on trees within subject site during call playback surveys and associated spotlighting. Also numerous observations flying overhead.

Key :
E - Elliott Trap Capture
Obs – Observation
Sc – Scat Identification
Ht – Hair Trap Analysis
T – Tracks observed
*- Vulnerable Species, Schedule 2, TSC Act (1995)
^ - Introduced Species

Bird Species Recorded Within the Study Area			
COMMON NAME	SCIENTIFIC NAME	TYPE OF RECORD	COMMENTS
Yellow Thornbill	*Acanthiza nana*		
Brown Thornbill	*Acanthiza pusilla*		
Osprey	*Pandion haliaetus*		
White-bellied Sea-Eagle	*Haliaeetus leucogaster*		
Grey Goshawk	*Accipiter novaehollandiae*	Obs	Foraging in Swamp Sclerophyll Forest
Peregrine Falcon	*Falco peregrinus*		
Laughing Kookaburra	*Dacelo novaeguineae*	Obs	Regularly heard and observed
Sacred Kingfisher	*Todiramphus sanctus*	Obs	Observed in Blackbutt Woodland
Australian Wood Duck	*Chenonetta jubata*		
Pacific Black Duck	*Anas superciliosa*		
Great Egret	*Ardea alba*		
Little Egret	*Egretta garzetta*		
White-faced Heron	*Egretta novaehollandiae*		
Pied Butcherbird	*Cracticus nigrogularis*	Obs	Regularly observed

Bird Species Recorded Within the Study Area			
COMMON NAME	SCIENTIFIC NAME	TYPE OF RECORD	COMMENTS
Australian Magpie	*Gymnorhina tibicen*	Obs	Observed in cleared areas of the subject site
Pied Currawong	*Strepera graculina*	Obs	Observed in cleared areas of the subject site
Sulphur-crested Cockatoo	*Cacatua galerita*	Obs	Observed in cleared areas of the subject site
Galah	*Cacatua roseicapilla*	Obs	Observed in cleared areas of the subject site
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	Obs	Observed in cleared areas of the subject site
Masked Lapwing	*Vanellus miles*	Obs	Observed in cleared areas of the subject site
Rock Dove *	*Columba livia*	Obs	Observed in cleared areas of the subject site
Bar-shouldered Dove	*Geopelia humeralis*	Ch/Obs	Call frequently heard
Peaceful Dove	*Geopelia placida*	Obs	Observed in open grassed areas
Crested Pigeon	*Ocyphaps lophotes*	Obs	Observed in open grassed areas
Spotted Turtle-Dove *	*Streptopelia chinensis*	Obs	Observed in open grassed areas
Australian Raven	*Corvus coronoides*	CH	Call heard form neighbouring lands to the east
Torresian Crow	*Corvus orru*	Obs	Throughout the subject site
Magpie-Lark	*Grallina cyanoleuca*	Obs	Common throughout the subject site

Bird Species Recorded Within the Study Area			
COMMON NAME	SCIENTIFIC NAME	TYPE OF RECORD	COMMENTS
Leaden Flycatcher	*Myiagra rubecula*	Obs	
Grey Fantail	*Rhipidura fuliginosa*	Obs	Common
Willie Wagtail	*Rhipidura leucophrys*	Obs	Common in cleared areas
Red-browed Finch	*Neochmia temporalis*	Obs	Observed in introduced grassland/sedgeland
Eastern Whipbird	*Psophodes olivaceus*	CH	Call heard during Avifauna surveys
Welcome Swallow	*Hirundo neoxena*	Obs	Observed in central area of the subject site
Silver Gull	*Larus novaehollandiae*	Obs	
Superb Fairy-wren	*Malurus cyaneus*	Obs	Observed in introduced grassland/sedgeland
Variegated Fairy-wren	*Malurus lamberti*	Obs	
Eastern Spinebill	*Acanthorhynchus tenuirostris*	Obs	Observed on the edge of the subject site.
Little Wattlebird	*Anthochaera chrysoptera*	Obs	Abundant throughout the subject site.
Yellow-faced Honeyeater	*Lichenostomus chrysops*	Obs	
Noisy Miner	*Manorina melanocephala*	Obs	Abundant throughout the subject site.
Lewin's Honeyeater	*Meliphaga lewinii*	Obs	

Bird Species Recorded Within the Study Area			
COMMON NAME	SCIENTIFIC NAME	TYPE OF RECORD	COMMENTS
Olive-backed Oriole	*Oriolus sagittatus*	Obs	
Figbird	*Sphecotheres viridis*	Obs	Observed in the eastern portion of the subject site
Striated Pardalote	*Pardalotus striatus*	CH	Call heard from
Spotted Pardalote	*Pardalotus punctatus*	Obs	
Australian Pelican	*Pelecanus conspicillatus*	Obs	
Eastern Yellow Robin	*Eopsaltria australis*	Obs	
Little Pied Cormorant	*Phalacrocorax melanoleucos*	Obs	
Tawny Frogmouth	*Podargus strigoides*	Obs	
Eastern Rosella	*Platycerus eximius*	Obs	Observed in
Rainbow Lorikeet	*Trichoglossus haematodus*	Obs	Observed flying overhead
Scaly-breasted Lorikeet	*Trichoglossus chlorolepidotus*	Obs	Common throughout the subject site
Southern Boobook	*Ninox novaeseelandiae*	Obs	
Tawny Grassbird	*Megalurus timoriensis*	Obs	
Australian White Ibis	*Threskiornis molucca*	Obs	Obs within the subject site

Bird Species Recorded Within the Study Area			
COMMON NAME	SCIENTIFIC NAME	TYPE OF RECORD	COMMENTS
Black Swan	*Cygnus atratus*	Obs	
Dollarbird	*Eurystomus orientalis*	Obs	Observed in road reserve
Brown Gerygone	*Gerygone mouki*	Obs	
Rufous Fantail	*Rhipidura rufifrons*	Obs	
Silvereye	*Zosterops lateralis*	Obs	
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	CH	Call heard during Avifauna surveys
Golden Whistler	*Pachycephala pectoralis*	Obs	Observed in road reserve
Grey Shrike-Thrush	*Colluricincla harmonica*	Obs	Common throughout the Study area
Dusky Woodswallow	*Artamus cyanopterus*	Obs	
Grey Butcherbird	*Cracticus torquatus*	Obs	Observed in road reserve
New Holland Honeyeater	*Phylidonyris novaehollandiae*	Obs	Abundant in the habitats of the road reserve and adjoining the southern boundary site
White-cheeked Honeyeater	*Phylidonyris nigra*	Obs	Common throughout the study area.
Noisy Friarbird	*Philemon corniculalatus*	CH	Common throughout the study area.
Mistletoebird	*Dicaeum hirundinaceum*	Obs	Common throughout the study area.

Bird Species Recorded Within the Study Area			
COMMON NAME	SCIENTIFIC NAME	TYPE OF RECORD	COMMENTS
White-throated Treecreeper	*Cormobates leucophaeus*	Obs	
Yellow-tailed Black Cockatoo	*Calyptorhynchus funereus*	CH	Call heard from neighbouring properties

Key:
- Vulnerable Species, Schedule 2, TSC Act (1995)
Obs – Observation
CH – Call heard
All nomenclature according to CSIRO

Reptile and Amphibian Species Recorded Within the Study Area During the Surveys (2005/2006)			
COMMON NAME	SCIENTIFIC NAME	TYPE OF RECORD	COMMENTS
Common Eastern Froglet	*Crinia signifera*	Pit, CH	Abundant throughout the Study area. Captured in each pitfall line.
Wallum Froglet *	*Crinia tinnula*	Orogen	Recorded by an Orogen ecologist however not confirmed to occur on the site
Eastern Dwarf Tree Frog	*Litoria fallax*	CH	Heard calling from various locations within and adjoining the subject site.
Brown-striped Frog	*Limnodynastes peronii*	Obs, Captured	Abundant in each pitfall line.
Green Tree Frog	*Litoria caerulea*	CH	
Bleating tree Frog	*Litoria dentata*	CH, Captured	
Eastern Dwarf Tree Frog	*Litoria fallax*	CH	Abundant throughout the Study area.
Dainty Green Tree Frog	*Litoria gracilenta*	CH	
Broad palmed Rocket Frog	*Litoria latopalmata*	CH	
Rocket Frog	*Litoria nasuta*	CH	
Peron's Tree Frog	*Litoria peronii*	CH	
Laughing Tree Frog	*Litoria tyleri*		
Bibrons Toadlet	*Pseudophyrne bibroni*	CH	

Reptile and Amphibian Species Recorded Within the Study Area During the Surveys (2005/2006)			
COMMON NAME	SCIENTIFIC NAME	TYPE OF RECORD	COMMENTS
Dark-flecked Garden Sunskink	Lampropholis sp	Obs	Common observation within eastern section

Key:
Obs - Observations
CH – Call heard
Pit – Pitfall capture
E = Elliott trap capture
* - Vulnerable Species, Schedule 2, TSC Act (1995)
All nomenclature according to CSIRO

Appendix C

Results of Anabat Analysis

Table C1 Results of Anabat Analysis

COMMON NAME	SPECIES	SITE A	SITE A	SITE B	SITE B	SITE C	SITE C	SITE D
Eastern Freetail Bat	*Mormopterus norfolkensis #*		*A*	*A*				
Unnamed Freetail Bat	*Mormopterus species 2*	*C*	*C*	*C*				
Gould's Wattled Bat	*Chalinolobus gouldii*	*A*	*A*	*A*	*A*	*A*	*A*	*A*
Chocolate Wattled Bat	*Chalinolobus morio*	*C*	*C*	*A*	*A*		*B*	
Little Bentwing-bat	*Miniopterus australis #*	*B*		*A*	*B*		*B*	*C*
Common Bentwing-bat	*Miniopterus schreibersii #*	*C*	*A*	*C*				
Long-eared Bat	*Nyctophilus sp.*	*A*	*A*	*A*	*A*		*A*	*A*
Eastern Broad-nosed Bat	*Scotorepens orion*	*B*			*B*		*B*	*B*
Little Forest Bat	*Vespadelus pumilus*	*A*	*A*	*B*	*A*		*B*	*A*
Eastern Forest Bat	*Vespadelus vulturnus*	*C*	*C*	*C*	*C*		*C*	*C*

Key: # -Threatened Species

ID reliability ratings

A, Definite, absolutely no doubt about identification of bat making call,

B, Probable, most likely the species named but low probability of confusion with species with similar calls

C, Possible, call is comparable with the listed species, but moderate to high probability of confusion with species with similar calls

Notes:on identification;

Chalinolbus morio, Vespadelus spp. and *Miniopterus australis,* significant frerquency overlap, *Vespadelus* distinct from others on pulse shape but not distinguishable from each other at <53kHz plenty of calls >53 definite pumilus but lots <53 could have been either, *C. morio* diff from *Vesp.* by down-turned tail, a few good calls at 2 locations obviously morio; others of poor quality indistinguishable from Vespadelus. *M. australis* overlaps with *V. pumilus* but pulse shape usually different, a few good calls of australis but many calls in overlap zone not distinguishable;

S. orion, very few calls attributable; *S. rueppellii* is similar but the few calls seen were more like orion;

M. norfolkensis, calls are similar to *M.* sp2 but *norfolkensis* usually has alternating pulse frequency, at least a few good calls of norfolkensis at sites A & B - distinctive pulse pattern, a number of calls that were obviously *Mormopterus* but not clear whether norfolkensis or sp2.

Appendix D

Hair Trap Analysis

HAIR ANALYSIS

AREA: Forster
DATE: March 2009

No.	LOCATION	MAMMAL SPECIES IDENTIFIED DEFINITE	PROBABLE
1	Trapline A	Rattus rattus	
2	Trapline A	R. rattus	
3	Trapline B	R. rattus	
4	Trapline B	R. rattus	
5	Trapline B	R. rattus	
6	Trapline B	one rodent hair	Rattus sp.
7	Trapline B	one fine hair	Trichosurus sp.
8	Trapline B	R. rattus	
9	Trapline B	R. rattus	
10	Trapline B	R. rattus	
11	Trapline B	R. rattus	
12	Trapline B	few rodent hairs	Rattus sp.
13	Trapline B	few rodent hairs	Rattus sp.
14	Trapline C	R. rattus	
15	Trapline C	few rodent hairs	Rattus sp.
16	Trapline C	no hairs – plant fibres	
17	Trapline C	R. rattus	
18	Trapline C	R. rattus	
19	Trapline C	R. rattus	
20	Trapline D	one fine hair	rodent
21	Trapline D	no hairs – plant fibres	
22	Trapline D	no hairs – plant fibres	
23	Trapline D	few fine hairs	rodent
24	Trapline D	few fine hairs	rodent
25	Trapline D	one rodent hair	Rattus sp.
26	Trapline D	Rattus sp.	R. rattus
27	Trapline D	Rattus sp.	R. rattus

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Appendix E

Threatened Species & EEC's Recorded in the Locality

Threatened Flora Species & Endangered Ecological Communities Recorded or Predicted to Occur on or Within the Locality of the Subject Site and Assessment of their Likelihood of Occurrence on the Subject Site

Species & ROTAP Status	TSC Act Status	EPBC Act Status	General Description, Habitat Requirements & Ecology	Recorded Distribution, Likelihood of Occurrence on the Subject Site & Adjoining Habitats
APOCYNACEAE Cynanchum elegans White-flowered Wax Plant ROTAP: 3ECi	Endangered	Endangered	A variable climber with underground suckering stems. Found on the edge of dry rainforest vegetation, and also associated with littoral rainforest, Coastal Tea Tree – Coastal Banksia (Leptospermum laevigatum – Banksia integrefolia subsp. Integrefolia) coastal scrub; Forest Red Gum Eucalyptus tereticornis open forest and woodland, Spotted Gum Corymbia maculata open forest and woodland, and Bracelet Honeymyrtle (Melaleuca armillary) scrub to open scrub. The species flowers between August and May (Plantnet, 2005).	The known distribution extends from Yabbra State Forest in the north to Gerroa in the south and west to Merriwa in the Upper Hunter (DEC, 2005). There are two records of the species within Booti Booti National Park (Cape Hawke) approximately 4 km to the northeast of the study area (Bionet, 2005; Griffith et al 2000). Unlikely to occur given the absence of habitat on site.
CASUARINACEAE Allocasuarina defungens Dwarf Heath Casuarina ROTAP: 2E	Endangered	Endangered	A straggly shrub to 2 m high. Found mainly in tall heath on sand, also found to occur on clay soils and sandstone. Extends on to hills nearby the coast and on headlands adjacent sandplains (DEC, 2005, Plantnet).	The species has been recorded in the vicinity of Nabiac NW of Forster to Byron Bay. Recorded within 12 km of the study area to the near Minimbah. There is potential for the species to occur within the wet heathland on site, although it was not recorded on the site during present study.
CASUARINACEAE Allocasuarina simulans Nabiac Casuarina ROTAP: 2VCa	Vulnerable	Vulnerable	A straggly shrub 1-3 m high. Recorded from heathland on coastal sands.	The species has a very limited distribution between Nabiac and Forster. It has been recorded within Booti Booti National Park approximately 3 km south of the study area in dry heathland. Other records of the species are from the northwest over Wallis Lake. Unlikely to occur given absence of dry heath on site.
EUPHORBIACEAE Chamaesyce psammogeton Sand Spurge	Endangered	Not Listed	A mat-forming herb that flowers in summer, with plant growth mainly occurring in spring and summer. It grows on exposed headlands and foredunes and has been recorded with Spinifex.	Recorded north From Jervis Bay area (Currarong, Culburra and Seven Mile Beach National Park) to Queensland. Also on Lord Howe Island. Populations within Wamberal Lagoon NR, Myall Lakes NP, Bundjalung NP.

Threatened Flora Species & Endangered Ecological Communities Recorded or Predicted to Occur on or Within the Locality of the Subject Site and Assessment of their Likelihood of Occurrence on the Subject Site				
SPECIES & ROTAP STATUS	TSC ACT STATUS	EPBC ACT STATUS	GENERAL DESCRIPTION, HABITAT REQUIREMENTS & ECOLOGY	RECORDED DISTRIBUTION, LIKELIHOOD OF OCCURRENCE ON THE SUBJECT SITE & ADJOINING HABITATS
ROTAP: -				Unlikely to occur as this species has been recorded in dune heath in Booti Booti National Park along The Lakes Way. Potential habitat for the species was not recorded on site during surveys.
FABACEAE – CASALPINIOIDEAE Senna acclinis Rainforest Cassia ROTAP: 3RC-	Endangered	Not Listed	A shrub to 3 m tall. Grows in or on the edges of subtropical and dry rainforest	The species has been recorded from coastal districts and tablelands from Illawarra to Queensland. There are two records of the species from Cape Hawke in Booti Booti NP, approximately 4 km northeast of the study area. Unlikely to occur. No appropriate habitat occurs on the subject site and the species was not identified during surveys.
HALORAGACEAE Gonocarpus salsoloides ROTAP: 3RCa	Not Listed	Not Listed	A perennial herb to 40 cm high. Found in swampy areas on sand.	Known in coastal districts from Port Macquarie south to Royal National Park. Species was recorded on the Lower North Coast in the Cattai Wetlands (author's pers obs.). Wet heathland on site is considered to be potential habitat for the species. This species was not recorded during present study.
MYRTACEAE Syzygium paniculatum Magenta Lillypilly ROTAP: 3VCi	Vulnerable	Vulnerable	The Magenta Lillypilly is found along the narrow coastal strip and grows in subtropical and littoral rainforests on sandy soils or stabilised dunes. In the central coast area the species is recorded from gravels, sands, silts and clays.	The species is distributed from Conjola National Park near Jervis Bay to Bulahdelah, with the northern limit being within Booti Booti National Park. Recorded within 6 km to the south of the study area in littoral rainforest within Booti Booti National Park (Cape Hawke). No appropriate habitat occurs on the subject site and the species was not identified during surveys.

Threatened Flora Species & Endangered Ecological Communities Recorded or Predicted to Occur on or Within the Locality of the Subject Site and Assessment of their Likelihood of Occurrence on the Subject Site

Species & ROTAP Status	TSC Act Status	EPBC Act Status	General Description, Habitat Requirements & Ecology	Recorded Distribution, Likelihood of Occurrence on the Subject Site & Adjoining Habitats
MYRTACEAE Eucalyptus fergusonii subsp. fergusonii ROTAP: 3KC-	Not Listed	Not Listed	A tree to 25 m with persistent dark grey ironbark. Recorded in wet sclerophyll forest or woodland on sandy soils.	Distributed from Bulahdelah to Morisset. Recorded in Booti Booti NP on bedrock. Appropriate habitat is not present on site and the species was not detected during present study.
RUBIACEAE Asperula asthenes Trailing Woodruff ROTAP: 3VC-	Vulnerable	Vulnerable	A low, trailing, perennial herb. Found in damp sites, often along riverbanks.	Species is recorded from Bulahdelah to near Kempsey. A number of scattered records are located within the Forster -Tuncurry area in swamp forest habitats in riparian zones generally situated over the western side of Wallis Lake (I. Mamott pers. obs.). High likelihood of occurrence. Foreshore swamp forest is considered to be potential habitat for the species, however this species was not detected during the target surveys.
SCROPHULARIACEAE Lindernia alsinoides Noah's False Chickweed ROTAP: -	Endangered	Not Listed	A herb to 15 cm high found in swampy sites in sclerophyll forest and wetland fringe areas. Has been found in damp paperbark swamp with Melaleuca alternifolia and M. quinquenervia.	Distributed north from Bulahdelah to Qld. Two records from the Forster – Tuncurry area within 5 km north of the study area. Known population at Bowens Quarry and recorded population in Baumea juncea – Melaleuca quinquenervia sedgeland/shrubland on subject site.

Threatened Flora Species & Endangered Ecological Communities Recorded or Predicted to Occur on or Within the Locality of the Subject Site and Assessment of their Likelihood of Occurrence on the Subject Site

Species & ROTAP Status	TSC Act Status	EPBC Act Status	General Description, Habitat Requirements & Ecology	Recorded Distribution, Likelihood of Occurrence on the Subject Site & Adjoining Habitats
ENDANGERED ECOLOGICAL COMMUNITIES				
Swamp Sclerophyll Forest on Coastal Floodplain	Endangered Ecological Community	Not Listed	This community has an open to dense layer of eucalypts and paperbarks, with Eucalyptus robusta in association with Melaleuca quinquenervia being the most widespread and abundant trees north of Sydney. The structure of this community is typically open forest, although partial clearing may have reduced the canopy to scattered trees. In some areas the tree stratum is low and dense, so that the community takes on the structure of scrub. The community also includes some areas of fernland and tall reedland or sedgeland, where trees are very sparse or absent. Typically these forests, scrubs, fernlands, reedlands and sedgelands form mosaics with other floodplain forest communities and treeless wetlands. Associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains. Generally occurs below 20 m (though sometimes up to 50 m) elevation.	Reserved locally in Booti Booti NP (particulary near Green Point) and Yahoo NR (Griffith et al 2000; I. Mamott pers comm.). Recorded as a composite community within the subject site where the soils contain fine silts and clays in the western portion of the site.
Swamp Oak Forest on Coastal Floodplain	Endangered Ecological Community	Not Listed	A community is dominated by Casuarina glauca which may occur as pure stands or in association with Acmena smithii, Glochidion spp. And Melaleuca spp.	Recorded locally in Wallis Lake estuary in Booti Booti NP and Yahoo NR (Griffith et al 2000).

Threatened Flora Species & Endangered Ecological Communities Recorded or Predicted to Occur on or Within the Locality of the Subject Site and Assessment of their Likelihood of Occurrence on the Subject Site				
SPECIES & ROTAP STATUS	TSC ACT STATUS	EPBC ACT STATUS	GENERAL DESCRIPTION, HABITAT REQUIREMENTS & ECOLOGY	RECORDED DISTRIBUTION, LIKELIHOOD OF OCCURRENCE ON THE SUBJECT SITE & ADJOINING HABITATS
			The structure of the community may vary from open forests to low woodlands, scrubs or reedlands with scattered trees. Typically these forests, woodlands, scrubs and reedlands form mosaics with other floodplain forest communities and treeless wetlands, and often they fringe treeless floodplain lagoons or wetlands with semi-permanent standing water. This community generally occurs below 20 m (rarely above 10 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.	Recorded as a composite community with Swamp Sclerophyll forest within the subject site. Generally confined to the foreshore of Wallis lake where the soils are saline and contain fine silts and clays
Coastal Saltmarsh of the NSW North Coast, Sydney Basin and South East Corner bioregions	Endangered Ecological Community	Not Listed	A community comprising chenopod shrubs and tussock grasses in the upper to mid intertidal zone of estuaries which become inundated only at spring high tides. Characteristic plants include Juncus kraussii subsp australiensis, Sarcocornia quinqueflora, Sporobolus virginicus, Isolepis nodosa, Samolus repens and Suaeda australis.	Occurs in the intertidal zone on the shores of estuaries and lagoons that are permanently or intermittently open to the sea. One of the few vegetation communities that become more diverse floristically from the northern to the southern extent of its distribution. Occurs sporadically around Wallis Lake estuary in Booti Booti NP and Yahoo Nature Reserve (I. Mamott pers. comm; Griffith et al 2000). Potential habitat for this EEC exists on the foreshore of the lower reaches of the Wallamba River. Not recorded within the subject site.

Threatened Flora Species & Endangered Ecological Communities Recorded or Predicted to Occur on or Within the Locality of the Subject Site and Assessment of their Likelihood of Occurrence on the Subject Site

Species & ROTAP Status	TSC Act Status	EPBC Act Status	General Description, Habitat Requirements & Ecology	Recorded Distribution, Likelihood of Occurrence on the Subject Site & Adjoining Habitats
Freshwater Wetlands On Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Endangered Ecological Community	Not Listed	This ecological community is associated with periodic or semi-permanent inundation by freshwater, although there may be minor saline influence in some wetlands. The structure of the community may vary from sedgelands and reedlands to herbfields, and woody species of plants are generally scarce. Typically these wetlands form mosaics with other floodplain communities, and often they include or are associated with ephemeral or semi-permanent standing water (NSW NPWS 2004).	Generally occurs at less than 20 m elevation on silty muds or humic loams in low-lying parts of floodplains, alluvial flats, depressions, drainage lines, backswamps, lagoons and lakes but may also occur in backbarrier landforms where floodplains adjoin coastal sandplains (NSW NPWS 2004). Associated with coastal areas. Very small areas (<2 ha) of Freshwater Wetland habitat have been recorded around the Wallis Lake estuary in Booti Booti NP (Griffith et al 2000). Not recorded within the subject site.
Subtropical Coastal Floodplain Forest NSW North Coast bioregion	Endangered Ecological Community	Not Listed	A community that occurs on floodplain alluvium and typically lines major rivers and river flats of the north coast estuaries. This community essentially replaces River Flat Eucalypt Forest north of the Manning River. The structure of this community may vary from tall open forests to woodlands, although partial clearing may have reduced the canopy to scattered trees. The most widespread and abundant trees include Eucalyptus tereticornis, E. siderophloia and Corymbia intermedia. Typically these forests and woodlands form mosaics with other floodplain forest communities and treeless wetlands, and often they fringe treeless floodplain lagoons or wetlands with semi-permanent standing water.	The community is associated with clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplain and occupies central or marginal parts of floodplains. Occupies habitats where flooding is periodic and soils are rich in silt and sand, sometimes humic, and show little influence of saline ground water. The community generally occurs below 50 m, but may occur on localised river flats up to 250 m elevation. Not recorded within the subject site.

Threatened Flora Species & Endangered Ecological Communities Recorded or Predicted to Occur on or Within the Locality of the Subject Site and Assessment of their Likelihood of Occurrence on the Subject Site

Species & ROTAP Status	TSC Act Status	EPBC Act Status	General Description, Habitat Requirements & Ecology	Recorded Distribution, Likelihood of Occurrence on the Subject Site & Adjoining Habitats
Littoral Rainforest NSW North Coast, Sydney Basin and South East Corner bioregions	Endangered Ecological Community	Not Listed	Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions is generally a closed forest, the structure and composition of which is strongly influenced by proximity to the ocean. The plant species in this ecological community are predominantly rainforest species with evergreen mesic or coriaceous leaves. Several species have compound leaves, and vines may be a major component of the canopy. These features differentiate littoral rainforest from sclerophyll forest or scrub, but while the canopy is dominated by rainforest species, scattered emergent individuals of sclerophyll species, such as Angophora costata, Banksia integrifolia, Eucalyptus botryoides and E. tereticornis occur in many stands.	Littoral Rainforest in NSW is found at locations along the entire NSW Coast. Found only on the coast on sand dunes and on soil derived from underlying rocks generally within 2 km of the ocean. Recorded in Booti Hill and Cape Hawke within Booti Booti National Park. Also recorded in Darawank NR at Black Head. Not recorded within the subject site.
Lowland Rainforest on Floodplain of the NSW North Coast Bioregion	Endangered Ecological Community	Not Listed	A community that occurs on floodplain alluvium comprised of rainforest species with evergreen mesic or coriaceous leaves. Several species have compound leaves, and vines may be a major component of the canopy.	Livistona australis subtropical rainforest community recorded locally in Booti Booti NP and Yahoo NR is an element of this EEC. Not recorded within the subject site.

Threatened Fauna Species Recorded or Predicted to Occur on or Within the Locality of the Subject Site and Assessment of their Likelihood of Occurrence on the Subject Site

SPECIES	TSC ACT STATUS	EPBC ACT STATUS	GENERAL DESCRIPTION HABITAT REQUIREMENTS & ECOLOGY	RECORDED DISTRIBUTION, LIKELIHOOD OF OCCURRENCE ON THE SUBJECT SITE & ADJOINING HABITATS,
Wallum Froglet *Crinia tinnula*	*Vulnerable*	*Not Listed*	The Wallum Froglet is restricted to coastal areas of south eastern Queensland and northern NSW where it occurs in fringing vegetation associated with wetlands with highly acidic, tannin stained waters that are usually dominated by paperbarks and tea trees (NPWS, 2005; Cogger, 2000).	The Wallum Froglet is known to occur within the subject site however was not recorded during appropriate weather conditions in the subsequent surveys conducted by Conics.
Green and Golden Bell Frog *Litoria aurea*	*Endangered*	*Vulnerable*	The Green and Golden Bell Frog occurs around large permanent swamps, lagoons, ponds and flood prone river flats with dense emergent vegetation such as bullrushes and spikerushes. They may also occur in farm dams and ornamental ponds that are close to preferred habitat (NPWS, 2000; Robinson, 1998). The Green and Golden Bell Frog is found in eastern and south eastern NSW and far eastern Victoria, more often at low altitudes (Cogger, 2000).	The subject site contains only small temporary pools that lack appropriate emergent vegetation and therefore do not represent potential habitat for the Green and Golden Bell Frog. Further it is unlikely that the Green and Golden Bell frog would occur within other areas of the study area given the lack of suitable habitat and the nearest records for the species on the Atlas is over 16 km to the south near Bungwahl (NPWS, 2005)..
Green-thighed Frog *Litoria brevipalmata*	*Vulnerable*	*Not Listed*	The Green-thighed Frog is known from isolated localities around the coast of south eastern Queensland and northern NSW (Cogger, 2000). They have been recorded in rainforest, moist and dry eucalypt forest and heath, usually in areas where surface water pools after rain (NPWS, 1999). Breeding aggregations have been observed near grassy ephemeral pools and flood prone grassy areas (NPWS, 2000; NPWS, 2005).	The subject site contains a small amount of potential habitat for the Green-thighed Frog. It is however; unlikely that this species would occur within the study area given that there are only two records of this species within the LGA, with the closest of these records being located over 70 km to the west (NPWS, 2005). In addition, this species was not detected during the herpetofauna surveys undertaken within the subject site.
Stuttering Frog *Mixophyes balbus*	*Endangered*	*Vulnerable*	The Stuttering Frog is found east of the Great Dividing Range from northern NSW, to north east Victoria (NPWS, 2000; Cogger, 2000). Across its range, the Stuttering Frog is usually found in association with permanent streams in wet sclerophyll forest, cool rainforest, and moist eucalypt forest and occasionally along creeks in dry eucalypt forest. This species feeds upon insects, spiders and smaller frogs. The Stuttering Frog breeds specifically in shallow and slowly flowing streams (NPWS, 2000; Cooger, 2000; DEH, 2005).	The study area does not contain any permanent streams and therefore lacks appropriate habitat for the Stuttering Frog. Given that the nearest records of this species held on the Atlas are over 25 km to the south west in Myall Lakes NP, and that the study area does not contain potential breeding habitat for the Stuttering Frog, it is unlikely that this species would occur within the study area (NPWS, 2005).

Threatened Fauna Species Recorded or Predicted to Occur on or Within the Locality of the Subject Site and Assessment of their Likelihood of Occurrence on the Subject Site

SPECIES	TSC ACT STATUS	EPBC ACT STATUS	GENERAL DESCRIPTION HABITAT REQUIREMENTS & ECOLOGY	RECORDED DISTRIBUTION, LIKELIHOOD OF OCCURRENCE ON THE SUBJECT SITE & ADJOINING HABITATS,
Giant Barred Frog *Mixophyes iterates*	*Endangered*	*Endangered*	The Giant Barred Frog is found on the coast and ranges of south eastern Qld and mid eastern NSW (Cogger, 2000, QPWS, 2005). Across its range, this species occurs among deep, damp leaf litter in rainforests, moist eucalypt and nearby dry eucalypt forest at elevations below 1000 m (NPWS, 2000). In a similar way to the Stuttering Frog, the Giant Barred Frog is usually found in association with permanent, slow moving shallow streams in these forest types. Eggs are laid onto moist creek banks or rocks above water level so tadpoles can drop into the water upon hatching (NPWS, 2000).	The study area does not contain any permanent streams and therefore lacks breeding habitat for the Giant Barred Frog. Given that the nearest records of this species held on the Atlas are over 50 km to the north, and that the study area does not contain potential breeding habitat for the Giant Barred Frog, it is unlikely that this species would occur within the study area (NPWS, 2005).
Square-tailed Kite *Lophoictinia isura*	*Vulnerable*	*Not Listed*	Square-tailed Kites in open eucalypt forest, woodlands and sand plains of coastal and subcoastal mainland Australia. This species is sparsely distributed through even its preferred habitat and breeding pairs are known to occupy very large home ranges of at least 100 km2 (1993; NPWS, 2000). Nests are a pile of sticks approximately 0.6 – 1 m in diameter, and are usually located in tall or emergent living trees that are near watercourses (NPWS, 2000; Schodde and Tidemann, 1993).	The subject site represents potential foraging habitat for the Square-tailed Kite, however this is only a small area of habitat in consideration of the species large home range. The study area contains limited potential nesting habitat for the Square-tailed Kite however was not recorded during the surveys undertaken. While the nearest record for this species is over 16 km to south, the Square-tailed Kite is considered as likely to occur within the study area given this species high mobility and home range, and also occurrence of potential foraging habitat within the subject site.
Osprey *Pandion haliaetus*	*Vulnerable*	*Not Listed*	The Osprey is thinly distributed around to coast of Australia where they forage for fish in fresh, brackish, or saline waters of rivers, lakes, estuaries and inshore coastal waters (Schodde and Tidemann, 1993; NPWS, 2000). Nests are usually located near a suitable area of foraging habitat and are a bulky structure made from piled sticks, often positioned in a tall dead tree or artificial structures such as telecommunication towers or poles (Schodde and Tidemann, 1993; NPWS, 2000). Breeding pairs defend breeding territory against other Ospreys, and active nests are usually more than 1 km apart (NPWS, 2005).	There are numerous records of the Osprey on the Atlas within 2 km of the study area, and some of these are within 500 m of the subject site (NPWS, 2005). In addition there are known nest sites within 5 km of the study area, with one of these being located in Forster CBD (B. Campbell pers obs). The subject site does not contain potential foraging habitat for the Osprey however the species was observed above Pipers creek adjoining the study area. Given the proximity to known feeding habitat, the stags and paddock trees within the subject site may represent potential nesting habitat for the species.

Threatened Fauna Species Recorded or Predicted to Occur on or Within the Locality of the Subject Site and Assessment of their Likelihood of Occurrence on the Subject Site

SPECIES	TSC ACT STATUS	EPBC ACT STATUS	GENERAL DESCRIPTION HABITAT REQUIREMENTS & ECOLOGY	RECORDED DISTRIBUTION, LIKELIHOOD OF OCCURRENCE ON THE SUBJECT SITE & ADJOINING HABITATS,
Australasian Bittern Botaurus poicilotilus	*Vulnerable*	*Not Listed*	The Australasian Bittern occurs from southern Queensland to Tasmania and south eastern South Australia. In NSW this species has been recorded along the coast as well as inland wetlands and rivers (NPWS, 1999xx). The Australasian Bittern occurs in estuarine and freshwater wetlands with tall dense vegetation, including sedges, spike rushes, reeds and bulrush (NPWS, 2000; NPWS, 1999). Feeds mostly at night upon frogs, yabbies, spiders, insects, snails, small fish and mice (Schodde and Tidemann, 1993; NPWS, 2000).	The foreshore vegetation of Wallis Lake that adjoins the western boundary of subject site represents potential foraging habitat for the Australasian Bittern. Some areas within the subject site represent a small area of low quality potential habitat for this species. The Australian Bittern has been recorded within 1km of the subject site (NPWS, 2008) and is therefore considered likely to occur within the study area.
Black Bittern Ixobrychus flavicollis	*Vulnerable*	*Not Listed*	The Black Bittern is distributed from southern NSW, north to Cape York and along the entire northern coast to the Kimberley Region. This species also occurs in the south western corner of WA (NPWS, 1999). This species occurs in dense vegetation, particularly amongst swamp she oaks and mangroves alongside streams, estuarine and terrestrial wetlands, tidal creeks and mudflats, and swamps. (NPWS, 2000; NPWS, 1999). This species forages mostly at night and amongst waterside vegetation, feeding upon fish amphibians, molluscs, insects and crustaceans (Schodde and Tidemann, 1993; NPWS, 2000).	The foreshore vegetation of Wallis Lake that adjoins the western boundary of subject site represents potential foraging habitat for the Black Bittern. Some areas within the subject site also represents a small area of low quality potential habitat for the Black Bittern. Although the nearest record for this species is over 15 km to the north of the subject site, the Black Bittern is considered likely to occur within the study area given the species mobility, distribution and occurrence of potential habitat adjoining the subject site to the west (NPWS, 2005).
Australian Painted Snipe Rostratula benghalensis australis	*Endangered*	*Vulnerable and Migratory (CAMBA)*	The Australian Painted Snipe is a small wader that is more often found in shallow inland wetlands that are both brackish and freshwater. This species is also found among fringes of swamps, dams and marshy areas where there is a cover of grasses, low scrub or open timber (NPWS, 2000; DEH, 2005). The Australian Painted Snipe primarily occurs along the east coast from North Queensland to Eyre Peninsula in South Australia. This species nests on the ground among tall vegetation including grass tussocks or reeds (NPWS, 1999).	The subject site contains very limited potential habitat for the Australian Painted Snipe. This species may occasionally occur amongst the foreshore vegetation of Wallis Lake located at the western boundary. It is unlikely however that the study area would be regularly utilised given the nearest records on the Atlas which are over 85 km to the south near Raymond Terrace (NPWS, 2005).
Glossy Black Cockatoo Calyptorhynchus lathami	*Vulnerable*	*Not Listed*	The Glossy Black Cockatoo primarily feeds upon the fruit cones of Allocasuarina species and are more often found in moist and dry coastal	The study area does not contain potential feed trees and it is unlikely that the stags within the subject site would be utilised for nesting given that

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			forests timbered watercourses and inland woodland (Schodde and Tidemann, 1993; NPWS, 2000). They are distributed in a wide coastal band on the east coast of Australia from central Queensland, south to Victoria. A separate population occurs on Kangaroo Island, SA (Schodde and Tidemann, 1993; NPWS, 2000). The Glossy Black Cockatoo requires hollow bearing trees located within close proximity to good stands of feeding habitat for nesting (NPWS, 2000).	there is limited potential feeding habitat within a suitable distance to the subject site. Despite this, there are numerous records win the LGA for this species, with some of these records being within 10 km to the south of the subject site, and therefore this species may occur within the subject site on occasion.
Lesser Sand Plover Charadrius mongolus	*Vulnerable*	*Not Listed*	The Lesser Sand Plover breeds in Asia and migrates to the Australian coast between September and March where it occurs on mudlflats, white sandy beaches, estuaries and tidal areas in mangroves (NPWS, 2000). The Lesser Sand Plover primarily feeds upon crustaceans, molluscs, insects, and marine worms (NPWS, 1999)	The subject site does not contain appropriate habitat for the Lesser Sand Plover. In addition, the Lesser Sand Plover has been recorded within 5 km to the north of the subject site near the entrance of Wallis Lake (NPWS, 2005). The Lesser Sand Plover is considered unlikely occur within the study area given the lack of foraging habitat adjoining the subject site to the west. This species is however; unlikely utilise any habitats within the study area.
Black-necked Stork Ephippiorhynchus asiaticus	*Endangered*	*Not Listed*	The Black-necked Stork is widely distributed in northern Australia, and also sparsely distributed in coastal eastern Australia from Queensland to southern NSW (NPWS, 2000). This species forages in wetlands, mangroves, swamps, mudflats, dry floodplains, irrigated land and occasionally open grassy woodland (NPWS, 2000; NPWS, 2005). The nest is a large flat pile of sticks, grass, and rushes place in a tree, usually near water (NPWS, 2000).	The wetland areas and drainage depression within the subject site represent a small amount of potential habitat for the Black-necked Stork. This species has been recorded around the edge of Wallis Lake at other locations in the locality, and some of these records are within 5km of the subject site (NPWS, 2005).
Wompoo Fruit-Dove Ptilinopus magnificus	*Vulnerable*	*Not Listed*	The Wompoo Fruit-Dove occurs in lowland and adjacent highland rainforests, and low elevation moist eucalypt and brushbox forests (NPWS, 2000; Schodde and Tidemann, 1993). They feed upon a range of tree and vine fruits and are locally nomadic, following food availability.	The study area does not contain potential habitat for the Wompoo Fruit Dove. This species is more likely to occur in littoral rainforest that is located in Booti Booti NP where it has been recorded within 7 km of the study area. (NPWS, 2005). The Wompoo Fruit Dove is unlikely to occur within the study area given the lack of suitable habitat.
Sooty Oystercatcher Haematopus fuliginosus	*Vulnerable*	*Not Listed*	The Sooty Oystercatcher is distributed around the entire coastline and islands around Australia. Throughout its range, the Sooty Oystercatcher	The study area does not contain appropriate habitat for the Sooty Oystercatcher. This species has been recorded within 5 km to the north

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			primarily occurs on rocky beaches, rocky shores, rocky headlands, rocky shelves and beaches, and offshore islands, and very rarely on sandy beaches and estuarine tidal flats (NPWS, 2000; Scodde & Tidemann, 1993). This species forages on exposed rock and coral at low tide for limpets, mussels, and crustaceans (NPWS, 2000) Nests are a shallow depression in sand above the high tide mark, or a cleft in rocks that may be built up with pebbles (NPWS, 2000; Scodde & Tidemann, 1993).	near Bennetts Head (NPWS, 2005). The Sooty Oystercatcher is unlikely to occur within the study area given the lack of suitable habitat within and adjoining the study site.
Pied Oystercatcher *Haematopus longirostris*	*Vulnerable*	*Not Listed*	The Pied Oystercatcher occurs around the entire coastline of Australia. Throughout its range, the Pied Oystercatcher favours beaches, intertidal flats and sand banks and occasionally rocky headlands (NPWS, 2000). Molluscs have been noted to be a staple food source, however, worms, crabs and small fish may be taken (NPWS, 2000; Scodde & Tidemann, 1993). Pied Oystercatchers primarily nest on coastal or estuarine beaches and occasionally they may use salt marsh or grassy areas. Nests are shallow scrapes in the sand above the high tide mark or amongst low growth behind the beach (NPWS, 2000).	The subject site does not contain appropriate habitat for the Pied Oystercatcher. This species may utilse the sandflats of Wallis Lake. In addition, there are numerous records of species within Wallis Lake, with some of the records within 4 km of the subject site (NPWS, 2008).
Little Tern *Sterna albifrons*	*Endangered*	*Not Listed*	The Little Tern occurs around the coast to Australia from mid WA, around northern and eastern Australia to the east coast of Tasmanian and around the Gulf of STR Vincent in SA (NPWS, 1999). Throughout its range, Little Terns are predominantly found in coastal waters, bays, shallow inlets salt or brackish lakes, with sheltered environments preferred (NPWS, 1999, NPWS; 2000). Little Terns nest in small scattered colonies and nests are small scrapes, usually located on low dunes, or sandy beaches near the mouths of estuaries, or adjacent coastal lakes and islands (NPWS, 1999); Scodde & Tidemann, 1993). The Little Tern feeds upon small fish, crustaceans, insects, annelids and molluscs (NPWS, 2000).	The subject site does not contain appropriate habitat for the Little Tern. This species may occasionally forage along the edge of the study area in Wallis Lake. In addition, the Little Tern has been recorded within 2 km of the study area (NPWS, 2005). The Little Tern is lhowever likely to occur within Pipers Creek on occasion given the species mobility, distribution and occurrence of a small area of potential foraging habitat adjoining the subject site. This species is however; unlikely utilise any habitats within the study area.

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Regent Honeyeater *Xanthomyza Phrygia*	*Endangered*	*Endangered and Migratory (JAMBA)*	The Regent Honeyeater is predominantly found along the western slopes of the Great Dividing Range, however it is often recorded along the eastern flank of this range. (Scodde & Tidemann, 1993; NPWS 1999; Environment Act, 2005). The Regent Honeyeater generally inhabits drier temperate woodlands and open forests with an abundance of nectar producing Eucalypts including Box-Ironbark woodland in the west and Eucalyptus robusta/Melaleuca quinquenervia forests on the coast (Environment ACT, 2005; NPWS, 2000). While nectar represents a major food source, insects, manna, lerps and fruit also comprise the diet of this species (NPWS, 1999; Scodde & Tidemann, 1993). The Regent Honeyeater is partly travelling to the south and west during spring to breed. Nests are cup-shaped and located in the fork of a tree or clump of mistletoe between one and twenty metres above the ground. (Environment ACT, 2005).	The Regent Honeyeater may forage amongst the Blackbutts, Angophoras and Melaleuca quinquenervias scattered within the subject site. Despite this, the subject site contains only a small amount of potential foraging habitat for this species. The vegetation of the subject site contains a suitable area of Swamp Mahogany. These vegetation communities therefore represent potential foraging habitat for the Regent Honeyeater. Given that a suitable area of potential feeding habitat adjoins the site, the Regent Honeyeater is considered as potentially occurring within the study area, and may therefore also occur within the subject site. It is unlikely however; that any areas within the subject site would be regularly utilised given the limited amount of potential foraging habitat within the subject site. The Regent Honeyeater is more likely to occur in higher densities further inland and there are only two (2) records for the LGA held on the Atlas, with the nearest of these within 20 km to the south west in Wallingat NP (NPWS, 2005).
Swift Parrot *Lathamus discolor*	*Endangered*	*Endangered*	The Swift Parrot breeds in Tasmania between spring and summer and migrate to the mainland during winter where they disperse widely across south eastern Australia (NPWS, 2000; Scodde & Tidemann, 1993). Swift parrots nest in tree hollows from a variety of Eucalypt species, and usually in old growth trees with a DBH of over 0.8 m. In coastal areas of northern NSW and southern Queensland, Swamp mahogany, Spotted Gum and Red Bloodwood provide important nectar sources. This species has been also recorded on numerous occasions to be foraging amongst Blackbutts in the Wollongong area (Swift Parrot Recovery Team, 2001).	The Swift Parrot may forage amongst the scattered Eucalypts and Melaleuca quinquenervia within the subject site. However it is unlikely that any areas within the subject site would be regularly utilised for foraging by this species given the limited amount of potential foraging habitat within the subject site and the nearest records of this species.

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Terek Sandpiper *Xenus cinereus*	*Vulnerable*	*Not Listed*	The Terek Sandpiper is a non breeding migrant to Australia between September and May (NPWS, 2000). In Australia, this species is distributed around the east, north and west coasts of Australia (NPWS, 1999). The Terek Sandpiper occurs on tidal mudflats, estuaries, shores and reefs of offshore islands and coastal swamps (NPWS, 2000). The Terek Sandpiper feeds on a wide variety of invertebrates including crustaceans, worms, small shell fish and insect larvae (NPWS, 1999).	The subject site does not contain appropriate habitat for the Terek Sandpiper. This species has also been recorded within 5 km of the study area near the entrance of Wallis Lake (NPWS, 2008). This species is therefore unlikely to utilise any habitats within the subject site.
Powerful Owl *Ninox strenua*	*Vulnerable*	*Not Listed*	The Powerful Owl is generally found on the east coast of Australia from south east Queensland through to south western Victoria (NPWS, 2005). This species occurs in a range of habitats including open woodland, open forest, tall moist forest and rainforest (NPWS, 2000). The Powerful owl has a very large home range of 800 to 1000 ha per breeding pair (NPWS, 2005). The Powerful Owl requires trees with large hollows that are at least 50 cm deep and 12 – 40 m above the ground (NPWS, 2000; Scodde & Tidemann, 1993). This species primarily preys upon terrestrial and arboreal mammals and birds; however, insects and flying foxes may be taken (NPWS, 1999; Scodde & Tidemann, 1993). Greater Gliders (Petauroides volans) and Possums have been noted as being an important food source (NPWS, 2000, Scodde & Tidemann, 1993; Hollands, 1991).	The study area contains appropriate foraging and nesting habitat for the Powerful Owl. In addition, the Powerful Owl has been recorded within 3 km to the south of the study area. The Powerful Owl is therefore likely to occur within the subject site and adjoining habitats.
Masked Owl *Tyto novaehollandiae*	*Vulnerable*	*Not Listed*	The Masked Owl is found around all coastal and subcoastal Australia (NPWS, 2000). The Masked Owl occurs in a range of habitats including dry eucalypt forest and woodlands, and commonly occurs on the fringes of urban bushland and farmland (NPWS, 2000; Hollands, 1991). Masked Owls have a large home range of between 800 and 1200 ha per breeding pair (NPWS, 2005). The Masked Owl preys upon terrestrial and arboreal mammals, particularly rats (NPWS, 2000). The Masked Owl nests in hollow bearing trees located in living trees or stags (NPWS, 2005).	The study area contains appropriate foraging and nesting habitat for the Masked Owl. In addition, the Masked Owl has been recorded within 5 km to the south of the subject site (NPWS, 2005). The Masked Owl is therefore likely to occur within the study area given the species mobility, distribution and large home range and the occurrence of potential habitat within the study area.

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Barking Owl *Ninox connivens*	*Vulnerable*	*Not Listed*	The Barking Owl can occur in a variety of habitats including eucalypt woodland, open forest, swamp woodlands and timber along water courses, however; the ideal habitat for the Barking Owl is open country with a good choice of large hollow trees for nesting. This species also has a distinct preference to be close water (Hollands, 1991; NPWS, 2000). Home ranges for this species may be between 30 and 200 hectares (NPWS, 2000; Schodde & Tidemann, 1993).	The study area contains appropriate foraging and nesting habitat for the Barking Owl. The nearest record of this species is over 16 km to the north west (NPWS, 2005). The Barking Owl is considered as potentially occurring within the study area given the species mobility and large home range.
Eastern Grass Owl *Tyto capensis*	*Vulnerable*	*Not Listed*	The Eastern Grass Owl has been recorded in all mainland states of Australia, but are more commonly recorded in northern and north eastern Australia (NPWS, 2000). Eastern Grass Owls are mainly found in tall grass including tussock grasslands, grass tussocks in swampy areas, grassy plains, swamps, coastal dunes, cane grass and other crops, tree lined creeks, and sedges on floodplains (NPWS, 2000; Garnett and Crowley, 2000). This species nests on the ground which may resemble a trampled platform in a large tussock or heavy growth (NPWS, 2000).	The study area contains appropriate foraging habitat for the Grass Owl, however the subject site contains only limited potential nesting habitat within the subject site. The Grass Owl has been recorded within 15 km to the south of the subject site (NPWS, 2005). The Eastern Grass Owl is therefore likely to occur within the study area given the species mobility, distribution, the nearest records, and the occurrence of potential habitat within the study area.
Black-browed Albatross *Thalassarche melanophris*	*Vulnerable*	*Vulnerable and Migratory (Bonn)*	The Black-browed Albatross occurs around the world. In Australia, the Black-browed Albatross occurs along the east coast from Stradbroke Island, and south around the coast to Western Australia. This spends most of its time at sea and usually nests on small, vegetated sub-antarctic and antarctic islands (NPWS 1999). Feeds upon fish, crustaceans, offal and squid, but may also take refuse and carrion thrown out by sea vessels (NPWS, 1999; Scodde & Tidemann, 1993).	As the subject site does not contain appropriate habitat for the Black-browed Albatross it is highly unlikely that the species would utilise the subject site or adjoining habitats
Amsterdam Albatross *Diomedea amsterdamensis*	*Not Listed*	*Endangered and Migratory (Bonn)*	There is limited information about the distribution and abundance of the Amsterdam Albatross, however, this species is known to breed on Amsterdam Island and forages mainly in the Indian Ocean. The Amsterdam Albatross is also considered as likely to occur along the south eastern, south western and southern coast of Australia, and may reach as fas south as Tasmania. This species is known to feed upon	The subject site does not contain appropriate habitat for the Amsterdam Albatross therefore it is highly unlikely that this species would utilise the subject site.

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			squid, fish and crustaceans (DEH, 2005)	
Antipodean Albatross Diomedea antipodensis	*Vulnerable*	*Vulnerable and Migratory (Bonn)*	The Antipodean Albatross feeds on squid, fish and crustaceans in the south west Pacific and Tasman Sea, more commonly off the coast of NSW. Non-breeding birds often move east to South American Waters following weather systems to exploit food resources. Breeds in colonies on isolated subantarctic islands such as Antipodes and Campbell Island (DEC, 2005).	The subject site does not contain appropriate habitat for the Antipodean Albatross therefore It is highly unlikely that this species would utilise the subject site.
Tristan Albatross Diomedea dabbenena	*Not Listed*	*Endangered and Migratory (Bonn)*	Recorded to wander across a great range from their sub-Antarctic breeding Islands within the South Atlantic Ocean. Has been recorded off Wollongong during a tag and recapture survey, however, are rarely observed in the Pacific Ocean (Environment Australia, 2001).	Given the distribution of the Tristan Albatross, it is unlikely that this species would fly over the study area. It is therefore highly unlikely that the Tristan Albatross would utilise the subject site.
Wandering Albatross Diomedea exulans	*Endangered*	*Vulnerable and Migratory (Bonn, JAMBA)*	Found in oceanic environments around the southern hemisphere. Breeds on sub-Antarctic islands, and feeds mostly on squid and cuttlefish, but may also take crustaceans, fish and offal from boats (Schodde and Tidemann, 1993).	The subject site does not contain appropriate habitat for the Wandering Albatross therefore it is highly unlikely that this species would utilise the subject site.
Gibson's Albatross Diomedea gibsoni	*Vulnerable*	*Vulnerable and Migratory (Bonn)*	The Gibson's Albatross breeds in colonies on subantarctic islands including Auckland Island, New Zealand, and primarily forages in the Tasman Sea, with males typically occurring further south or in the Mid Pacific Ocean. This species has been recorded foraging between Coffs harbour and Wilson's Promontory. The Gibson's Albatross often take advantage of weather systems to exploit food resources and feeds upon squid, fish and crustaceans (DEH, 2005).	The subject site does not contain appropriate habitat for Gibson's Albatross therefore it is highly unlikely that this species would utilise the subject site.
Buller's Albatross Thalassarche bulleri	*Not Listed*	*Vulnerable and Migratory (Bonn)*	In Australia, the Buller's Albatross is known to more commonly occur around the coastal waters of south eastern NSW and SA, and all around Tasmania and Victoria. This species nests in colonies and often follow fishing vessels, feeding upon fish, squid and other cephalopods (DEH, 2005).	The subject site does not contain appropriate habitat for Buller's Albatross therefore highly it is unlikely that this species would utilise the subject site.

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Shy Albatross Thalassarche cauta	*Vulnerable*	*Vulnerable and Migratory (Bonn)*	The Shy Albatross is an oceanic species that inhabits sub Antarctic and subtropical marine waters. This species feeds upon fish, squid, crustaceans and offal, and breeds on offshore islands around New Zealand and Australia (NPWS, 1999).	The subject site does not contain appropriate habitat for the Shy Albatross therefore it is highly unlikely that this albatross species would utilise the subject site.
Campbell Albatross Thalassarche impavida	*Not Listed*	*Vulnerable and Migratory (Bonn)*	Across Australian and New Zealand waters, breeding for the Campbell Albatross is restricted to Campbell Island, New Zealand. Non breeding birds are known to forage over temperate shelf waters of New Zealand, Australia and the central and western Pacific Islands. Breeding individuals usually forage over the continental shelf waters of New Zealand. This species feeds upon squid, fish and crustaceans and also follows fishing vessels, feeding upon offal (DEH, 2005).	The subject site does not contain appropriate habitat for the Campbell Albatross therefore it is highly unlikely that this albatross species would utilise the subject site.
Salvin's Albatross Thalassarche salvini	*Not Listed*	*Vulnerable and Migratory (Bonn)*	The Gibson's Albatross breeds in dense colonies on bare, rocky islands including Bounty, Snares and Chatham Islands, New Zealand. This species forages over most of the southern Pacific Ocean and feeds upon cephalopods, fish, and offal from boats (DEH, 2005).	The subject site does not contain appropriate habitat for the Salvin's Albatross therefore it is highly unlikely that this albatross species would utilise the subject site.
White-capped Albatross Thalassarche steadi	*Not Listed*	*Vulnerable and Migratory (Bonn)*	The White-capped Albatross breeds in colonies among tussock grassland, and has been recorded nesting on Disappointment, Adams, Auckland, Bollons and Chatham Islands, New Zealand. During breeding, this species forages in waters near nest sites. The White-capped Albatross is also thought to regularly forage across the south eastern coast of Australia. In addition, this species has been caught on loglines hooks off Tasmania (DEH, 2005).	The subject site does not contain appropriate habitat for the White-capped Albatross therefore it is highly unlikely that this albatross species would utilise the subject site.
Southern Giant-Petrel Macronectes giganteus	*Endangered*	*Endangered and Migratory (Bonn)*	The Southern Giant Petrel occurs in southern oceanic waters of Australia, and breeds along Antarctic and subantarctic islands. The Southern Giant Petrel is both a scavenger and a predator, feeding upon whale or seal carcasses, cephalopods and smaller birds such as penguins (DEC, 2004; Scodde & Tidemann, 1993).	The subject site does not contain appropriate habitat for the Southern Giant Petrel therefore it is highly unlikely that this species would utilise the subject site.

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Northern Giant Petrel Macronectes halli	*Vulnerable*	*Vulnerable and Migratory (Bonn)*	The Northern Giant Petrel has a wide distribution and often occurs in south eastern waters of Australian in winter and autumn during the breeding period (DEC, 2005; Scodde & Tidemann, 1993). Like the Southern Giant Petrel, the Northern Giant Petrel feeds upon seal carcasses, cephalopods and smaller birds such as penguins.	The subject site does not contain appropriate habitat for the Northern Giant Petrel therefore it is highly unlikely that this species would utilise the subject site.
Gould's Petrel Pterodroma leucoptera leucoptera	*Endangered*	*Endangered and Migratory (JAMBA)*	The Gould's Petrel is pelagic, recorded to predominantly forage within the Tasman Sea, feeding upon surface fish, squid and krill. This species has been observed to primarily breed on Cabbage tree Island which is located offshore from the entrance to Port Stephens (NPWS, 2000).	The study area does not contain appropriate habitat for the Gould's Petrel therefore it is highly unlikely that this species would utilise the study area.
Kermadec Petrel (western) Pterodroma neglecta neglecta	*Vulnerable*	*Vulnerable*	The Kermadec Petrel is a medium to large petrel that occurs in subtropical seas. Breeding commonly occurs on atolls and rocky islets across subtropical South Pacific Ocean (NPWS, 1999). Breeding colonies are known to be located in the South Pacific Ocean from Lord Howe Island to Juan Fernandez Island (Marchant and Higgins, 1990 in NPWS 1999). Feeds mostly upon squid and crustaceans which it plucks from the oceans surface, rarely diving or swimming after prey (Scodde & Tidemann, 1993).	The subject site does not contain appropriate habitat for the Kermadec Petrel, it is therefore highly unlikely that this species would utilise the subject site.
Eastern Pygmy-possum Cercartetus nanus	*Vulnerable*	*Not Listed*	The Eastern Pygmy-possum occurs in east coast of Australia from south east Queensland through to south eastern SA (NPWS, 2005). The Eastern Pygmy-possum can be found in rainforest, wet and dry sclerophyll forest, tree heath and teatree closed scrub (NPWS, 2005; Strahan, 1998). This species primarily feeds upon nectar and pollen from banksias, leptospermum, eucalypts and bottlebrushes, but may feed upon insects and soft fruits (Strahan, 1998; NPWS, 2005). The Eastern Pygmy-possum nests in a small spherical nest (60 mm diameter) made of shredded bark that may be placed between the wood and bark of eucalypts, in tree hollows, abandoned birds nests or in the forks of teatrees (Strahan, 1998).	The subject site contains limited potential habitat for the Eastern Pygmy-possum. The heathland that adjoins the subject site to the south, and also occurring to the east represents potential habitat for this species. Further, this species has been recorded within 4 km to the south of the study area in Booti Booti NP. Given the nearest records of this species, and the occurrence of potential habitat surrounding the subject site, the Eastern Pygmy-possum is likely to occur within the study area.

Threatened Fauna Species Recorded or Predicted to Occur on or Within the Locality of the Subject Site and Assessment of their Likelihood of Occurrence on the Subject Site

SPECIES	TSC ACT STATUS	EPBC ACT STATUS	GENERAL DESCRIPTION HABITAT REQUIREMENTS & ECOLOGY	RECORDED DISTRIBUTION, LIKELIHOOD OF OCCURRENCE ON THE SUBJECT SITE & ADJOINING HABITATS,
Spotted-tailed Quoll Dasyurus maculatus maculatus	*Vulnerable*	*Endangered (SE mainland population)*	The Spotted-tailed Quoll (Dasyurus maculatus maculatus) occurs along the east coast of Australia from south east Queensland to South Australia and Tasmania. Another sub species Dasyurus maculatus gracilis occurs as a small isolated population in north Queensland (NPWS, 1999). The subspecies Dasyurus maculatus maculatus that occurs in mainland Australia is listed as a Threatened species under the EPBC act. The Spotted-tailed Quoll has been recorded in a wide range of habitat types including dry and moist sclerophyll forests and woodlands, rainforest, coastal heathland, and riparian forest. This species been occasionally sighted in treeless area, rocky outcrops and grazing lands (NPWS, 1999; NPWS, 2000; Strahan, 1998). The Spotted-tailed Quoll shelters and dens in small caves, fallen logs with large hollows and tree hollows and may utilise numerous dens within its home rang which has been estimated to be between 800 ha to 20 km2 (NPWS, 2000; NPWS in prep in NPWS, 1999). The Spotted-tailed Quoll is partly arboreal and feeds upon a variety of prey species including birds, rodents, lizards, small wallabies, and even insects. The Spotted-tailed Quoll is also known to scavenge and feed upon carrion, road kills including wild dogs, and litter (Strahan; 1998; NPWS; 2000).	The study area contains potential foraging habitat for the Spotted-tailed Quoll. The study area however represents only a very small area of potential habitat for this species in consideration of its large home range. The subject site does not contain potential denning habitat. The Spotted-tailed Quoll has been recorded within 15 km to the south in Booti Booti National Park, and has also been recorded as road kill near Elim Road less than 10 km to the south of the study area (NPWS, 2008; Matthew Bell pers comm.). Given the species large home range and the proximity of the nearest records to the study area, and that the study area contains potential foraging habitat for the Spotted-tailed Quoll, it is considered that this species is likely to occur within the subject site and adjoining habitats.
Brush-tailed Phascogale Phascogale tapoatafa	*Vulnerable*	*Not Listed*	The Brush-tailed Phascogale has a patchy distribution around the coast of mainland Australia (NPWS, 1999). The Brush-tailed Phascogale is a largely arboreal species that primarily occurs in dry forests and woodlands with a sparse ground cover of herbs, grasses shrubs and leaf litter (NPWS, 2000; NPWS, 1999). Males have a home range of up to 100 ha, while females occupy a home range of 20 to 60 ha (NPWS, 1999). This species feeds upon invertebrates such as spiders, beetles and cockroaches, and occasionally small vertebrates. Nectar from flowering eucalypts is also an important dietary component (NPWS, 2000). The Brush-tailed Phascogale dens in hollow bearing trees and may utilise numerous hollows within its home range (NPWS, 2000;	The subject site contains a small amount of potential foraging habitat for the Brush-tailed Phascogale. The subject site also contains potential denning habitat for this species. The Brush-tailed Phascogale has been recorded within 2 km to the south of the subject site (D. Turner pers comm, NPWS officer). The Brush-tailed Phascogale is therefore likely to occur within the subject site.

Threatened Fauna Species Recorded or Predicted to Occur on or Within the Locality of the Subject Site and Assessment of their Likelihood of Occurrence on the Subject Site

SPECIES	TSC ACT STATUS	EPBC ACT STATUS	GENERAL DESCRIPTION HABITAT REQUIREMENTS & ECOLOGY	RECORDED DISTRIBUTION, LIKELIHOOD OF OCCURRENCE ON THE SUBJECT SITE & ADJOINING HABITATS,
			NPWS, 1999).	
Eastern Chestnut Mouse *Pseudomys gracilicaudatus*	*Vulnerable*	*Not Listed*	The Eastern Chestnut Mouse occurs from north eastern Queensland along the coast and ranges to central NSW (NPWS, 2000). In NSW, the Eastern Chestnut Mouse is more often found in heathland and is most common in wet heath and swampy areas, where it colonises regenerating areas of vegetation following a fire (Monamy and Fox, 2000). The Eastern Chestnut Mouse has been observed to reach maximum population density in heathland that is regenerating after fire (Strahan, 1998). Nests may be constructed of grass above ground, or be part of a burrow complex. Home ranges are generally less than 0.5 ha, however, some individuals have been known to move up to 250 m (Strahan, 1998; NPWS 2000).	The subject site contains limited potential habitat for the Eastern Chestnut Mouse. The adjoining habitats to the north and south of the subject site however; represent potential habitat for this species. In addition, the Eastern Chestnut Mouse has been recorded within 51 km to the south of the subject site (NPWS, 2005). It is therefore considered that the Eastern Chestnut Mouse would occur within the study area, and may occasionally forage along the edge of the subject site.
Squirrel Glider *Petaurus norfolcensis*	*Vulnerable*	*Not Listed*	The Squirrel Glider is distributed in eastern Australia from northern Queensland, through eastern NSW to Victoria (NPWS, 2000). The Squirrel Glider occurs in dry sclerophyll forest and woodland (Strahan, 1998). This species feeds upon nectar, pollen, flowers, insects, and sap of particular eucalypts (Strahan, 1998; NPWS, 1999). The Squirrel Glider dens in hollow bearing trees, and often dens in family groups (Strahan, 1998; NPWS, 2000). Home ranges have been estimated as between 0.65 to 8.55 ha, with movements tending to be greater for males (NPWS, 1999).	There were numerous Squirrel Gliders captured in Elliott traps during the field surveys undertaken within the study area. There are also numerous records of the Squirrel Glider within 1 km of the study area (NPWS, 2005).
Koala *Phascolarctos cinereus*	*Vulnerable*	*Not Listed*	The Koala occurs in eucalypt woodlands and forests throughout eastern Australia (NPWS, 2000). The Koala feeds almost exclusively on the foliage of particular eucalypts, and may prefer certain species within any local or regional area (Strahan, 1998; Callaghan et al, 2002).	The study area contains eucalypt species including Swamp Mahogany (Eucalyptus robusta) and Blackbutt (E. pilularis), and therefore contains potential foraging habitat for the Koala. In addition, the Koala has been recorded within 500 m of the study area and is therefore likely to occur within the subject site (NPWS, 2005).
Long-nosed Potoroo *Potorous tridactylus*	*Vulnerable*	*Vulnerable (SE mainland*	The Long-nosed Potoroo occurs in a variety of habitats including subtropical and warm temperate rainforest, moist and dry forests, and	The Long-nosed Potoroo has been recorded within 12 km to the south of the study area (GLC, 2002). The heathland adjoining the south of the

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SPECIES	TSC ACT STATUS	EPBC ACT STATUS	GENERAL DESCRIPTION HABITAT REQUIREMENTS & ECOLOGY	RECORDED DISTRIBUTION, LIKELIHOOD OF OCCURRENCE ON THE SUBJECT SITE & ADJOINING HABITATS,
tridactylus		*Population)*	coastal heathland (NPWS, 2005; NPWS, 2000; EPA, 2005; Strahan 1998). All vegetation types where this species has been recorded have a dense lower stratum with occasional open areas. The lower stratum may be comprised of grasses, vines, shrubs, sedges, or ferns, or a combination all these undercover vegetation types (NPWS, 2005; NPWS, 2000; EPA, 2005; Strahan 1998). In addition, the Long-nosed Potoroo is more often found in higher densities where the soil is a light sandy loam which is most likely associated with easier digging in such soil types (NPWS, 2000; EPA, 2005; Strahan 1998). The Long-nosed Potoroo forages for roots, tubers, fungi, fruit, insects, seeds; insect larvae, and other soft bodied soil biota (NPWS, 2000; EPA, 2005; Strahan 1998). The Long-nosed Potoroo sleeps during the day in nests made of grass and other vegetation that are placed below dense scrub, grass tussocks or grass trees (NPWS, 2005). Home ranges have been noted to be between 2 – 10 hectares (NPWS, 2005; NPWS, 2000).	subject site and the Swamp Forest to the north represents potential habitat for this species. The subject site is not considered as potential habitat for this species however, given the occurrence of potential habitat adjoining the subject site, and the nearest record of this species, the Long-nose Potoroo is likely to occur within the study area.
Grey-headed Flying-fox Pteropus poliocephalus	*Vulnerable*	*Vulnerable*	The Grey-headed Flying-fox occurs in a range of habitats including subtropical and temperate rainforests, dry and wet sclerophyll forests, Banksia woodland, heaths and Melaleuca swamps (Duncan et al, 1999; NPWS, 2001). The Grey-headed Flying-fox is a frugivorous and nectivorous species that feeds upon a variety of flowering and fruiting plants, feeding upon the blossoms of eucalypts, angophoras, tea-trees, and banksias, and the fruits of figs and palms (Strahan, 1998). This species may travel hundreds of kilometres in response to food availability, and may often feed upon orchids and trees in urban gardens (NPWS, 2001). The Grey-headed Flying-fox roosts in large colonies of op the tens of thousands, often known as 'camps'. The camps are generally located within 20 km of a regular food source, and often situated in the exposed branches of emergent tree within riparian rainforest, and Paperbark or	The study area contains known foraging habitat for the Grey-headed Flying-fox and there are numerous records of this species within the locality (NPWS, 2005; GLC 2002).

Threatened Fauna Species Recorded or Predicted to Occur on or Within the Locality of the Subject Site and Assessment of their Likelihood of Occurrence on the Subject Site

SPECIES	TSC ACT STATUS	EPBC ACT STATUS	GENERAL DESCRIPTION HABITAT REQUIREMENTS & ECOLOGY	RECORDED DISTRIBUTION, LIKELIHOOD OF OCCURRENCE ON THE SUBJECT SITE & ADJOINING HABITATS,
			Casuarina Forest (Duncan et al, 1999; NPWS, 2001).	
Common Blossom-bat Syconycteris australis	*Vulnerable*	*Not Listed*	The Common Blossom-bat occurs in coastal areas of north eastern NSW and eastern Qld, and is also widely distributed in New Guinea (NPWS, 2000; Strahan, 1998). The Common Blossom-bat usually roosts in rainforest and feeds upon nectar and pollen in adjacent heathland and paperbark swamps (NPWS, 2000). The Common Blossom-bat roosts individually in the foliage of trees, often Cabbage Palms, and may frequently change between roost sites that are usually located within 50 m of each other. The Common Blossom-bat has been recorded to travel up to 4 km from a roost site to feed, and usually return to the same limited area for feeding which may often be only several hundred square metres (Strahan, 1998; NPWS, 2000; NPWS, 2005).	The subject site contains a small amount of potential foraging habitat for the Common Blossom-bat, however, the heathland that adjoins the subject site to the north, and also the swamp forest to the south represents a large area of potential foraging habitat for this species. While the subject site does not contain appropriate roosting habitat, this species may roost in the swamp forest that adjoins the north of the subject site. In addition, potential roosting habitat is located within 4 km to the north east of the site in rainforest at Cape Hawke and this specie has been recorded within 3 km of the study area to the south (NPWS, 2005). Therefore, given that the subject site is adjoined by a large area of potential foraging habitat for this species, and that potential roosting habitat is located within 4 km of the study area, it is considered that the Common Blossom-bat is likely occur within the study area, and is also likely to traverse, and/or forage within the subject site.
Eastern Freetail-bat Mormopterus norfolkensis	*Vulnerable*	*Not Listed*	The Eastern Freetail-bat occurs on the mid coast of NSW to south eastern Queensland (NPWS, 2000). While little is known about the biology of this species, the Eastern Freetail-bat has been mostly recorded in drier forest types east of the Great Dividing Range such as dry sclerophyll forest, woodland and coastal dune vegetation (NPWS, 2005). In addition, the Eastern Freetail-bat has been recorded to roost in tree hollows and also under bark and man made structures (Strahan, 1998; NPWS, 2005; DEC, 2005).	The study area contains potential foraging and roosting habitat for the Eastern Freetail-bat. In addition, this species has been recorded within 500 m of the study area and is therefore likely to occur within the subject site and adjoining habitats (NPWS, 2005).
Yellow-bellied Sheathtail-bat Saccolaimus flaviventris	*Vulnerable*	*Not Listed*	The Yellow-bellied Sheathtail-bat occurs across northern Australia, north of the Tropic of Capricorn, extending south through eastern NSW to Victoria and SA. There are only a few scattered records of this species in NSW (NPWS, 2000). The Yellow-bellied Sheathtail-bat occurs in a	The study area contains potential foraging and roosting habitat for the Yellow-bellied Sheathtail-bat. This species has been recorded within approximately 12 km to the north of the study area (Cumberland Ecology, 2005). The Yellow-bellied Sheathtail-bat is therefore likely to occur within

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SPECIES	TSC ACT STATUS	EPBC ACT STATUS	GENERAL DESCRIPTION HABITAT REQUIREMENTS & ECOLOGY	RECORDED DISTRIBUTION, LIKELIHOOD OF OCCURRENCE ON THE SUBJECT SITE & ADJOINING HABITATS,
			wide range of habitats, and primarily roost in tree hollows, however is known to roost in abandoned Sugar Glider nests and have also been observed roosting on the walls of buildings in broad daylight (Churchill, 1998; Strahan, 1998).	the subject site given the occurrence of potential habitat within the study area and the proximity of the nearest records.
Greater Broad-nosed Bat Scoteanax rueppelli	*Vulnerable*	*Not Listed*	The Greater Broad-nosed Bat occurs along the coast and coastal ranges of eastern Australia from north Queensland to southern NSW (NPWS, 2000; Duncan et al., 1999). This species occurs from sea level to highland areas in the central parts of its range, and appears to be restricted to altitudes below 500 m in the southern parts of its range, and restricted to high altitudes in the northern parts of its range (Duncan et al., 1999, Strahan, 1998). The Greater Broad-nosed Bat occurs in a variety of habitats from woodland, moist and dry eucalypts forest and rainforest (NPWS, 2000; Duncan, 1999). This species feeds upon large flying insects, and is also known to feed upon other species of bats (NPWS, 2000; Strahan, 1998). While little is known about breeding habitat for this species, the Greater Broad-nosed Bat has been found roosting in tree hollows, cracks and fissures in the trunk and boughs of stags, under exfoliating bark, and roof spaces of buildings (Duncan et al., 1999; Strahan, 1998).	The study area contains potential foraging and roosting habitat for the Greater Broad-nosed Bat. This species has been recorded within 2 km of the study area. Therefore, given the species mobility and occurrence of potential habitat within the study area, the Greater Broad-nosed Bat is likely to occur within the subject site and adjoining habitats (Ecotone, 2005).
Large-eared Pied Bat Chalinolobus dwyeri	*Vulnerable*	*Vulnerablee*	The Large-eared Pied Bat mainly occurs in a variety of drier habitats, including dry woodlands and dry sclerophyll forest. This species has been recorded from scattered locations on between the central coast of Queensland and southern NSW (Strahan, 1998). There are some isolated records from subalpine woodland above 1500 m and at the edge of rainforest and moist eucalypt forest (Strahan, 1998). The Large-eared Pied Bat is insectivorous and roosts in caves, mine tunnels and abandoned mud nests of Fairy Martins (Strahan, 1998).	The subject site contains potential foraging habitat for the Large-eared Pied Bat. In addition, the vegetation communities that surround the subject site also represent potential foraging habitat for this species. The study area however, does not contain potential roosting habitat for this species. Given that the Large-eared Pied Bat is more often recorded further inland, and that nearest record of this species is over 70 km to the south near Nelson Bay, it is considered unlikely that the Large-eared Pied Bat would utilise the study area on a regular basis.
Southern Myotis	*Vulnerable*	*Not Listed*	This species is currently under taxonomic revision and therefore a	The small bodies of water within the subject site represents potential

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SPECIES	TSC ACT STATUS	EPBC ACT STATUS	GENERAL DESCRIPTION HABITAT REQUIREMENTS & ECOLOGY	RECORDED DISTRIBUTION, LIKELIHOOD OF OCCURRENCE ON THE SUBJECT SITE & ADJOINING HABITATS,
Myotis macropus			definitive statement about this species is difficult. Despite this, the Southern Myotis is thought to have occurred along the east coast of Australia from south east Queensland to Victoria and South Australia, and also along inland waterways of the Murray and Darling River Systems (Duncan et al., 1999). This species are often found roosting near bodies of still or slowly moving water where they almost exclusively forage, catching aquatic insects and small fish by raking the surface with its specialised and relatively large claws (NPWS, 2000; Strahan, 1998; Duncan et al., 1999). This species roosts in colonies that may occur in tree hollows, caves, mines, tunnels, dense vegetation, and disused birds nests, or underneath bridges and buildings (NPWS, 2000; Duncan, 1999).	foraging habitat for the Southern Myotis. In addition, the subject site and adjoining habitats contain potential roosting habitat (hollow trees) for the Southern Myotis. This species has been recorded within 4 km to the north of the study area (NPWS, 2005). Given the occurrence of potential habitat within the study area and the nearest records, the Southern Myotis is likely to occur within the subject site.
Little Bentwing-bat Miniopterus australis	*Vulnerable*	*Not Listed*	The Little Bentwing-bat occurs along the east coast of Australia from north eastern Queensland to the central coast of NSW (NPWS, 2000; NPWS, 2005). This species has been noted to predominantly forage between the canopy and the understorey within well timbered habitats including moist and dry sclerophyll forest, rainforest, Melaleuca swamps, dense coastal banksias (Strahan, 1998; NPWS, 2005; NPWS, 2000). This species roosts in colonies, primarily roosting in caves and tunnels, often sharing the roost with the Eastern Bentwing-bat (NPWS, 2005; NPWS, 2000; Strahan, 1998).	The study area contains potential foraging habitat for the Little Bentwing-bat however due to the lack of tunnels or caves, does not contain potential roosting habitat for this species. This species has been recorded within 500 m of the study area and is therefore likely to forage within the subject site and adjoining habitats (Ecotone, 2003; NPWS, 2005)
Eastern Bentwing-bat Miniopterus schreibersii oceansis	*Vulnerable*	*Not Listed*	The Eastern Bentwing-bat occurs in eastern Australia from north Queensland to far south east SA In NSW they are found along the coast and western slopes, including high elevations of the Great Dividing Range (NPWS, 2000). This species predominantly forages above the tree canopy in well timbered valleys occurring in a range of forest and woodland types (Strahan, 1998; NPWS, 2000). This species roosts in colonies, roosting in caves, tunnels, and closed stormwater drains, and often shares the roost with the Little Bentwing-bat (NPWS, 2005; NPWS, 2000; Strahan, 1998).	The study area contains potential foraging habitat for the Eastern Bentwing-bat. The study area however, does not contain potential roosting habitat for this species. This species has been recorded within 500 m of the study area and is therefore likely to occur within the subject site and adjoining habitats (Ecotone, 2003; NPWS, 2005).

Threatened Fauna Species Recorded or Predicted to Occur on or Within the Locality of the Subject Site and Assessment of their Likelihood of Occurrence on the Subject Site

SPECIES	TSC ACT STATUS	EPBC ACT STATUS	GENERAL DESCRIPTION HABITAT REQUIREMENTS & ECOLOGY	RECORDED DISTRIBUTION, LIKELIHOOD OF OCCURRENCE ON THE SUBJECT SITE & ADJOINING HABITATS,
Leathery Turtle *Dermochelys coriacea*	*Vulnerable*	*Vulnerable and Migratory (Bonn)*	The Leathery Turtle occurs in all coastal waters of Australia, with most sightings in temperate waters (Cogger, 2000). This species mostly feeds gelatinous organisms such as jellyfish, squid, salps, and siphonophores (DEH, 2005). Most of the nesting in Australia appears to be low density and there are no major nest sites recorded in Australia. Although nesting is mostly confined to tropical beaches, there are records of nests in northern NSW. (DEH, 2005; Cogger et al., 1993).	The subject site does not contain oceanic marine environments and therefore does not contain appropriate feeding or nesting habitat for the Leathery Turtle. This species may occasionally occur within Wallis Lake, and has been recorded within 3 km to the south east of the study area, near Seven Mile Beach. It is unlikely that the Leathery Turtle would occur with in the subject site (NPWS, 2005).
Green Turtle *Chelonia mydas*	*Vulnerable*	*Vulnerable and Migratory (Bonn)*	The Green Turtle has been recorded in coastal waters of all Australian states; however, this species predominantly occurs in tropical and subtropical waters, with some individuals straying into temperate waters, including coastal waters of NSW north coast (Cogger et al., 1993; NPWS, 2000). This species migrates great distances between foraging grounds and nesting beaches, where they lay eggs in holes dug in beaches throughout their range. In Australia, major nest sites are known in the Great Barrier Reef and the Gulf of Carpentaria and WA (DEH, 2005, Cogger et al, 1993). The Green Turtle has been noted to be carnivorous when young; however, as adults, this species primarily feeds upon seagrass and algae, and may also consume fish egg cases, jellyfish and sponges (DEH, 2005, NPWS, 2000).	The subject site does not contain oceanic marine environments and therefore does not contain appropriate feeding or nesting habitat for the Green Turtle. This species may occasionally occur within Wallis Lake and has been recorded within 9 km to the south east of the study area, near Seven Mile Beach. It is unlikely, however that the Green Turtle would occur with in the subject site (NPWS, 2005).
Stephen's Banded Snake *Hoplocephalus stephensii*	*Vulnerable*	*Not Listed*	The Stephen's Banded Snake occurs on the coast and ranges of eastern Australia from the central coast of NSW to south eastern Queensland (NPWS, 2000; Cogger, 2000). This species occurs in a variety of habitats including rainforest, wet and moist sclerophyll forest, and dry sclerophyll forest, however, it is more commonly found in wetter habitats such as rainforest and wet sclerophyll forest, particular with rocky outcrops, cliffs or ridges (NPWS, 2005; Cogger, 2000). The Stephen's Banded Snake is a partly arboreal species and feeds upon lizards, frogs, birds and small mammals. The Stephen's Banded Snake dens among vines, or in rock crevices, and hollow trees and logs (NPWS, 2000; NPWS, 2005; Cogger et al. 2000).	The subject site is considered as unlikely to contain potential habitat for this species due to the small number of hollow bearing trees and lack of dead timber on the site.

Appendix F

Fauna species recorded in the Locality

Table 7-1. Mammalian Species Recorded in the Locality

Family Name	Common Name	Species Name	Ecotone, (2003)	Austeco, (1993)	ERM, (2001)	Salter, (2002)	ERM, (1997)	Orogen, (2008)
ACROBATIDAE	Feathertail Glider	*Acrobates pygmaeus*						x
CANIDAE	Fox	*Vulpes vulpes*			x			
	Dog	*Canis familiaris*	x		x			
	Dingo	*Canis lupus*						x
DASYURIDAE	Brown Antechinus	*Antechinus stuartii*	x		x	x	x	x
PERAMELIDAE	Northern Brown Bandicoot	*Isoodon macrourus*	x		x	x		
	Long-nosed Bandicoot	*Perameles nasuta*	x	x	x			
PETAURIDAE	Sugar Glider	*Petaurus breviceps*	x		x			x
	Squirrel Glider	*Petaurus norfolcensis*	x		x	x		x
PHALANGERIDAE	Common Brushtail Possum	*Trichosurus vulpecula*	x		x	x		
PSEUDOCHEIRIDAE	Greater Glider	*Petauroides volans*				x		
PTEROPODIDAE	Grey-headed Flying-fox	*Pteropus poliocephalus*		x	x			x
	Little Red Flying-fox	*Pteropus scapulatus*	x		x			
MACROPODIDAE	Eastern Grey Kangaroo	*Macropus giganteus*				x		x

Family Name	Common Name	Species Name	Ecotone, (2003)	Austeco, (1993)	ERM, (2001)	Salter, (2002)	ERM, (1997)	Orogen, (2008)
	Red-necked Wallaby	*Macropus rufogriseus*						x
	Quokka	*Setonix brachyurus*			x			
	Swamp Wallaby	*Wallabia bicolor*	x	x			x	x
MOLOSSIDAE	Eastern Freetail-bat	*Mormopterus norfolkensis*		x		x		
	White-striped Freetail-bat	*Nyctinomus australis*	x	x				
MURIDAE	Eastern Chestnut Mouse	*Pseudomys gracilicaudatus*			x			
	New Holland Mouse	*Pseudomys novaehollandiae*	x		x			x
	House Mouse	*Mus musculus*			x		x	
	Bush Rat	*Rattus fuscipes*	x		x	x		x
	Swamp Rat	*Rattus lutreolus*	x		x			x
	Black Rat	*Rattus rattus*			x			
RHINOLOPHIDAE	Eastern Horseshoe-bat	*Rhinolophus megaphyllus*	x					
TACHYGLOSSIDAE	Short-beaked Echidna	*Tachyglossus aculeatus*				x		
VESPERTILIONIDAE	Little Bentwing-bat	*Miniopterus australis*	x			x		x
	Common Bentwing-bat	*Miniopterus schreibersii*				x		x
	Lesser Long-eared Bat	*Nyctophilus geoffroyi*	x					

Family Name	Common Name	Species Name	Ecotone, (2003)	Austeco, (1993)	ERM, (2001)	Salter, (2002)	ERM, (1997)	Orogen, (2008)
	Gould's Long-eared Bat	*Nyctophilus gouldi*	x					x
	Gould's Wattled Bat	*Chalinolobus gouldii*	x		x			x
	Chocolate Wattled Bat	*Chalinolobus morio*	x		x			x
	Southern Myotis	*Myotis macropus*			x			
	Greater Broad-nosed Bat	*Scoteanax rueppellii*			x			
	Eastern Broad-nosed Bat	*Scotorepens orion*	x		x	x		
	Eastern Forest Bat	*Vespadelus pumilus*				x		x
	Little Forest Bat	*Vespadelus vulturnus*	x		x			x

Table 7-2. Amphibian Species Recorded in the locality

FAMILY NAME	COMMON NAME	SPECIES NAME	ECOTONE (2003)	AUSTECO (1993)	ERM, (2001)	SALTER, (2002)	ERM, (1997)	CONICS (2008)
HYLIDAE	*Green Tree Frog*	*Litoria caerulea*			x			
	Bleating Tree Frog	*Litoria dentata*	x		x			
	Eastern Dwarf Tree Frog	*Litoria fallax*	x		x	x	x	x
	Freycinet's Frog	*Litoria freycineti*		x				
	Dainty Green Tree Frog	*Litoria gracilenta*			x			x
	Rocket Frog	*Litoria nasuta*	x					
	Peron's Tree Frog	*Litoria peronii*	x	x				
MYOBATRACHIDAE	*Common Eastern Froglet*	*Crinia signifera*	x	x	x		x	x
	Wallum Froglet *	*Crinia tinnula*			x		x	x
	Eastern Banjo Frog	*Limnodynastes dumerilii*	x		x			x
	Brown-striped Frog	*Limnodynastes peronii*	x	x	x		x	x
	Brown Toadlet	*Pseudophryne bibronii*		x				
	Dusky Toadlet	*Uperoleia fusca*			x			x
	Smooth Toadlet	*Uperoleia laevigata*						x

* = Vulnerable, Schedule 2 TSC Act (1995).

Table 7-3. Reptilian Species Recorded in the locality

FAMILY NAME	COMMON NAME	SPECIES NAME	ECOTONE, (2003)	AUSTECO, (1993)	ERM, (2001)	SALTER, (2002)	ERM, (1997)	CONICS, (2008)
AGAMIDAE	*Jacky Lizard*	*Amphibolurus muricatus*	*x*		*x*			
COLUBRIDAE	*Common Tree Snake*	*Dendrelaphis punctulata*	*x*				*x*	
ELAPIDAE	*Black-bellied Swamp Snake*	*Hemiaspis signata*	*x*					
	Red-bellied Black Snake	*Pseudechis porphyriacus*	*x*		*x*		*x*	
	Eastern Brown Snake	*Pseudonaja textiles*	*x*					
	Eastern Small-eyed Snake	*Rhinoplocephalus nigrescens*	*x*					
PYGOPODIAE	*Common Scaly-foot*	*Pygopus lepidopodus*		*x*				
SCINCIDAE	*Robust Ctenotus*	*Ctenotus robustus*	*x*		*x*			*x*
	Copper-tailed Skink	*Ctenotus taeniolatus*	*x*		*x*			
	Land Mullet	*Egernia major*	*x*			*x*		
	Dark-flecked Garden Sunskink	*Lampropholis delicata*	*x*	*x*	*x*			*x*
	Yellow-bellied Three-toed Skink	*Saiphos equalis*						*x*
VARANIDAE	*Lace Monitor*	*Varanus varius*	*x*		*x*	*x*		

Table 7-4. Bird Species Recorded in the locality

FAMILY NAME	COMMON NAME	SPECIES NAME	ECOTONE (2003)	AUSTECO (1993)	ERM (2001)	SALTER (2002)	ERM (1997)	CONICS (2008)
ACCIPITRIDAE	*Osprey*	*Pandion haliaetus*					*x*	
	Pacific Baza	*Aviceda subcristata*	*x*					
	Black-shouldered Kite	*Elanus axillaries*	*x*				*x*	
	Whistling Kite	*Haliastur sphenurus*	*x*		*x*	*x*	*x*	
	Brahminy Kite	*Haliastur Indus*	*x*		*x*			
	White-bellied Sea-Eagle	*Haliaeetus leucogaster*	*x*	*x*	*x*	*x*	*x*	
	Swamp Harrier	*Circus approximans*	*x*		*x*			
	Grey Goshawk	*Accipiter novaehollandiae*					*x*	*x*
	Collared Sparrowhawk	*Accipiter cirrocephalus*	*x*					
AEGOTHELIDAE	*Australian Owlet-nightjar*	*Aegotheles cristatus*		*x*				
ALCEDINIDAE	*Laughing Kookaburra*	*Dacelo novaeguineae*		*x*		*x*		*x*
	Sacred Kingfisher	*Todiramphus sanctus*			*x*			*x*
ANATIDAE	*Musk Duck*	*Biziura lobata*		*x*				
	Australian Wood Duck	*Chenonetta jubata*		*x*		*x*		*x*
	Pacific Black Duck	*Anas superciliosa*		*x*		*x*	*x*	
	Grey Teal	*Anas gracilis*		*x*				
	Chestnut Teal	*Ana castanea*		*x*		*x*		

FAMILY NAME	COMMON NAME	SPECIES NAME	ECOTONE (2003)	AUSTECO (1993)	ERM (2001)	SALTER (2002)	ERM (1997)	CONICS (2008)
	Hardhead	*Aythya australis*				x		
ARDEIDAE	*Australasian Bittern*	*Botaurus poiciloptilus*		x				
ARTAMIDAE	*White-breasted Woodswallow*	*Artamus leucorynchus*			x			
	White-browed Woodswallow	*Artamus superciliosus*	x					
	Dusky Woodswallow	*Artamus cyanopterus*			x			x
	Grey Butcherbird	*Cracticus torquatus*	x	x	x			x
	Pied Butcherbird	*Cracticus nigrogularis*			x		x	x
	Australian Magpie	*Gymnorhina tibicen*	x	x	x	x	x	x
	Pied Currawong	*Strepera graculina*	x			x	x	x
CACATUIDAE	*Yellow-tailed Black-Cockatoo*	*Calyptorhynchus funereus*	x		x			x
	Galah	*Eolophus roseicapillus*	x					x
	Sulphur-crested Cockatoo	*Cacatua galerita*				x		
CAMPEPHAGIDAE	*Black-faced Cuckoo-shrike*	*Coracina novaehollandiae*	x		x	x		
	Cicadabird	*Coracina tenuirostris*	x		x			
CAPRIMULGIDAE	*White-throated Nightjar*	*Eurostopodus mystacalis*				x		
CENTROPODIDAE	*Pheasant Coucal*	*Centropus phasianius*			x		x	
CHARADRIIDAE	*Masked Lapwing*	*Vanellus miles*				x		x
CLIMACTERIDAE	*White-throated Treecreeper*	*Cormobates leucophaeus*		x				x

Family Name	Common Name	Species Name	Ecotone (2003)	Austeco (1993)	ERM (2001)	Salter (2002)	ERM (1997)	CONICS (2008)
COLUMBIDAE	*Brown Cuckoo-Dove*	*Macropygia amboinensis*	*x*			*x*		
	Common Bronzewing	*Phaps chalcoptera*	*x*					
	Crested Pigeon	*Ocyphaps lophotes*			*x*			*x*
	Bar-shouldered Dove	*Geopelia humeralis*	*x*		*x*	*x*		*x*
	Topknot Pigeon	*Lopholaimus antarcticus*	*x*			*x*		
CORACIIDAE	*Dollarbird*	*Eurystomus orientalis*			*x*	*x*		*x*
CORVIDAE	*Australian Raven*	*Corvus coronoides*	*x*		*x*			*x*
	Forest Raven	*Corvus tasmanicus*	*x*					
	Little Raven	*Corvus mellori*	*x*					
	Torresian Crow	*Corvus orru*		*x*	*x*	*x*		*x*
CUCULIDAE	*Pallid Cuckoo*	*Cuculus pallidus*	*x*					
	Fan-tailed Cuckoo	*Cacomantis flabelliformis*				*x*		*x*
	Pacific Koel	*Eudynamys orientalis*			*x*			
	Channel-billed Cuckoo	*Scythrops novahollandiae*	*x*					
DICAEIDAE	*Mistletoebird*	*Dicaeum hirundinaceum*	*x*	*x*	*x*			*x*
DICRURIDAE	*Black-faced Monarch*	*Monarcha melanopsis*	*x*					
	Leaden Flycatcher	*Myiagra rubecula*	*x*					
	Satin Flycatcher	*Myiagra cyanoleuca*				*x*		

FAMILY NAME	COMMON NAME	SPECIES NAME	ECOTONE (2003)	AUSTECO (1993)	ERM (2001)	SALTER (2002)	ERM (1997)	CONICS (2008)
	Magpie-lark	*Grallina cyanoleuca*			x	x		x
	Rufous Fantail	*Rhipidura rufifrons*	x	x	x			
	Grey Fantail	*Rhipidura fuliginosa*	x	x	x	x		x
	Willie Wagtail	*Rhipidura leucophrys*			x			x
HIRUNDINIDAE	*Welcome Swallow*	*Hirundo neoxena*	x		x			x
	Tree Martin	*Hirundo nigricans*			x			
MALURIDAE	*Superb Fairy-wren*	*Malurus cyaneus*		x	x	x		x
	Variegated Fairy-wren	*Malurus lamberti*		x	x			
	Southern Emu-wren	*Stipiturus malachurus*		x	x			x
MELIPHAGIDAE	*Little Wattlebird*	*Anthochaera chrysoptera*		x	x	x		x
	Noisy Friarbird	*Philemon corniculatus*	x					x
	Noisy Miner	*Manorina melanocephala*		x		x		x
	Lewin's Honeyeater	*Meliphaga lewinii*		x				x
	Yellow-faced Honeyeater	*Lichenostomus chrysops*		x	x	x		x
	New Holland Honeyeater	*Phylidonoyris novaehollandiae*			x			x
	White-cheeked Honeyeater	*Phylidonyris nigra*		x	x			x
	Eastern Spinebill	*Acanthorhynchus tenuirostris*	x	x	x			x
	Scarlet Honeyeater	*Myxomela sanguinolenta*			x			

FAMILY NAME	COMMON NAME	SPECIES NAME	ECOTONE (2003)	AUSTECO (1993)	ERM (2001)	SALTER (2002)	ERM (1997)	CONICS (2008)
ORIOLIDAE	*Olive-backed Oriole*	*Oriolus sagittatus*	*x*			*x*		
	Figbird	*Sphecotheres viridis*	*x*		*x*			*x*
PACHYCEPHALIDAE	*Crested Shrike-tit*	*Falcunculus frontatus*	*x*					
	Golden Whistler	*Pachycephala pectoralis*	*x*	*x*		*x*		*x*
	Rufous Whistler	*Pachycephala rufiventris*	*x*		*x*			
	Grey Shrike-thrush	*Colluricincla harmonica*	*x*		*x*	*x*		
PARDALOTIDAE	*Spotted Pardalote*	*Pardalotus punctatus*		*x*				
	Striated Pardalote	*Pardalotus striatus*		*x*				*x*
	White-browed Scrubwren	*Sericornis frontalis*			*x*			
	Brown Thornbill	*Acanthiza pusilla*		*x*	*x*	*x*		
	Buff-rumped Thornbill	*Acanthiza reguloides*			*x*			
	Yellow Thornbill	*Acanthiza nana*			*x*			
	Striated Thornbill	*Acanthiza lineate*		*x*				
PASSERIDAE	*Red-browed Finch*	*Neochmia temporalis*	*x*					*x*
PELECANIDAE	*Australian Pelican*	*Pelecanus conspicillatus*			*x*			
PETROICIDAE	*Jacky Winter*	*Microeca fascinans*	*x*	*X*				
	Eastern Yellow Robin	*Eopsaltria australis*	*x*		*x*	*x*		
PHALACROCORACIDAE	*Little Pied Cormorant*	*Phalacrocorax melanoleucos*		*x*		*x*		

FAMILY NAME	COMMON NAME	SPECIES NAME	ECOTONE (2003)	AUSTECO (1993)	ERM (2001)	SALTER (2002)	ERM (1997)	CONICS (2008)
	Little Black Cormorant	*Phalacrocorax sulcirostris*			x			
	Great Cormorant	*Phalacrocorax carbo*		x				
PHASIANIDAE	*Brown Quail*	*Coturnix ypsilophora*	x		x			
	King Quail	*Coturnix chinensis*			x			
PODARGIDAE	*Tawny Frogmouth*	*Podargus strigoides*			x	x		
PODICIPEDIDAE	*Hoary-headed Grebe*	*Poliocephalus poliocephalus*		x				
PSITTACIDAE	*Rainbow Lorikeet*	*Trichoglossus haematodus*	x			x		x
	Scaly-breasted Lorikeet	*Trichoglossus chlorolepidotus*			x			x
	Musk Lorikeet	*Glossopsitta concinna*	x					
	Australian King-Parrot	*Alisterus scapularis*				x		
	Eastern Rosella	*Platycercus eximius*	x		x			x
PSOPHODIDAE	*Eastern Whipbird*	*Psophodes olivaceus*	x	x	x	x		
PTILONORHYNCHIDAE	*Green Catbird*	*Ailuroedus crassirostris*	x					
RALLIDAE	*Dusky Moorhen*	*Gallinula tenebrosa*		x				
SYLVIIDAE	*Tawny Grassbird*	*Megalurus timoriensis*	x		x			
	Brown Songlark	*Cinclormphus cruralis*	x					
	Golden-headed Cisticola	*Cisticola exilis*	x					
THRESKIORNITHIDAE	*Australian White Ibis*	*Threskiornis molucca*					x	x

FAMILY NAME	COMMON NAME	SPECIES NAME	ECOTONE (2003)	AUSTECO (1993)	ERM (2001)	SALTER (2002)	ERM (1997)	CONICS (2008)
ZOSTEROPIDAE	*Silvereye*	*Zosterops lateralis*	*x*		*x*			

Eotone = Ecotone, (2003). Species Impact Statement for the Proposed Residential Development at Lots 103, 142 & 178 The Lakes Way, Forster.
Austeco = Austeco, (1993). Pacific Palms Sewerage and Forster Sewerage Augmentation. Impacts on Flora and Fauna.
ERM = ERM, (2001). Sweet Pea Road to Greenpoint Drive Watermain Replacement – Ecological Investigations. Prepared for Terra Consulting (NSW) Pty Ltd.
Salter = Salter, B.J., (2002). Ecological Assessment for Proposed Expansion of Bowen's Quarry. Part Lot 22 & Lot 23 DP 1023003 Sweet Pea Road, South Forster.
ERM, (1997). Eight Part Test. Lots 4 – 7 DP 249361 South Forster. Report Prepared for Inquiry Investments Pty Ltd.
OROGEN (2008) Terrestrial Flora and Fauna Study, Lots 1-7 DP 249361, The Lakes Way, South Forster
CONICS, (2008). Detected within the Study area during the recent surveys undertaken by CONICS within the Study area

Appendix G.

Weather recorded for the months of the field surveys

Forster, New South Wales
September 2008 Daily Weather Observations

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Mo	9.5	22.5	1.6						17.0	75	1	WNW	15		18.5	62	1	SE	22	
2	Tu	9.5	21.2	0						16.0	69	0	WSW	15		18.0	58	1	ESE	20	
3	We	8.4	19.5	0						15.5	79	4	WSW	19							
4	Th	11.6	18.5	45.6						18.0	62	7	E	30		16.3	77	8	ESE	39	
5	Fr	13.5	17.0	5.0						16.0	90	8	ESE	65		15.0	96	8	SE	35	
6	Sa	12.5	15.0	51.6						13.0	100	8	W	52		13.0	94	8	WSW	37	
7	Su	11.5	19.5	13.2						14.5	73	4	W	41		17.5	61	3	SW	13	
8	Mo	9.6	20.0	0						15.5	79	2	SW	17		17.0	61	2	SSW	17	
9	Tu	10.2	17.0	0.2						14.0	57	1	SW	19		16.0	46	1	SSW	24	
10	We	6.0	18.5	0						13.0	66	1	W	11		16.0	55	1	SSE	24	
11	Th	6.5	19.0	0						13.0	72	0	W	6		18.0	53	5	ENE	24	
12	Fr	8.5	20.5	0						17.0	61	1	WNW	4		19.5	68	1	ENE	24	
13	Sa	9.8	21.8	0						17.5	73	0	NE	7		20.0	81	3	NE	22	
14	Su	15.3	22.0	0						18.5	85	7	NNE	24		20.0	81	8	NNE	13	
15	Mo	15.0	28.5	1.0						19.5	68	0	NE	24		28.0	33	0	NW	37	
16	Tu	14.2	21.6	0						17.5	31	0	SSW	24		20.5	30	0	SSW	26	
17	We	8.6	18.0	0						14.5	73	7	SSW	17		16.0	69	7	ESE	19	
18	Th	12.4	20.0	0						17.0	66	3	NE	9		19.4	64	3	ENE	26	
19	Fr	11.8	21.5	0						17.5	80	1	NE	9		20.0	81	0	NE	22	
20	Sa	13.2	23.0	0						20.0	81	0	ENE	15		21.0	82	2	ENE	17	
21	Su	14.7	24.0	0						21.0	73	0	NE	4		21.0	77	1	NE	13	
22	Mo	12.5	28.0	0						22.5	66	1	NE	15		22.5	78	7	SE	19	
23	Tu	12.5	20.0	6.8						19.0	85	8	WSW	9		20.0	68	8	SW	11	
24	We	13.2	20.0	11.0						18.5	37	2	S	22		18.0	49	7	S	11	
25	Th	14.0	20.2	0						17.0	70	5	WSW	4							
26	Fr	9.0	22.0	0						17.0	66	0	NNE	11		19.0	67	1	NE	31	
27	Sa	9.8	26.5	0						21.5	50	1	W	28							
28	Su	11.4	33.0	0						20.0	64	0	E	9		32.5	20	0	WNW	28	
29	Mo	15.3	23.5	0						19.5	85	1	SW	13		21.5	42	1	S	15	
30	Tu	12.0	20.0	6.8						17.5	71	3	WNW	7		19.0	67	1	NE	26	
Statistics for September 2008																					
Mean		11.4	21.4							17.3	70	2		18		19.4	63	3		22	
Lowest		6.0	15.0							13.0	31	0	#	4		13.0	20	0	#	11	
Highest		15.3	33.0	51.6						22.5	100	8	ESE	65		32.5	96	8	ESE	39	
Total				142.8																	

Observations were drawn from Forster - Tuncurry R.V.C.P. (station 060013)

The closest station with pressure and evaporation observations is at Taree about 36 km to the north. The closest station with sunshine observations is at Williamtown about 91 km to the southwest.

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Forster, New South Wales
February 2009 Daily Weather Observations

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Su	22.0	27.0	0						22.0	87	1	NE	20		26.0	69	1	E	39	
2	Mo	22.0	27.5	0						25.0	83	6		Calm		25.5	76	6	E	17	
3	Tu	18.0	27.0	0						22.0	87	5	NE	4		25.0	79	5	ENE	31	
4	We	19.0	27.5	0						24.5	88	3	ENE	9		26.5	80	2	NE	24	
5	Th	21.5	27.0	0						22.0	91	1	NE	20		26.0	76	1	ENE	31	
6	Fr	18.5	25.0	0						21.5	86	0	NE	28		24.0	79	0	NE	28	
7	Sa	18.0	25.0	0						21.2	85	0	ENE	19		24.5	76	0	NNE	37	
8	Su	17.2	25.5	0						21.5	86	0	NE	20		25.0	76	0	ENE	26	
9	Mo	17.0	28.8	0						23.0	67	7	WSW	6		28.0	54	2	SE	28	
10	Tu	19.0	27.0	0						23.0	84	7	E	11		26.0	76	7	ESE	22	
11	We	17.8	23.0	4.8						19.0	90	8	WSW	30		22.0	82	6	SW	19	
12	Th	16.5	21.5	20.0						18.5	90	8	SW	4		20.5	81	8	S	17	
13	Fr	16.5	24.0	28.8						21.0	57	8	SE	22		23.0	55	8	ESE	30	
14	Sa	18.0	23.0	17.0						19.0	100	8	SE	37							
15	Su	16.8	23.0	118.0						19.0	100	8	ESE	15		20.0	100	8	SSW	26	
16	Mo	17.0	24.5	30.0						23.0	59	7	S	31		23.0	71	8	SE	19	
17	Tu	18.5	22.2	6.8						22.0	74	8	S	31		21.5	86	8	SSE	28	
18	We	18.4	23.5	53.4						20.0	95	8	WNW	15		22.0	87	8	SSE	11	
19	Th	18.0	26.3	0.4						22.0	82	6	WSW	11		25.0	72	3	E	17	
20	Fr	18.8	28.2	0						23.5	87	6	SW	9		26.0	80	6	ESE	30	
21	Sa	21.0	27.5	0						24.5	79	7	SSE	17		27.0	71	4	E	31	
22	Su	17.8	26.0	6.0						23.0	74	6	S	11		25.0	68	3	ESE	20	
23	Mo	17.5	26.6	0						23.0	83	0		Calm		26.0	73	1	NE	43	
24	Tu	19.5	27.0	0						22.5	87	4	NNE	7		26.0	76	5	NE	31	
25	We	18.8	27.0	0						24.0	87	7	WSW	7		25.0	76	8	ESE	17	
26	Th	19.5	25.2	0						22.0	74	6	W	15		25.0	57	5	SW	22	
27	Fr	16.0	25.0	0						21.0	77	1	WSW	11		23.5	56	6	S	19	
28	Sa		25.5	0						19.0	81	2	WNW	4		25.0	62	2	NE	24	
Statistics for February 2009																					
	Mean	18.5	25.6							21.8	82	4		14		24.5	73	4		25	
	Lowest	16.0	21.5							18.5	57	0		Calm		20.0	54	0	SSE	11	
	Highest	22.0	28.8	118.0						25.0	100	8	SE	37		28.0	100	8	NE	43	
	Total			285.2																	

Observations were drawn from Forster - Tuncurry R.V.C.P. (station 060013)
The closest station with pressure and evaporation observations is at Taree about 36 km to the north. The closest station with sunshine observations is at Williamtown about 91 km to the southwest.

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