Flora and Fauna Assessment
For
Myall River Downs, Tea Gardens

Prepared by:

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Job No: 24737
Date: February 2009

Document Status

Version	Purpose of Document	Orig	Review	Review Date	Format Review	Approval	Issue Date
Ver 1	Draft for Client Review				WJ 10-12-09		

Disclaimers

EXECUTIVE SUMMARY

Introduction

RPS Harper Somers O'Sullivan Pty Ltd (RPS HSO) has been commissioned by Great Lakes Council to review and update the original Local Environmental Study prepared by Parsons Brinkerhoff (2003) for Myall River Downs, Tea Gardens. This study is to take into account more recent survey works and investigations with some additional survey to be included in the Local Environmental Study (LES) over land at Myall River Downs.

A number of studies have been completed including an LES undertaken by Parsons Brinckerhoff (PB) in October 2003, however, a number of new or updated studies need to be reviewed in preparing the updated LES. The following objectives are considered within this report:

- Review all ecological documentation produced within the area since preparation of the previous LES in 2003;

- Further detailed assessment, including additional surveys covering the study area, and updated wildlife database searches are required to identify the current state of the environment in relation to previous documentation;

- Detailed consolidation of Squirrel Glider documentation and information needs to be provided in the LES as the occurrence of the Squirrel Glider within the area is of significance. The Koala population requires a similar level of specific consideration in relation to the Plan of Management (POM);

- An updated and consolidated habitat mapping and constraints analysis is required to be prepared to identify potential areas for future development and any future offsets. This should take into account regional vegetation mapping, SIS vegetation mapping (prepared by Conacher Travers) and representation and conservation status of vegetation communities present within the study area. It should also take into account habitat suitability for the Squirrel Glider (and other threatened or regionally significant species); and

- Drainage issues are a major factor requiring consideration for the study area. It should be ensured that proposed drainage outcomes and their resultant impact upon threatened species issues are adequately considered in the LES.

Methods

The development of the Flora and Fauna Assessment Report for Myall River Downs comprised of the following aspects:

- **Literature Review -** Collation and review of existing flora and fauna datasets and survey reports relevant to the locality of the study area. These include Species Impact

Statement (SIS) by Conacher Travers (2007) and the LES by Parsons Brinkerhoff (2003).

- **Vegetation survey & mapping datasets –** The vegetation assessment included a review of the Great Lakes Council Vegetation Strategy (Eastern Portion) (2003). Ground truthing of the existing mapping by both Conacher Travers and Parsons Brinckerhoff was performed.

- **Habitat investigations –** Updated and consolidated habitat mapping and constraints analysis. Review of the occurrence of the Squirrel Glider within the area of consideration. Updated consideration of relevant Koala issues.

RESULTS

Flora

The flora survey methodology consisted of a combination of quadrats, transects, random meanders and targeted searches for threatened flora species considered likely to occur within the subject site.

Eleven vegetation communities were found within the study area. The majority of the subject site was cleared comprising an exotic open pasture while the remaining vegetation communities mapped were remnant or planted vegetation. The eleven vegetation communities included:

1. Open Woodland *Eucalyptus signata*
2. Open Forest *Corymbia maculata & Eucalyptus siderophloia*
3. Open Forest *Corymbia gummifera*
4. Woodland *Angophora costata*
5. Open Forest *Eucalyptus robusta*
6. Open Forest *Melaleuca quinquinervia*
7. Open Forest *Melaleuca quinquinervia/Eucalyptus robusta*
8. Woodland *Pinus elliotii/Eucalyptus signata*
9. Open Forest *Pinus elliotii*
10. Disturbed/Cleared Land
11. Dams

No Endangered Ecological Communities (EECs) were located in the study area. Nonetheless, the combined results of various flora surveys undertaken have confirmed the presence of one threatened flora species within the study area being *Syzygium paniculatum*.

One *Syzygium paniculatum* plant was located within the study area during surveys and no other specimens could be located by RPS HSO ecologists. As this is the only example of

this threatened plant located within the study area, it is unlikely to be viable into the future, although should be retained where possible and appropriate buffers maintained.

Regionally Significant Vegetation Community

The Open Forest *Eucalyptus signata* vegetation community has a limited distribution within the Great Lakes LGA with the majority of the community being mapped by Great Lakes Council within the northern part of the LGA near Forster. Six areas have been mapped in the Tea Gardens area with the majority mapped within the Myall River Downs study area. Four disturbed remnant fragmented patches and one larger portion occur within the study area. The four fragmented portions have limited potential for regeneration due to their isolation. It is considered that due to their limited potential and fragmentation that these areas could be removed as part of the proposal. The larger patch, however, has good potential for regeneration due to the connectivity to the adjoining swamp vegetation to the south and potential soil seed bank. This area is currently subjected to grazing by cattle and slashing. If these management practices were to cease within the community the understorey species are still present and the potential for regeneration is good.

Fauna

A total of 21 threatened fauna species were recorded or considered likely to occur within the study area. These species included Wallum Froglet, Black-necked Stork, Regent Honeyeater, Swift Parrot, Powerful Owl, Masked Owl, Brush-tailed Phascogale, Eastern Pygmy Possum, Squirrel Glider, Eastern Chestnut Mouse, Long-nosed Potoroo, Koala, Grey-headed Flying fox, Large-eared Pied Bat, Little Bentwing-bat, Eastern Bentwing Bat, Eastern Freetail Bat, Yellow-bellied Sheathtailed Bat, Eastern False Pipistrelle, Large-footed Myotis and Greater Broad-nosed Bat.

The study area was found to have significant habitat for Wallum Froglet, Koala and Squirrel Glider species. These habitats have been mapped as constraints and future development within these areas would be subject to impact assessment.

Hawks Nest and Tea Gardens Endangered Koala Population

A Recovery Plan for the Hawks Nest and Tea Gardens Endangered Koala Population has been prepared (DECC 2003). This Recovery Plan contains future recovery actions and objectives for habitat protection rehabilitation, protection of existing Koalas and community education and awareness. The recovery plan has identified Habitat Loss and Fragmentation, mortalities from vehicle collisions and attacks by domestic and wild dogs as the key threats to this population.

The occurrence of preferred Koala Habitat in the form of Open Forest *Eucalyptus robusta* within the southern portion of the study area and the Open Forest *Eucalyptus signata* within the eastern portion of the study area will require specific consideration.

It is therefore recommended that identified Koala Habitat be considered for retention as part of any future concept plan. Any potential loss of Koala Habitat via proposed development will need to be carefully assessed in regards to identification, mitigation and control of impacts to acceptable levels. Future landscaping within buffers and drainage lines could utilise Preferred Koala Feed trees to improve and maintain connectivity with retained habitat and habitat occurring within the local area.

In addition to the above recommendations any future development that may proceed within the preferred koala habitat will require a Koala Plan of Management to be prepared.

Squirrel Glider Habitat Management Plan

A Squirrel Glider Habitat Management Plan (SGHMP) has been prepared for the Squirrel Glider Population to address agreements, prohibitions and actions to protect habitat area of the Squirrel Glider (SG). This Plan was prepared as a result of an appeal to the Land and Environment Court in relation to a Development Application for a retirement village on Part Lot 404 DP 1048133.

A Species Impact Statement (Conacher Travers 2007) has been undertaken for a proposed 8 Lot subdivision in the southern portion of the Study Area. The SIS considers that there may be allowances to permit single dwelling constructions without significantly impacting on SG population due to the retention of the majority of canopy within this section of the site. However, under the requirements of the SGHMP (Section 2.1 Action 1) no development or vegetation clearing is to be carried out within the areas identified within the SGHMP, with the exception of ongoing Bushfire Hazard Management (Section 2.5) for the adjacent retirement village. Under these actions the proposed subdivision is currently not permissible and the subdivision would require Court Consent to modify the SGHMP.

Further, it is considered that any changes to the SGHMP to allow the inclusion of a subdivision would require full attention to the proposed management actions to minimise vegetation removal and enhance habitat restoration.

SEPP 14 (Coastal Wetlands)

The close proximity of the SEPP 14 wetland to the RPS HSO study area, approximately 80m south of the southern boundary and entering the study area on the north western edge) is of potential concern. Due to the close proximity of the SEPP 14 wetland (a small area of the study area is mapped as SEPP 14 wetlands), development of the study area has the potential to influence the sensitive receiving environment of the wetland. Due to the low-lying nature and complex hydrology of wetlands, even potential impacts that may occur near the downstream outlet may also potentially impact on the remainder of the wetland upstream. Such examples include pollutant dispersal, erosion and sedimentation, and resultant impacts on habitats, vegetation and micro ecological niches. It is therefore recommended that a 100m buffer be adopted to protect the SEPP 14 Wetland from the potential aforementioned impacts.

A constraints map (Figure 5-1) has been developed incorporating all of the aforementioned constraints to give a possible development area which is most likely to have the least impact upon native flora, fauna and ecological communities.

Constraints and Opportunities

Due to the previous planning history of the Myall River Downs site for pragmatic reasons the study area was divided into three sections (Figure 1-3):

1. Proposed 8-lot subdivision in the southern part of the site;
2. A 'Transition Area' in the western part of the site;
3. The remainder of the Myall River Downs study area, which for the purposes of this report is identified as the 'Potential Development area'.

The conclusions for each of these sections are listed below and contain recommendations for potential development therein. In addition, buffers are recommended for the SEPP 14 Wetland and the 7(a1) Environmental Protection Zones. These buffers have been incorporated into the constraints map to provide Great Lakes Council with a potential development area for the entire Myall River Downs Site from an ecological perspective.

The following are a summary of the recommendations

Proposed 8- lot Rural Subdivision

- Retention of the *Syzygium paniculatum*, where possible and implement a buffer of at least 50 metres to protect this plant from any proposed building envelopes;

- This section has been identified as Core Koala habitat. A Koala Plan of Management will need to be prepared for the whole ***study area*** to ensure adequate habitat and linkage is retained throughout the study area in conjunction with any development proposal;

- A SGHMP has been prepared and should be duly considered to ensure that Squirrel Glider habitat is adequately protected;

- This part of the site is identified as Squirrel Glider habitat. In particular, canopy trees which maintain connectivity. Should any development proceed in this area and vegetation is removed, revegetation within allotments and adjacent buffers will need to occur.

- Indirect impacts to the Wallum Froglet may occur as a result of any development. If any development proceeds appropriate sediment and water management strategies will need to be implemented to offset any impacts for this species;

- A 40m buffer be implemented around the 7(a1) Environmental Protection Zoned land to protect native vegetation to the south.

Therefore, in conclusion, should the proposed 8 lot rural subdivision proceed the above recommendations will need to be addressed.

Transition Area

- Development Principles should be generated for this area via an appropriate planning mechanism to ensure that the value and function of the zone is reflected in any land use proposals within and adjacent to this zone.

- It is recommended that the large area of Open Forest *Eucalyptus signata* vegetation community located within this area be retained;

- From an ecological perspective, there is no reason development cannot proceed within the northern portion of this area which is mapped as Disturbed / Cleared Land;

- A 40m buffer should be implemented around the 7(a1) Environmental Protection Zoned land to protect native vegetation to the west;

- A 100 m buffer should be implemented around the SEPP 14 Wetland mapped to the west to protect sensitive ecosystems.

Potential Development Area

- The four remaining fragmented patches of the Open Forest *Eucalyptus signata* vegetation community are considered to have limited ability for regeneration due to their isolation, fragmentation and small size. Therefore removal of these areas is considered to unlikely to have a significant impact upon this vegetation community within the locality. Nonetheless, it is recommended that the Open Forest *Eucalyptus signata* vegetation community within this area be retained, where possible;

- A 40 m buffer should be implemented around the drainage lines within this area;

- A 40m buffer should be implemented around the 7(a1) Environmental Protection Zoned lands to protect native vegetation;

- Retention of the mapped areas of Koala and Wallum Froglet habitat within this area is recommended.

It is also recommended that Great Lakes Council undertake targeted surveys for *Grevillea parviflora ssp parviflora* species during July to December to determine the extent of the population within the Great Lakes Council Lands to the north east of the study area. It is also recommended that this land be rezoned from Open Space to a conservation zone such as 7(a1) to conserve this population for the future. Any disturbance of the

understorey is likely to be detrimental to this species in the long term. Further searches should be undertaken in other areas of know habitat particularly the Scribbly Gum Open Forest Habitats in the northern portion of Great Lakes LGA.

General Conclusions for Study Area

RPS Harper Somers O'Sullivan Pty Ltd (RPS HSO) has been commissioned by Great Lakes Council to review and update the original Local Environmental Study prepared by Parsons Brinkerhoff (2003) for Myall River Downs. This study has taken into account more recent survey works and investigations with some additional survey.

In addition to the conclusions which have already been made the following conclusions have been made in respect to the entire study area:-

- The study area provides suitable habitat for the threatened flora species *Grevillea parviflora spp parviflora* within the areas mapped as Open Woodland *Eucalyptus signata*;

- No EECs are present within the study area;

- The alteration of any drainage lines are to be avoided as this is likely to result in the Key Threatening Process of "Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands" which must be reduced through incorporating sediment and water management strategies into the planning, construction and occupation phases of the proposed development;

- Appropriate future development of the study area is considered unlikely to lead to a significant impact on the threatened fauna assessed, notwithstanding habitat for Koala, Squirrel Glider and Wallum Froglet as previously mentioned will need to be carefully considered and managed;

- The study area contains "Core Koala Habitat" under SEPP 44 and will require an approved Koala Plan of Management for the entire study area in conjunction with any development proposal;

- The study area is within close proximity to a SEPP 14 Coastal Wetland and must be protected through the implementation of a 100 metre buffer of the mapped wetland and through incorporating sediment and water management strategies into the planning, construction and occupation phases of the proposed development; and

- If any proposed development adjoins lands zoned 7(a1) environmental protection it has the potential to be influenced by edge affects. Implementation of a 40 metre buffer has been recommended to minimise this impact.

- The minimum amount of clearing should take place as a general objective of the project, particularly within those areas that currently contain identified native vegetation communities. These areas have been described within this report.

- Map and document the hollow bearing trees within the study area and ensure that no more than 5% of hollow bearing trees are removed by the proposed development without further impact assessment. Mature and / or hollow-bearing trees should be retained wherever feasible and with regards to public safety within the development framework.

- Retain, cease slashing and fence the larger portion of the Open Woodland *Eucalyptus signata* to allow regeneration. Implement a vegetation management plan to guide rehabilitation of the community. Great Lakes Council rezone the Open Forest *Eucalyptus signata* vegetation community within its lands to 7(a1) Environmental Protection to conserve the population of *Grevillea parviflora subsp. parviflora* found therein. Targeted surveys should be undertaken within these lands to determine the size and extent of the population.

- Proposed sediment retention ponds should be landscaped with fringing wetland vegetation (e.g. *Typha sp*.) to provide habitat for guilds such as frogs and waterbirds, including the threatened Wallum Froglet which inhabits the study area.

- A weed management and monitoring plan for the study area should be developed and implemented to minimise the potential for the invasion of aquatic and terrestrial weed species into the SEPP 14 wetland and buffer zones. The weed management and monitoring plan should be developed in consultation with DECC to ensure consistency with management strategies undertaken for the adjacent Myall Lakes National Park and Corrie Island Nature Reserve.

Development and Construction Recommendations

- During any construction phase, for any tree removal within forested areas, and in particular where hollow-bearing trees may be removed, all works should be supervised by an ecologist to recover any native fauna that are potentially displaced. Furthermore, where such risks occur, site-specific ecological advice should be sought to minimise impacts during the entire process. A clearing protocol should be adopted for the removal of trees containing suitable habitat hollows as follows (this is considered as a guideline, variations on the methods employed may be required to accommodate site specific factors):

    - All hollow bearing trees are to be flagged by an ecologist prior to the commencement of works within the study area.
    - Underscrubbing of the entire study area should be carried out by a 4x4 tractor with a slashing deck, this will minimise the establishment of degradation processes and leave a layer of mulch to aid in soil retention in

the event of adverse weather. At this time felling of non habitat trees can take place, however a matrix of trees *must* be maintained to allow animal movement into the designated refuge area.

- After a period of two weeks, clearing of habitat trees should commence. Clearing must be carried out moving from the fringe of the matrix towards the refuge area. Trees should be 'soft felled' and inspected immediately by an ecologist for displaced fauna. All trees must be left for a minimum of two nights prior to being moved to a stockpile, to allow resident fauna to vacate tree hollows.

- Strict management of stormwater runoff and sediment control from the study area must occur to minimise potential impacts on SEPP 14 wetlands and Wallum Froglet habitat.

- Where possible, earthworks (and certainly all works in the vicinity of drainage lines) should be undertaken during appropriate (i.e. dry) weather conditions. This will ensure that any potential erosion events will be intercepted and that no downstream impacts occur within any of the drainage lines. This will help to maintain existing habitat characteristics for native fauna in those areas, including those for threatened species.

- Nutrient and sediment control devices should be erected pre-clearing and post-construction works in sensitive areas where degradation processes may be triggered such as areas adjacent to watercourses until suitable rehabilitation has occurred to maintain surface integrity. Furthermore, stockpiles should be subject to individual sediment and nutrient control devices.

- Pre-clearing inspections should be undertaken by an ecologist in wooded areas where threatened fauna species have been recorded or are considered likely to occur. This is particularly important in areas where threatened fauna may have been noted during recent surveys either breeding or nest-building. No breeding attempts should be disrupted during the course of the project, particularly by threatened fauna.

Note Clearing should ideally take place outside of the main breeding seasons of resident fauna, preferably during late autumn and winter.

Post Development Recommendations

- Species selection for future landscaping works and seed stock for revegetation should, where possible, collected from locally occurring native species to maintain local genetic diversity. These species should include Eucalyptus robusta, Eucalyptus signata and other regionally significant species.

TERMS AND ABBREVIATIONS

Abbreviation	Meaning
aff.	Affinity
CMA	Catchment Management Authority
CT	Conacher Travers Environmental Consultants
DBH	Diameter at Breast Height (centimetres)
DECC	NSW Department of Environment and Climate Change (formerly NSW Department of Environment and Conservation)
DEWHA	Commonwealth Department of Environment, Water, Heritage and the Arts (formerly Department of Environment and Heritage)
DNR	NSW Department of Natural Resources (formerly Department of Infrastructure, Planning and Natural Resources)
DoP	NSW Department of Planning
EEC	Endangered Ecological Community
EPA Act	*NSW Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
ERM	Environmental Resources Management Australia
FM Act	NSW *Fisheries Management Act 1994*
Ha	hectare
Hwy	Highway
LES	Local Environmental Study
LEP	Local Environmental Plan
KPoM	Koala Plan of Management
LGA	Local Government Area
NPWS	NSW National Parks and Wildlife Service
PB	Parsons Brinckerhoff Australia Pty Ltd
PFC	Projected Foliage Cover
RPS HSO	RPS Harper Somers O'Sullivan
ROTAP	Rare or Threatened Australian Plants (Briggs & Leigh 1995)
SGHMP	Squirrel Glider Habitat Management Plan
SIS	Species Impact Statement
Ssp. or subsp.	Subspecies
Sp	Singular Species
Spp	Multiple Species

SSS	State Significant Site
Study Area	Area studied within this report
TSC Act	NSW *Threatened Species Conservation Act 1995*
Var.	Variety

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1.0 INTRODUCTION

RPS Harper Somers O'Sullivan Pty Ltd (RPS HSO) has been commissioned by Great Lakes Council to review and update the original Local Environmental Study prepared by Parsons Brinkerhoff (2003) for Myall River Downs. This study is to take into account more recent survey works and investigations with some additional survey work to be included in the updated Local Environmental Study (LES) over land at Myall River Downs.

1.1 Background

Several previous studies have been undertaken within the Myall River Downs site and the immediate vicinity. These include a Local Environmental Study (LES) by Parson Brinkerhoff (PB) in 2003 and a Species Impact Statement (SIS) by Conacher Travers (CT) in 2007. The CT study area covered a large area of approximately 2000 ha. This study area is depicted in Figure 1-1 and will be described as the CT study area from this point forward. The PB study area was smaller and comprised of approximately 440 ha (Figure 1-1) and will be referred to as the PB study area. This report encompasses a small area of approximately 250 ha (Figure 1-1) and will be referred to as the 'study area' from this point forward. The main difference between the PB study area and the current study area is that lands within the PB study area (to the south) have already been zoned for conservation purposes and as such no development is proposed within these areas.

The Parsons Brinckerhoff (2003) LES was commissioned by Great Lakes Council to consider environmental issues associated with possible development of land identified as a key urban growth opportunity in the Tea Gardens Hawks Nest Conservation Strategy. The land was defined as Myall River Downs within the PB (2003) LES. A flora and fauna survey was performed for the Myall River Downs area by Parsons Brinkerhoff (PB) as part of their LES. This report delineated 17 vegetation communities with no threatened flora species detected. Targeted surveys for cryptic orchids and *Tetratheca juncea* were recommended in the report. No Endangered Ecological Communities (EECs) were reported, however several of the communities which were described have since that time been listed as EEC's within the *Threatened Species Conservation (TSC) Act*. These include Swamp Oak Floodplain Forest, Coastal Saltmarsh and Swamp Sclerophyll Forest on Coastal Floodplains.

Seven threatened fauna species were recorded by PB (2003), with an additional ten species identified by PB to have been recorded within 5 kilometres of the study area. These include Koala, Squirrel Glider, Eastern Chestnut Mouse, Eastern Blossom Bat, Greater Broad-nosed Bat, Little Bent-wing Bat, Large Bent-

wing Bat, Large-footed Myotis, Powerful Owl, Masked Owl, Osprey, Glossy Black Cockatoo, Black-necked Stork, Little Tern, Sooty Oystercatcher, Pied Oystercatcher and Wallum Froglet.

Conacher Travers (CT) prepared a Species Impact Statement (SIS) (2007) for the landholder *Myall River Downs Pty Ltd* to accompany the development application for a proposed 8 lot rural subdivision within the study area.

The CT report delineated 24 vegetation communities within the CT study area. One threatened flora species, *Syzygium paniculatum*, was identified within the proposed 8 lot rural residential subdivision area (in the south of the study area). Ten threatened fauna species were identified within the CT study area, these included Koala, Squirrel Glider, Eastern Pygmy Possum, Eastern Freetail Bat, Little Bent-wing Bat, Grey Headed Flying Fox, Powerful Owl, Masked Owl, Pied Oystercatcher and Wallum Froglet. Two endangered ecological communities were recorded, being Swamp Oak Floodplain Forest and Coastal Saltmarsh.

WARNING
No part of this plan should be used for critical design dimensions. Confirmation of critical positions should be obtained from Harper Somers O'Sullivan Pty Ltd.

LEGEND
- Study Area
- Parsons Brinckerhoff Study Area
- Conacher Travers Study Area

0 0.75 1.5km

TITLE: Figure 1-1 Survey Locations

SCALE: 1: 25000 at A3 Size **DRAWN:** A.Saddington **APPROVED:** D.Landenberger

DATUM: MGA Zone 56 (GDA 94) **DATE:** 21/10/2008

LAYOUT REF:J:\JOBS\24k\24737 Tea Gardens\Drafting\MapInfo\Ecology\Report Workspaces\24737 Figure 1-1 Survey Locations A A3

CONTOUR INTERVAL: N/A

JOB REF: 24737

CLIENT:
Great Lakes Council

PLANNING SURVEYING ECOLOGY

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1.2 Study Area Particulars

Locality – The study area adjoins the Port Stephens estuary and encompasses the Myall River Downs site (Figure 1-2).

LGA – Great Lakes Council

Title(s) – Lot 403 DP 1042125, Lot 54 DP 1039382, Lot 404 DP 1093720 and Parts of Sections 7-10 DP 13103. It should be noted that 77 Lots of Sections 7-10 DP 13103 are included within the proposed 8 lot subdivision, but are lots in name only. These historically created lots are referred to as 'paper subdivisions' as they are lots identified on paper only and are incapable of being developed. These lots also include several road reserves. The study area is currently zoned 1(a) Rural Zone, 7(a) Wetlands and Littoral Rainforest Zone and 7(a1) Environmental Protection Zone under Great Lakes Local Environmental Plan (LEP) 1996.

Area – The study area covers approximately 250 ha.

Boundaries – The study area is bound by bushland that extends to Limekilns Road and Wobbegong Bay to the south, by bushland that extends to Myall Way to the north, by the township of Tea Gardens and Myall River to the east and by Kore Kore Creek to the west. The proposed 8 Lot subdivision located in the southern portion of the study area is located on Spinifex Avenue and is bordered to the north east by the Tea Gardens Grange Retirement Village, to the south by native vegetation that adjoins SEPP 14 wetland and to the north by the Hermitage Retirement Village.

Current Land Use – Current land use is pasture for grazing, and a sand mining quarry. The majority of the study area is being regularly slashed, with the surrounding bushland area to the south, north and west being vacant and relatively undisturbed. The majority of the bushland has been zoned as environmental protection.

Topography – The majority of the study area is characterised by gently sloping land which is low lying, with some areas of the study area periodically inundated.

The previous planning history of the study area means that for pragmatic reasons the current Myall River Downs study area is divided into three areas as identified in Figure 1-3:

1. Proposed 8-lot subdivision in the southern part of the site;

2. A ‘Transition Area’ in the western part of the site;

3. The remainder of the Myall River Downs study area, which for the purposes of this report is identified as the ‘Potential Development area’.

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LEGEND

- Study Area
- Drainage Lines
- Roads

Viney Creek Road

Kore Kore Creek

Myall Street

Tea Gardens

HERMITAGE RETIREMENT VILLAGE

0 0.5 1km

TITLE: Figure 1-2 Site Location

SCALE: 1: 17232.32 at A3 Size **DRAWN:** A.Saddington **APPROVED:** D.Landenberger

DATUM: MGA Zone 56 (GDA 94) **DATE:** 21/10/2008

LAYOUT REF:J:\JOBS\24k\24737 Tea Gardens\Drafting\MapInfo\Ecology\Report Workspaces\24737 Fig 1-2 Site locality B A3

CONTOUR INTERVAL: N/A

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LEGEND

- Study Area
- Drainage Lines
- Roads

Study Area Sections

- Pre Approved Hermitage Retirement Village
- Proposed 8 Lot Subdivision
- Potential Development Area
- Transition Area

WARNING
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To Pacific Hwy

Viney Creek Road

Shearwater Estate

Kore Kore Creek

Tea Gardens

Myall Street

Hermitage Retirement Village

Wobbengong Bay

Pindimar Bay

0 400 800m

TITLE: Figure 1-3 Proposed Development & Potential Development Areas

CLIENT: Great Lakes Council

SCALE: 1: 12000 at A3 Size **DRAWN:** A.Saddington **APPROVED:** D.Landenberger

DATUM: MGA Zone 56 (GDA 94) **DATE:** 3/2/2009

LAYOUT REF:J:\JOBS\24k\24737 Tea Gardens\Drafting\MapInfo\Ecology\Report Workspaces\24737 Figure 1-3 proposed dev and potential dev areas A A3

CONTOUR INTERVAL: N/A

JOB REF: 24737

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1.3 Scope of the Study

The following objectives are considered within this report:

- Review all ecological documentation produced within the area since preparation of the previous LES in 2003;

- Further detailed assessment, including additional on-site surveys covering the LES area, and updated wildlife database searches are required to identify the current state of the environment in relation to previous documentation;

- Detailed consolidation of Squirrel Glider documentation and information needs to be provided in the LES as the occurrence of the Squirrel Glider within the area is of significance. The Koala population requires a similar level of specific consideration in relation to the Koala Plan of Management (POM);

- An updated and consolidated habitat mapping and constraints analysis is required to be prepared to identify potential areas for development and any future offsets. This should take into account regional vegetation mapping, SIS vegetation mapping prepared by Conacher Travers and representation and conservation status of vegetation communities present on-site. It should also take into account habitat suitability for the Squirrel Glider (and other threatened or regionally significant species) and

- Drainage issues are a major factor requiring consideration for the study area. It should be ensured that proposed drainage outcomes and their resultant impact upon threatened species issues are adequately considered in the LES.

1.4 Qualifications and Licensing

1.4.1 Qualifications

The principal author of this report was Toby Lambert BEnvSc of RPS Harper Somers O'Sullivan Pty Ltd, with additional input from Deborah Landenberger BSc (Hons), Sam Bishop BEnvSc and Shaun Corry (Dip Cons. and Land Mgt). The academic qualifications and professional experience of all RPS HSO ecologists involved in the project are documented in Appendix 4.

1.4.2 Licensing

Research was conducted under the following licences:

- NSW National Parks and Wildlife Service Scientific Investigation Licence S10300 (Valid 30 November 2009);
- Animal Research Authority (Trim File No: 01/1142) issued by NSW Agriculture (Valid 12 March 2009);
- Animal Care and Ethics Committee Certificate of Approval (Trim File No: 01/1142) issued by NSW Agriculture (Valid 12 March 2010); and
- Certificate of Accreditation of a Corporation as an Animal Research Establishment (Trim File No: 01/1522 & Ref No: AW2001/014) issued by NSW Agriculture (Valid 22 May 2011).

1.5 Certification

As the principal author, I, Toby Lambert, make the following certification:

- The results presented in the report are, in the opinion of the principal author and certifier, a true and accurate account of the species recorded, or considered likely to occur within the study area;
- All research workers have complied with relevant laws and codes relating to the conduct of flora and fauna research, including the *Animal Research Act 1995, National Parks and Wildlife Act 1974 and the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes*.

Signature of Principal Author and Certifier:

Toby Lambert
Senior Ecologist
RPS Harper Somers O'Sullivan
February 2009

2.0 METHODS

The development of the Flora and Fauna Assessment Report for Myall River Downs comprised of the following aspects:

- Literature Review - Collation and review of existing flora and fauna datasets and survey reports relevant to the locality of the study area. These include a SIS by Conacher Travers (2007) and the previous LES by Parsons Brinckerhoff (2003).

- Vegetation survey & mapping datasets – The vegetation assessment included a review of the Great Lakes Council Vegetation Strategy (Eastern Portion) (2003). Ground truthing of the existing mapping by both Conacher Travers and Parsons Brinckerhoff was performed.

- Habitat investigations – Updated and consolidated habitat mapping and constraints analysis. Review of the occurrence of threatened species within the area of consideration. Review of the SGHMP and the Recovery Plan for the Hawks Nest and Tea Gardens Endangered Koala Population (DECC 2003).

The information below, including Table 2-1, summarises the field survey methods and survey effort carried out within the Myall River Downs site by the three consultancies mentioned above. The survey area covered during the different surveys within the study area is summarised in Figure 1-1. Extensive survey work within the Conacher Travers study area has been undertaken and it is considered that sufficient survey effort was undertaken for this SIS. This is due to the high level of targeted surveys and large number of hours spent performing field work. PB (2003) have also performed field work, this report completed the field surveys which are sufficient to provide ecological constraints of the site.

The role of the current survey is to identify any vegetation mapping discrepancies between the two previous reports, and to identify potential development areas within the defined study area (see Figure 1-1). The portions of the site zoned 7(a) Wetlands and Littoral Rainforest & 7 (a1) Environmental Protection have not been surveyed in any detail within the current survey. The current study has restricted the survey to the predominantly disturbed areas, as these areas hold the greatest potential for any future development.

The following sections contain a detailed description of the methods undertaken for this Report. The methods used to conduct previous ecological investigations are contained within the relevant reports (Conacher Travers, 2003; 2007; Parsons Brinckerhoff 2003) and should be read in conjunction with this Flora & Fauna Assessment Report for completeness if more detail is required.

Table 2-1: Combined survey effort of flora and fauna investigations within study area at Myall River Downs

	Conacher Travers (2003, 2007)	Parsons Brinckeroff LES (2003)	RPS HSO (2008)
Season	Autumn (March 2003, April, May 2005) Winter (June, July, August 2005) Spring (September 2005, October, November 2004) Summer (December 2005, February 2004)	Spring (November 1999) and Summer (December and January 2000)	Winter (August) Spring(September)
Flora Survey Work	6 x quadrats and random meanders in the proposed 8 lot rural subdivision area. A further 24 quadrats within the study area Targeted searches for 10 m parallel transects for *Angophora inopina, Asperula asthenes, Callistemon linearifolius, Cryptostylis hunteriana, Cynanchum elegans, Dillwynia tenuifolia, Diuris arenaria, Diuris praecox, Eucalyptus glaucina, Eucalyptus parramattensis ssp. decadens, Melaleuca biconvexa, Pomaderris queenslandica, Rhizanthella slateri, Senecio spathulatus, Senna acclinis, Syzygium paniculatum, Tetratheca juncea, Thesium australe* and *Tylophora wololsii*	17 x quadrats, and random meanders.	5 x quadrats random meanders to groundtruth existing vegetation mapping Opportunistic sightings of threatened flora species.
Diurnal Bird Survey	Census points, general observation and call identification	15 Census points, general observation and call identification	Opportunistic surveys during flora surveys
Effort	Over 200 hours and opportunistic observations undertaken during each site visit Seasonal surveys were undertaken targeted for specific species	24 person hours and opportunistic observations on each site visit	Opportunistic surveys during flora surveys
Nocturnal Bird Survey	Spotlighting, call playback and call identification	Spotlighting, call playback and call identification	-
Effort	Spotlighting – 56.5 hours over 18 nights Call playback – 15 hours over 17 nights	Spotlighting - 26 person hours Call playback - 6 nights	-
Herpetofauna Survey	Diurnal habitat searches, nocturnal spotlighting, pitfall trapping and frog call playback	Diurnal habitat searches	Opportunistic surveys during flora surveys

	Conacher Travers (2003, 2007)	Parsons Brinckeroff LES (2003)	RPS HSO (2008)
Effort	Diurnal habitat searches - 130 hours over 27 days Spotlighting – 26.25 hours over 12 nights Pitfall trapping 22 trap nights over 7 days Frog call playback 11.75 hours over 7 days Diurnal call census 110 hours over 22 days	Diurnal habitat searches – 10 person hours over 4 days	Opportunistic surveys during flora surveys
Bat Survey	Harp trapping, bat call recording (ANABAT)	Harp trapping and bat call recording (ANABAT)	-
Effort	Harp trapping - 13 harp trap nights over 5 nights Mobile ANABAT recording – 75.5 hours over 20 nights	Harp trapping – 24 trap nights at 9 sites ANABAT recording – 16 sites	-
Terrestrial Mammal Survey	Elliott A, B & E, cage and hair trapping and spotlighting	Elliott and cage trapping, Hair tubes and spotlighting	Opportunistic surveys during flora surveys
Effort	Elliott 'A, E & B ' traps - 775 trap nights over 22 nights Cage traps - 150 trap nights over 13 nights Hair traps – 360 tub nights over 12 nights Spotlighting - 61 hours over 19 nights	Elliott 'A ' traps – 150 traps for 4 nights = 600 trap nights Cage traps - 18 medium traps for 8 nights = 48 trap nights Spotlighting - 26 hours Hair tubes – ten hair tubes, 5 with peanut butter oats and 5 with meat left out for 10 days.	Opportunistic surveys during flora surveys
Arboreal Mammal Survey	Arboreal trapping and spotlighting	Arboreal trapping, , spotlighting and call playback	-
Effort	Elliott 'B' traps - 922 trap nights over 22 nights Spotlighting - 61 hours over 19 nights	Elliott 'B' traps - 70 traps mounted on trees for 4 nights = 280 trap nights Spotlighting - 26 person hours Call playback - 4 nights	-
Koala Survey	100m walking transects, scat searches, spotlighting, call playback and general observation	-	-
Effort	100m walking transects – over 60 transects Call Playback – 8.5 hours over 10 separate nights Spotlighting - 61 hours over 19 nights	-	-

	Conacher Travers (2003, 2007)	Parsons Brinckeroff LES (2003)	RPS HSO (2008)
Secondary indications and incidental observations	General observation and habitat searches	General observation and habitat searches	-
Effort	Undertaken during each site visit	Undertaken during each site visit	-

2.1 Literature Review

A review of existing literature relevant to the project was undertaken in an effort to glean as much information as possible on the existing environment and ensure a holistic approach to ecological assessment. Notably several specific flora and fauna investigations and impact assessments within the Myall River Downs site and the general locality have been undertaken in recent times. An account of the information considered is listed below.

Note: the following list is not considered comprehensive. Additional references can be viewed within Section 9 of this report.

- Conacher Travers (2007a) *Species Impact Statement Proposed Rural Subdivision Part Lot 404 Spinifex Avenue Tea Gardens.* A report for Myall River Downs Pty Ltd.

- Environmental Resources Management Australia (2007) *Resolution of Deferred Matter – Great Lakes LEP 1996 (Amendment No. 44) and Statement of Environmental Effects*, Crighton Properties Pty Ltd.

- Parsons Brinckerhoff (2003) *Local Environmental Study*, Myall River Downs. Great Lakes Council.

Vegetation Mapping Projects

- WBM (2005) *Great Lakes Council Vegetation Strategy Eastern Portion.*

Fauna Surveys / Reports

- Conacher Travers (2007b) *Koala Plan of Management Proposed Rural Subdivision Lot 404 in DP 1041833 Spinifex Avenue Tea Gardens.*

- Goldingay R., and Sharpe D., (2006). *Ecological Studies on the Squirrel Glider at Myall River Downs*. Unpublished report prepared for Conacher Travers Pty Ltd.

- Hawks Nest and Tea Gardens Endangered Koala Population (DEC 2003).

- Environment Australia (2001). *A Directory of Important Wetlands in Australia, Third Edition*. Environment Australia, Canberra.

- Garnett, S. and Crowley, G. (2000). *The Action Plan for Australian Birds 2000*. Environment Australia, Canberra, ACT.

- Gibbons, P. and Lindenmayer, D. (2002). Tree Hollows and Wildlife Conservation in Australia. CSIRO Publishing Collingwood, Victoria.

- Hilton-Taylor, C. (compiler) (2000). *2000 IUCN Red List of Threatened Species.* IUCN, Gland, Switzerland and Cambridge, UK.

- Quin, D.G. (1993). *Sociology of the Squirrel Glider and the Sugar Glider*. PhD Thesis, Department of Ecosystem Management, University of New England.

- Recher, H.F (1995) *The conservation and management of Eucalypt forest birds: resource requirements for nesting and foraging. Conservation of Australia's Forest Fauna*. Royal Zoological Society of NSW, Mosman.

Biodiversity Databases

The Atlas of NSW Wildlife	BioNet
CANRI	Australian Museum Fauna Database
Atlas of Australian Birds	PlantNet
FaunaNet	EPBC Act Database

2.2 Field Investigations – RPS HSO Nov 2008

2.2.1 Vegetation mapping

Flora surveys and vegetation mapping carried out on the study area as a part of recent efforts by RPS HSO (2008) has been undertaken as follows:

- Aerial Photograph Interpretation (API) to map the community(s) extent into definable map units;

- Confirmation of the community type(s) present (dominant species) via the undertaking of detailed flora surveys and identification;

- Review of previous vegetation mapping conducted by Parsons Brinckerhoff (2003) and Conacher Travers (2007);

- Review of the Great Lakes Shire Council Vegetation Strategy Eastern Portion (WBM 2003);

- The conservation status of the derived vegetation communities was considered in light of the findings of the Great Lakes Council Vegetation Strategy. Assessment of the potential for the derived vegetation communities to constitute EEC's as listed within the *TSC Act (1995)* and the *EPBC Act (1999)* was also undertaken. The floristic composition, geomorphological

characters and geographic distribution were considered when determining whether an EEC was present;

- Flora surveys were carried out across the study area, with an emphasis on potentially significant species, as outlined below. The general flora survey also included nine 20m x 20m quadrats (Figure 2-1), as well as Random Meanders in line with methodology termed as the "Random Meander Technique" by Cropper (1993). All roads were driven by vehicle and the paddocks in the eastern portion of the study area;

- The area surveyed is shown in Figure 2-1 and does not include the large vegetated areas within the 7(a1) Environmental Protection corridor in the south of the study area. This area was not surveyed as the proposed and potential development areas were the focus of the study to assess any ecological constraints therein. The effects of any development adjoining this area are discussed in detail in Section 5 of this report.

- Quadrats and edges of vegetation communities have been recorded by RPS HSO during the survey period. This has been undertaken with a Trimble GeoXH GPS unit, which is capable of sub-metre accuracy following post processing.

To keep consistency and to allow for comparisons between reports the names of vegetation communities that have been used by Conacher Travers (2007) have been adopted in this report.

2.2.2 Additional Vegetation Mapping

To assess the regional significance of the Open Forest *Eucalyptus signata* vegetation which is present in the study area, a quick reconnaissance of the mapped MU 171 Scribbly Gum by Great Lakes Council within the Tea Gardens locality was performed. This resulted in finds of one other area of this vegetation community as well as a threatened flora species. These observations are additional to the scope of this study however are relevant to assess whether potential development could occur within the Myall River Downs site. Thus one flora quadrat was performed outside the study area (Figure 2-1) for comparison purposes with the vegetation recorded within the study area.

2.2.3 Opportunistic observations

Opportunistic flora and fauna observations were made within the study area whilst undertaking all other field activities. Such observations were noted and added to the base dataset to ensure completeness.

This included identification of birds, reptiles and other fauna as they were observed.

WARNING

Note that this Vegetation Community Map depicts clearly defined boundaries between vegetation communities that are the product of individual interpretation and are not distinguished by clearly defined boundaries 'on the ground'.
Therefore, this map should only be treated as an indication of approximate peripheries between delineated vegetation communities.

Caution should therefore be exercised when using this data for purposes requiring high levels of accuracy. Furthermore, no account for intergrading areas between delineated vegetation communities has been made.

LEGEND

- Study Area
- Great Lake Council Lands
- 20m X 20m Flora Quadrat

Vegetation Communities

- Dam
- Disturbed/Cleared Land
- Open Forest Corymbia gummifera
- Open Forest Corymbia maculata & Eucalyptus siderophloia
- Open Forest Eucalyptus robusta
- Open Forest Eucalyptus signata
- Open Forest Melaleuca quinquinervia
- Open Forest Melaleuca quinquinervia/Eucalyptus robusta
- Open Woodland Eucalyptus signata
- Pine Forest Pinus elliotii
- Woodland Angophora costata
- Woodland Pine/Eucalyptus signata

Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9

0 0.5 1km

TITLE: Figure 2-1 Flora Quadrat Locations

CLIENT: Great Lakes Council

SCALE: 1: 13000 at A3 Size **DRAWN:** D. Landenberger **APPROVED:** M.Doherty

DATUM: MGA Zone 56 (GDA 94) **DATE:** 7/10/2008

LAYOUT REF:J:\JOBS\24k\24737 Tea Gardens\Drafting\MapInfo\Ecology\Report Workspaces\24737 Figure 2-1 Flora Quadrat Locations A-A3 071008

CONTOUR INTERVAL: N/A

JOB REF: 24737

PLANNING SURVEYING ECOLOGY

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2.3 Limitations

Limitations associated with the Flora and Fauna Assessment Report are presented herewith. The limitations have been taken into account specifically in relation to threatened species assessments, results and conclusions.

In these instances, a precautionary approach has been adopted; as such 'assumed presence' of known and expected threatened species, populations and ecological communities has been made where relevant and scientifically justified to ensure a holistic assessment.

Seasonality

The flowering and fruiting plant species that attract some nomadic or migratory threatened species, often fruit or flower in cycles spanning a number of years. Furthermore, these resources might only be accessed in some areas during years when resources more accessible to threatened species fail. As a consequence threatened species may be absent from some areas where potential habitat exists for extended periods and this might be the case for the above-mentioned species.

The seasonality of the surveys places limits on the number of flora species identified in the study area as the surveys occurred in late spring, some species may have stopped flowering and are difficult to detect. Thus the flora species cannot be considered to be complete when one survey has been completed, due to seasonality of flowering. In this case the surveys undertaken by Conacher Travers (2007) for the Species Impact Statement have been undertaken over all four seasons and therefore can be considered to give more comprehensive species detection than the current study for this report.

Data Availability & Accuracy

- The collated threatened flora and fauna species records provided by the NPWS for the region are known to vary in accuracy and reliability. Traditionally this is due to the reliability of information provided to the NPWS for collation and/or the need to protect specific threatened species locations. For the purposes of this assessment this information has been considered to have an accuracy of ± 1km.

- Threatened flora and fauna records within the region were predominantly sourced from the DECC Atlas of Wildlife Database and a DEWHA Protected Matters Search. Other sources such as Birdata and HBOC were also utilised. Limitations are known to exist with regards to these data sources and their accuracy.

Note: Data recorded by RPS HSO during the survey period, has been undertaken with a Trimble GeoXH GPS unit, which is capable of sub-metre accuracy following post processing.

Vegetation Mapping

The vegetation mapping that has been undertaken within the study area was to groundtruth previous mapping undertaken by Conacher Travers (2007) and Parsons Brinckerhoff (2003). Aerial photograph interpretation was used in conjunction with groundtruthing to produce the vegetation map. The study area for this survey was considerably smaller than that of Conacher Travers (2007) and Parsons Brinckerhoff (2003).

Fauna

The presence of fauna within a particular area is not static over time, may be seasonal or in response to the availability of a particular resource. As such, where survey effort targeting particular threatened fauna species has not specifically met guidelines recommended by DECC, habitat assessment and prediction of the occurrence of threatened fauna species has been applied. Nevertheless, it is considered that the combined survey effort and dataset from all of the investigations undertaken to date provide a substantial picture of the fauna species and habitat values occurring within the study area.

3.0 RESULTS OF FIELD INVESTIGATIONS – RPS HSO 2008

3.1 Vegetation Mapping

PB (2003) delineated seventeen vegetation communities within the PB study area. Conacher Travers (2007) provided further detail with twenty four vegetation communities delineated within their study area. A discussion on the discrepancies between the vegetation mapping of the current survey and the previous two surveys is outlined in Section 3.1.3 of this report. A review of the Great Lakes Council vegetation mapping project has mapped eleven vegetation communities within the study area. These include the following

1. MU 30 Swamp Mahogany
2. MU 31 Paperbark
3. MU 37 Dry Blackbutt
4. MU 48/31 Paperbark/Flooded Gum
5. MU 74 Spotted Gum – Ironbark/Grey Gum.
6. MU 105 Smooth barked Apple
7. MU 106 Smooth barked Apple – Sydney Peppermint – Stringybark
8. MU 117 Scribbly Gum
9. MU 126 Stringybark-Bloodwood
10. MU 231 Swamp
11. MU 220 Cleared

Groundtruthing of the study area delineated twelve vegetation communities, as opposed to the eleven identified by Council. Five of the vegetation communities listed above did not occur. These included MU 37 Dry Blackbutt, MU 48/31 Paperbark / Flooded Gum, MU 106 Smooth barked Apple – Sydney Peppermint – Stringybark, MU 126 Stringybark-Bloodwood and MU 231 Swamp. The additional vegetation communities of Pine, MU 30/31 Swamp Mahogany/Paperbark and MU 126 Red Bloodwood were mapped as occurring within the study area.

3.1.1 Description of Vegetation Communities

A description of each community is provided below and the names of the vegetation communities have been adopted from Conacher Travers 2007 for consistency and ease of identification between the two reports. The vegetation community names of CT (2007) have been adopted as these names include the floristic structure of the community within the name to give the reader a clearer understanding of the structure as well as the dominant canopy species. The PB (2003) vegetation community's names use common names with the structure in most cases being described as Forest or Woodland, this naming whilst informative does not provide detailed structure information (e.g. Open Forest or

Open Woodland). The descriptions are similar and the corresponding PB name is given at the beginning of each vegetation description.

The following 11 vegetation communities were delineated within the study area as shown in Figure 3-1 and listed below:

1. Open Woodland *Eucalyptus signata*
2. Open Forest *Corymbia maculata & Eucalyptus siderophloia*
3. Open Forest *Corymbia gummifera*
4. Woodland Angophora costata
5. Open Forest *Eucalyptus robusta*
6. Open Forest *Melaleuca quinquinervia*
7. Open Forest *Melaleuca quinquinervia/Eucalyptus robusta*
8. Woodland *Pinus elliotii/Eucalyptus signata*
9. Open Forest *Pinus elliotii*
10. Disturbed/Cleared Land
11. Dams

1. Open Woodland *Eucalyptus signata*

PB Name (2003) – 13 Scribbly Gum Woodland
This vegetation community covers approximately 11.37 ha within the study area. This vegetation community is commensurate with MU171 – Scribbly Gum as mapped by the Great Lakes Council Vegetation Mapping project. The vegetation community occurs within 5 separate sections in the western portion of the study area. It is regularly slashed and is currently being grazed by cattle. The understorey is minimal with pasture weed incursions throughout the woodland. The northern portions have isolated understorey of *Banksia aemula* (Wallum Banksia).

Upper Stratum 15 to 18m with a Projected Foliage Cover (PFC) of 5 to 20%, the dominant species being *Eucalyptus signata* (Scribbly Gum), *Corymbia gummifera* (Red Bloodwood), and occasionally *Angophora costata* (Smooth-barked Apple).

Mid Stratum 2 2 to 5m with a PFC of 30 to 40%, the dominant species being, *Banksia aemula* (Wallum Banksia), *Leptospermum polygalifolium* (Lemon-scented Tea-tree), *Acacia myrtifolia*, *Leucopogon lanceolatus*, *Dillwynia retorta* (Eggs and Bacon), *Hakea dactyloides*, and *Acacia ulicifolia* (Prickly Moses).

Lower Stratum to 1m with a PFC of 60 to 80%, the dominant species being *Hibbertia fasciculata*, *Lomandra longifolia* (Spiky-headed Matgrass) *Pteridium esculentum* (Bracken Fern),

Hypochaeris radiata (Flatweed), *Plantago lanceolata* (Ribwort), *Imperata cylindrica var. major* (Blady Grass), *Themeda australis* (Kangaroo Grass), *Pomax umbellata, Eharta erecta* (Panic Vedlt Grass) and *Pennisetum clandestinum* (Kikuyu).

2. Open Forest *Corymbia maculata & Eucalyptus siderophloia*

PB Name (2003) – 9 Spotted Gum Forest

This vegetation community occurs on the higher slopes and ridgetops within the study area. Conacher Travers mapped a large section of this community within the northern portion of their study area. In the current study this vegetation community was not sampled using flora quadrats however, a description of the dominant species was noted. This community encompasses approximately 6.91ha in the study area and is commensurate with MU 70 – Spotted Gum as described by the Great Lakes Council Vegetation Mapping project (2005).

Upper Stratum to 20m with a Projected Foliage Cover (PFC) of 20 to 30%, the dominant species being *Corymbia maculata* (Spotted Gum), *Eucalyptus siderophloia* (Grey Ironbark), *Eucalyptus umbra subsp. umbra* (Broad-leafed Mahogany) and *Eucalyptus punctata* (Grey Gum).

Mid Stratum 1 4 to 8m with a PFC of 10 to 20%, the dominant species being *Allocasuarina torulosa* (Forest She-oak) and juvenile eucalypts.

Mid Stratum 2 1.5 to 3m with a PFC of 30 to 90%, the dominant species being *Bursaria spinosa* (Blackthorn), *Pultenea villosa* and *Ozothamnus diosmifolius*.

Lower Stratum to 1.5m with a PFC of 10 to 70%, the dominant species being *Themeda australis* (Kangaroo Grass), *Entolasia stricta* (Wiry Panic), *Pomax umbellata*, *Lomandra multiflora* (Many-Flowered Mat Grass) *Dianella caerulea var. producta* (Blue Flax Lily) and *Austrodanthonia sp.*

3. Open Forest *Corymbia gummifera*

PB Name (2003) – 12 Red Bloodwood Woodland

This vegetation community covers approximately 19.66 ha within the study area. This vegetation community is commensurate with MU126 – Red Bloodwood as mapped by the Great Lakes Council Vegetation Mapping project. It occurs within the southern portions of the study area in the lower lying areas adjoining the

swamp forests. It is regularly slashed and portions of the community are currently being grazed by cattle. The southern portion is currently being utilised as an asset protection zone for the Hermitage Retirement Village.

Upper Stratum 15 to 20m with a Projected Foliage Cover (PFC) of 20 to 30%, the dominant species being *Corymbia gummifera* (Red Bloodwood), *Angophora costata* (Smooth-barked Apple) and *Eucalyptus robusta* (Swamp Mahogany).

Mid Stratum 1 5 to 8 m with a PFC of 10 to 20%, the dominant species being, *Banksia serrata* (Old Man Banksia) and juvenile eucalypts.

Mid Stratum 2 1 to 2 m with a PFC of 30 to 40%, the dominant species being, *Acacia longifolia var. longifolia* (Sydney Golden Wattle), *Pteridium esculentum* (Bracken Fern) and *Monotoca scoparia*.

Lower Stratum 0.1 to 1 m with a PFC of 60 to 80%, the dominant species being *Lomandra longifolia* (Spiky-headed Matrush), *Pomax umbellata* (Pomax), *Hardenbergia violacea* (Native Sarsparilla), *Imperata cylindrica var. major* (Blady Grass) and *Gonocarpus teucrioides* (Poverty Raspwort).

4. Woodland *Angophora costata*

PB Name (2003) – 14 Smoothbarked Apple Woodland

This vegetation community covers approximately 4.12 ha within the Study area. This vegetation community is commensurate with MU105 – Smooth-barked Apple as mapped by the Great Lakes Council Vegetation Mapping project. This vegetation community occurs in two patches within the northern portion of the study areas. The majority of the remainder of the disturbed areas contain Angophora costata as the dominant canopy tree. This community is regularly slashed and is currently being grazed by cattle.

Upper Stratum 15 to 18m with a Projected Foliage Cover (PFC) of 5 to 20%, the dominant species being *Angophora costata* (Smooth-barked Apple) with occasionally *Corymbia gummifera* (Red Bloodwood), *Eucalyptus robusta* (Swamp Mahogany) and *Melaleuca quinquinervia* (Broad-leaf Paperbark).

Mid Stratum 2 1 to 2 m with a PFC of 30 to 40%, the dominant species being, *Acacia longifolia var. longifolia* (Sydney Golden

Wattle), *Pteridium esculentum* (Bracken Fern), and *Monotoca scoparia*.

Lower Stratum – 0.1 to 1 m with a PFC of 60 to 80%, the dominant species being *Lomandra longifolia* (Spiky-headed Matrush), *Pomax umbellata* (Pomax), *Hardenbergia violacea* (Native Sarsparilla), *Imperata cylindrica var. major* (Blady Grass) and *Gonocarpus teucrioides* (Poverty Raspwort).

5. Open Forest *Eucalyptus robusta*

PB Name (2003) – 8 Swamp Mahogany Forest

This vegetation community covers approximately 18.95 ha within the study area. This vegetation community is commensurate with MU30 – Swamp Mahogany as mapped by the Great Lakes Council Vegetation Mapping project. It occurs in three patches. One is located along the creekline in the north eastern portion of the study area. This section is in very good condition with a wide variety of natives present and only pasture weed incursions on the edges of the community. The south western patch follows the creekline and has weed incursions along the edges of the community. The remaining patch in the southern section of the study area is being slashed for Asset Protection Zone purposes for the adjoining Hermitage Retirement Village.

Upper Stratum 12 to 18m with a Projected Foliage Cover (PFC) of 10 to 30%, the dominant species being Eucalyptus resinifera (Red Mahogany), Eucalyptus robusta (Swamp Mahogany) and Melaleuca quinquinervia (Broad-leaf Paperbark).

Mid Stratum 1 – 6 to 10 m with a PFC of 5 to 10%, the dominant species being, Melaleuca sieberi (Sieber's Paperbark) and Melaleuca linearifolia (Snow-in-Summer).

Mid Stratum 2 1 to 2 m with a PFC of 5 to 30%, the dominant species being, Melaleuca ericifolia (Swamp Paperbark), Melaleuca linearifolia (Snow-in-summer) and Leptospermum juniperinum (Prickly Tea-tree).

Lower Stratum 0.1 to 1 m with a PFC of 10 to 60%, the dominant species being Gahnia clarkei (Tall Saw-sedge), Baloskion tetraphyllum subsp. meiostachyum (Tassel Cord-rush), Pteridium esculentum (Bracken Fern), Lomandra longifolia (Spiky-headed Mat-rush) and Entolasia stricta (Wiry Panic).

6. Open Forest *Melaleuca quinquinervia*

PB Name (2003) – 7 Swamp Paperbark Forest
This vegetation community covers approximately 4.49 ha within the study area. This vegetation community is commensurate with MU 31 – Paperbark as mapped by the Great Lakes Council Vegetation Mapping project and occurs within the northern portion of the study area. This community is currently being grazed by cattle.

Upper Stratum 15 to 22m with a Projected Foliage Cover (PFC) of 5 to 20%, the dominant species being *Melaleuca quinquinervia* (Broad-leaf Paperbark), *Pinus elliotii* (Slash Pine) with occasionally *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus microcorys* (Tallowwood).

Mid Stratum 1 6 to 12 m with a PFC of 5 to 15%, the dominant species being, juvenile *Melaleuca quinquinervia* (Broad-leaf Paperbark) and *Pinus elliotii* (Slash Pine).

Mid Stratum 2 1 to 2 m with a PFC of 30 to 40%, the dominant species being, *Melaleuca sieberi* (Sieber's Paperbark), *Leptospermum juniperinum* (Prickly Tea-tree) and *Melaleuca linearifolia* (Snow-in-summer).

Lower Stratum – 0.1 to 1 m with a PFC of 60 to 80%, the dominant species being (Tall Saw-sedge), *Baloskion tetraphyllum subsp. meiostachyum* (Tassel Cord-rush), *Pteridium esculentum* (Bracken Fern), *Lomandra longifolia* (Spiky-headed Mat-rush) and *Entolasia stricta* (Wiry Panic).

7. Open Forest *Melaleuca quinquinervia/Eucalyptus robusta*

PB Name (2003) – 7/8 Swamp Paperbark Forest/Swamp Mahogany Forest
This vegetation community covers approximately 7.85 ha within the study area. It occurs along the creekline in the north of the study area and adjoins the Open Woodland *Eucalyptus signata* in the south of the study area. This vegetation community is commensurate with MU30/31 – Swamp Mahogany / Paperbark as mapped by the Great Lakes Council Vegetation Mapping project. The northern portion of this community has been disturbed by slashing and grazing of cattle, with the majority of the native species occurring along the creekline. The southern portion has also been slashed and has incursions of pasture weeds.

Upper Stratum 12 to 18m with a Projected Foliage Cover (PFC) of 10 to 30%, the dominant species being *Eucalyptus resinifera*

(Red Mahogany), *Eucalyptus robusta* (Swamp Mahogany) and *Melaleuca quinquinervia* (Broad-leaf Paperbark).

Mid Stratum 1 6 to 10 m with a PFC of 5 to 10%, the dominant species being, *Melaleuca sieberi* (Sieber's Paperbark) and *Melaleuca linearifolia* (Snow-in-Summer).

Mid Stratum 2 1 to 2 m with a PFC of 5 to 30%, the dominant species being, *Melaleuca ericifolia* (Swamp Paperbark), *Melaleuca linearifolia* (Snow-in-summer) and *Leptospermum juniperinum* (Prickly Tea-tree).

Lower Stratum 0.1 to 1 m with a PFC of 20 to 80%, the dominant species being (Tall Saw-sedge), *Baloskion tetraphyllum subsp. meiostachyum* (Tassel Cord-rush), *Pteridium esculentum* (Bracken Fern), *Lomandra longifolia* (Spiky-headed Mat-rush) and *Entolasia stricta* (Wiry Panic).

8. Woodland *Pinus elliotii/Eucalyptus signata*

PB Name (2003) – 15/13 Pine Forest/Scribbly Gum Woodland
This vegetation community covers approximately 8.18 ha within the study area. This vegetation community is not commensurate with any vegetation community mapped by the Great Lakes Council Vegetation Mapping project. The canopy layer is dominated by *Pinus elliottii* (Slash Pine) with *Eucalyptus signata* (Scribbly Gum) being the co-dominate species within this community. This community is regularly slashed and is currently being grazed by cattle.

Upper Stratum 15 to 18m with a Projected Foliage Cover (PFC) of 5 to 20%, the dominant species being *Pinus elliotii* (Slash Pine) and *Eucalyptus signata* (Scribbly Gum) and occasionally *Melaleuca quinquinervia* (Broad-leaf Paperbark).

Mid Stratum 2 1 to 2 m with a PFC of 30 to 40%, the dominant species being juvenile *Pinus elliotii* (Slash Pine).

Lower Stratum to 1m with a PFC of 80 to 90%, the dominant species being *Pennisetum clandestinum* (Kikuyu), *Cynodon dactylon* (Common Couch), *Richardia brasiliensis* (White Eye), *Andropogon virginicus* (Whisky Grass), *Hypochaeris radicata* (Flatweed), *Plantago lanceolata* (Ribwort), *Trifolium repens* (White Clover), *Trifolium pratense* (Red Clover), *Paspalum urvellei* (Vasey Grass) and *Senecio madagascariensis* (Fireweed).

9. Pine Forest *Pinus elliotii*

PB Name (2003) – 15 Pine Forest
This vegetation community covers approximately 9.8 ha within the study area. This vegetation community is commensurate with Pine as mapped by the Great Lakes Council Vegetation Mapping project. It occurs in the north eastern portion of the study area.

Upper Stratum 15 to 20m with a Projected Foliage Cover (PFC) of 20 to 50%, the dominant species being *Pinus elliotii* (Slash Pine).

Mid Stratum 2 1 to 2 m with a PFC of 30 to 40%, the dominant species being, juvenile *Pinus elliotii* (Slash Pine).

Lower Stratum to 1m with a PFC of 80 to 90%, the dominant species being *Pennisetum clandestinum* (Kikuyu), *Cynodon dactylon* (Common Couch), *Richardia brasiliensis* (White Eye), *Andropogon virginicus* (Whisky Grass), *Hypochaeris radicata* (Flatweed), *Plantago lanceolata* (Ribwort), *Trifolium repens* (White Clover), *Trifolium pratense* (Red Clover), *Paspalum urvellei* (Vasey Grass) and *Senecio madagascariensis* (Fireweed).

10. Disturbed / Cleared Areas

PB Name (2003) – 16 Cleared Land
This vegetation community occurs within the central portion of the study area and is the result of clearing for past agriculture practices. This community encompasses approximately 163 ha and is not commensurate with any vegetation communities that have been described by the Great Lakes Council Vegetation Mapping project. These areas are highly disturbed and have high weed incursions and are currently subjected to grazing by cattle.

Upper Stratum 15 to 18m with a Projected Foliage Cover (PFC) of 5%, the dominant species being *Angophora costata* (Smooth-barked Apple), *Corymbia gummifera* (Red Bloodwood), *Eucalyptus robusta* (Swamp Mahogany) and *Melaleuca quinquinervia* (Broad-leaved Paperbark).

Mid Stratum to 2 m with PFC of 20 to 30%, the dominant species being *Pteridium esculentum* (Bracken Fern), *Acacia ulicifolia*

(Prickly Moses) and *Acacia longifolia var. longifolia* (Sydney Golden Wattle).

Lower Stratum to 1m with a PFC of 80 to 90%, the dominant species being *Pennisetum clandestinum* (Kikuyu), *Pteridium esculentum* (Bracken Fern), *Cynodon dactylon* (Common Couch), *Richardia brasiliensis* (White Eye), *Andropogon virginicus* (Whisky Grass), *Hypochaeris radicata* (Flatweed), P*lantago lanceolata* (Ribwort), *Trifolium repens* (White Clover), *Trifolium pratense* (Red Clover) and *Senecio madagascariensis* (Fireweed).

11. Dams

PB Name (2003) – No equalivent included in Cleared Land

Five man made dams occur within the study area and adjoin cleared portions of the study area. This community encompasses approximately 0.76 ha and is not commensurate with any vegetation communities that have been described by the Great Lakes Council Vegetation Mapping project. Two occur in the north eastern corner near the farmhouse which is now utilised as an office by Myall River Downs Pty Ltd. These two dams have unformed roads surrounding them but they do contain a small diversity of native aquatic flora species. The remaining three are located along the main access road in the north of the study area. These dams are used by the cattle for water supply and are highly disturbed with the edges being trampled and muddy with high weed incursions.

Lower Stratum to 1m with a PFC of 80 to 90%, the dominant species being *Pennisetum clandestinum* (Kikuyu), *Hydrocotyle bonariensis* (Pennywort), *Imperata cylindrica var. major* (Blady Grass), *Andropogon virginicus* (Whisky Grass) and *Hypochaeris radicata* (Flatweed).

Emergents *Philydrum lanuginosum* (Wooly Frogmouth), *Baumea articulata* (Jointed Twig Rush), *Juncus prismatocarpus* (Branching Rush) and *Juncus usitatus* (Common Rush).

Floating Aquatics *Nymphoides sp.*

3.1.2 Additional Vegetation Mapping Outside the Study Area

The following is the description of the vegetation community found within the Great Lakes Council owned land to the North east of the study area. As mentioned in Section 2.2.2 above this community was studied for comparison purposes for the Open Woodland *Eucalyptus signata* vegetation which was located within the current study area described above in Section 3.1.1.

Open Forest Eucalyptus signata

PB Name (2003) – 13 Scribbly Gum Woodland

This vegetation community covers approximately 1.58 ha within the Conacher Travers study area. This vegetation community is commensurate with MU171 – Scribbly Gum as mapped by the Great Lakes Council Vegetation Mapping project. This vegetation community does not occur within the study area and occurred offsite within a lot owned by Great Lakes Shire Council (Figure 3-1). The threatened flora species *Grevillea parviflora subsp. parviflora* was identified within this vegetation community. This vegetation community occurs to the south of Viney Creek Road East and is located on the ridge top. This section on the ridgetop has a more open grassy understorey habitat dominated by *Eucalyptus signata* (Scribbly Gum), *Angophora costata* (Smooth-barked Apple) and *Corymbia gummifera* (Red Bloodwood).

Upper Stratum 15 to 18m with a Projected Foliage Cover (PFC) of 20 to 30%, the dominant species being *Eucalyptus signata* (Scribbly Gum), *Corymbia gummifera* (Red Bloodwood), *Eucalyptus capitellata* (Brown Stringybark) and occasionally *Angophora costata* (Smooth-barked Apple).

Mid Stratum 1 5 to 15m with a PFC of 10 to 20%, the dominant species being, *Allocasuarina torulosa* (Forest She-oak) and juvenile eucalypts.

Mid Stratum 2 1 to 5m with a PFC of 30 to 40%, the dominant species being, *Banksia spinulosa var. collina* (Hairpin Banksia), *Leptospermum polygalifolium* (Lemon-scented Tea-tree), *Acacia myrtifolia*, *Gompholobium latifolium* (Broad-leaf Wedge Pea), *Dillwynia retorta* (Eggs and Bacon), *Hakea dactyloides*, *Lambertia formosa* (Mountain Devil), *Acacia ulicifolia* (Prickly Moses), and *Dodonea triquetra* (Hop Bush).

Lower Stratum to 2m with a PFC of 60 to 80%, the dominant species being *Ptilothrix deusta*, *Tetratheca thymifolia*, *Lomandra obliqua* (Fishbones), *Xanthorrhoea latifolia* (Forest Grass Tree), *Hibbertia fasciculata*, *Patersonia sericea*, *Hibbertia aspera*, *Imperata cylindrica var. major* (Blady Grass), *Mirbelia rubifolia*, *Themeda australis* (Kangaroo Grass) and *Entolasia stricta* (Wiry Panic).

WARNING

Note that this Vegetation Community Map depicts clearly defined boundaries between vegetation communities that are the product of individual interpretation and are not distinguished by clearly defined boundaries 'on the ground'.

Therefore, this map should only be treated as an indication of approximate peripheries between delineated vegetation communities.

Caution should therefore be exercised when using this data for purposes requiring high levels of accuracy. Furthermore, no account for intergrading areas between delineated vegetation communities has been made.

LEGEND

- Study Area
- Great Lakes Council Land

Vegetation Communities

- Pine Forest Pinus elliotii
- Open Forest Eucalyptus signata
- Open Forest Corymbia gummifera
- Open Forest Eucalyptus robusta
- Open Forest Melaleuca quinquinervia
- Dam
- Open Forest Corymbia maculata & Eucalyptus siderophloia
- Woodland Angophora costata
- Disturbed/Cleared Land
- Open Woodland Eucalyptus signata
- Woodland Pine elliotii/Eucalyptus signata
- Open Forest Melaleuca quinquinervia/Eucalyptus robusta

Site Sections

- Transition Area
- Proposed 8 Lot Subdivision
- Pre approved Hermitage Retirement Village
- Potential Development Area

TEA GARDENS

0 0.5 1

kilometers

TITLE: Figure 3-1
Vegetation Map

CLIENT: Great Lakes Council

SCALE: 1: 13000 at A3 Size **DRAWN:** D. Landenberger **APPROVED:** S. Bishop

DATUM: MGA Zone 56 (GDA 94) **DATE:** 07/10/2008

LAYOUT REF: J:\JOBS\24k\24737 Tea Gardens\Drafting\MapInfo\Ecology\Report Workspaces\24737 Figure 3-1 Vegetation Map A-A3

CONTOUR INTERVAL: N/A

JOB REF: 24737

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3.1.3 Vegetation Mapping Discrepancies

Discrepancies exist between the vegetation mapping undertaken by RPS HSO, PB and Conacher Travers. While the study areas between the mapping projects differ slightly, similar areas are mapped differently between the three vegetation maps. Table 6-1 is a breakdown of the areas of vegetation communities which were delineated within the three studies, which includes the areas for Conacher Travers and RPS HSO. The areas for the PB vegetation communities were not included as the area data was not available.

The main discrepancies lie within lands that Conacher Travers has mapped as Disturbed / Cleared Lands. While these lands are highly disturbed, RPS HSO mapped certain areas of these lands as different vegetation. This is because RPS HSO ecologists surveying the study area believed them to be significant and capable of recovery.

For example, an area mapped by Conacher Travers as Disturbed/Cleared Lands was surveyed by RPS HSO ecologists who found and mapped an area of *Eucalyptus robusta* in the eastern part of the study area. While the vegetation was disturbed, the *Eucalyptus robusta* vegetation community is considered to be regionally significant by RPS HSO and so was included in the vegetation mapping.

An area mapped by Conacher Travers as Woodland *Eucalyptus signata* at the junction of several tracks to the west of the study area has been mapped by RPS HSO as three different vegetation types including Open Woodland *Eucalyptus signata*, Open Forest *Melaleuca quinquenervia/Eucalyptus robusta* and Woodland *Angophora costata*. An area mapped by Conacher Travers as Woodland *Eucalyptus signata* slightly north of the road junctions has been mapped by RPS HSO as Open Forest *Melaleuca quinquenervia*. RPS HSO mapped this area using a GPS and found that it was a low lying swamp that did not contain any *Eucalyptus signata*.

The vegetation mapping performed by PB (2003) was based on a combination of aerial photo interpretation and six days of groundtruthing. One 20 X 20m flora plot was placed within each vegetation community. The current mapping generally concurs with the original mapping performed by PB (2003). The only discrepancies are with the Scribbly Gum communities in the north of the study area. The current survey has mapped this area as a combination of fragmented Open Woodland *Eucalyptus signata*, Open Forest *Melaleuca quinquinervia/Eucalyptus robusta* and Woodland Pine/*Eucalyptus signata*. Another difference is that along the northern boundary the majority of vegetation mapped is identified as Spotted Gum Forest, however the current study found this area to be that of Open Forest *Melaleuca quinquinervia*. The other discrepancies occurred in some minor line changes which may have been related

to the scale of the mapping projects. The small drainage line which is located in the western portion near the new urban development has been mapped as Open Forest *Eucalyptus robusta* by the current survey was mapped by PB (2003) as cleared land.

Table 3-1: Areas of Vegetation Communities Surveyed by Different Studies

Parsons Brinckerhoff (2003)	Conacher Travers (2007)		RPS HSO (2008)	
Vegetation Community (Areas not supplied)	**Vegetation Community**	**Area (ha)**	**Vegetation Community**	**Area (ha)**
Saltmarsh	Saltmarsh	33.49	Not Surveyed	-
*	Saltmarsh/Closed Sedgeland/Closed Rushland *Baumea juncea/ Juncus kraussii* Closed Sedgeland / Rushland *Baumea juncea/ Juncus kraussii*	14.92	Not Surveyed	-
Baumea juncea sedgeland	Closed Sedgeland *Baumea juncea*	8.28	Not Surveyed	-
Juncea kraussii Rushland	Closed Rushland *Juncus kraussii*	78.09	Not Surveyed	-
Mangrove Forest	Low Closed Forest/Open Scrub *Avicennia marina* var *australasica* & *Aegicereas corniculatum*	133.78	Not Surveyed	-
*	Low Closed Forest/Open Scrub/Swamp Forest *Avicennia marina* var. *australasica* & *Aegicereas corniculatum/Melaleuca quinquinervia*	8.50	Not Surveyed	-
Melaleuca ericifolia Heathland	Closed Heathland *Melaleuca ericifolia*	41.63	Not Surveyed	-

Wet Heathland	Since been developed	0.00	Since been developed	-
Swamp Paperbark Forest	Swamp Forest *Melaleuca quinquinervia*	48.09	Open Forest *Melaleuca quinquinervia*	4.49
Swamp Mahogany Forest	Swamp Forest *Eucalyptus robusta*	37.57	Open Forest *Eucalyptus robusta*	18.95
*	Swamp Forest *Melaleuca quinquinervia/ Eucalyptus robusta*	139.33	Swamp Forest *Melaleuca quinquinervia/ Eucalyptus robusta*	7.85
*	Swamp Forest / Moist Open Forest *Melaleuca quinquinervia / Eucalyptus grandis*	3.60	Not Surveyed	-
Spotted Gum Forest	Open Forest *Corymbia maculata & Eucalyptus siderophloia*	157.87	Open Forest *Corymbia maculata & Eucalyptus siderophloia*	6.91
Blackbutt Forest	Open Forest *Eucalyptus pilularis*	7.2	Not Surveyed	-
*	Open Forest *Eucalyptus pilularis* Woodland/Open Forest *Angophora costata*	43.33	Not Surveyed	-

Parsons Brinckerhoff (2003)	**Conacher Travers (2007)**		**RPS HSO (2008)**	
Vegetation Community	**Vegetation Community**	**Area (ha)**	**Vegetation Community**	**Area (ha)**
Flooded Gum	Moist Open Forest *Eucalyptus grandis*	4.42	Not Surveyed	-
Red Bloodwood Woodland	Woodland/Open Forest *Corymbia gummifera*	57.88	Open Forest *Corymbia gummifera*	19.66
Scribbly Gum Woodland	Woodland *Eucalyptus signata*	99.64	Open Woodland *Eucalyptus signata*	11.37
*	Not Mapped by CT	-	Open Forest *Eucalyptus signata*	1.58

Not Mapped by PB	Not Mapped by CT	-	Woodland *Pinus elliottii* & *Eucalyptus signata*	8.18
Smooth-barked Apple Woodland	Woodland/Open Forest *Angophora costata*	125.72	Woodland *Angophora costata*	4.12
Pine Forest	Pine Forest *Pinus elliotii*	30.49	Pine Forest *Pinus elliotii*	9.80
Cleared Land	Disturbed/Cleared Land	631.01	Disturbed Cleared Land	163.90
Not Mapped by PB	Not Mapped by CT	0.00	Dams	0.76
Swamp Oak Forest	Swamp Forest */Casuarina glauca*	35.71	Not Surveyed	-
*	Swamp Forest/Woodland *Melaleuca quinquinervia/Casuarina glauca*	1.65	Not Surveyed	-
Not Mapped by PB	Moist Forest *Eucalyptus microcorys*	18.88	Not Surveyed	-
		843.46		**257.57**

*These communities were delineated by Conacher Travers and would have been included in similar communities by PB.

3.1.4 Conservation Status of Vegetation Communities

No Endangered Ecological Communities (EECs) are present within the current study area. The areas mapped as Open Forest *Eucalyptus robusta*, Open Forest *Melaleuca quinquenervia* and Open Forest *Melaleuca quinquenervia/Eucalyptus robusta* floristically meet the criteria for being the Swamp Sclerophyll Forest on Coastal Floodplains EEC. As these vegetation communities occur on Aeolian sands rather than coastal floodplain, they do not meet the geomorphological criteria of being the EEC mentioned. Conacher Travers (2006) has undertaken extensive soil testing within their study area and these results confirmed that the study area was Aeolian sands. The Scientific Determination for this EEC states that it is associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains. Thus, the study area is not associated with alluvial flats but rather coastal sand dunes of Aeolian origin. Keith & Scott (2005) have completed a study on the vegetation of coastal floodplains of NSW. They report a vegetation community of Swamp Sclerophyll Forest on Coastal Sandplains, and it is most likely that the vegetation communities on site are commensurate with this community. Therefore, RPS HSO concur with the findings of Conacher Travers that this particular vegetation within the study area is not commensurate with this EEC. However, the vegetation is still of high regional significance due the habitat it provides for threatened fauna and flora.

3.1.5 Regionally Significant Flora Species in the Great Lakes LGA

No ROTAP listed species (Briggs and Leigh, 1996) were identified within the study area.

3.1.6 Regionally Significant Communities within the Great Lakes LGA

The following vegetation communities, which occur within the study area, are considered to be regionally significant by The Great Lakes Vegetation Strategy (2005) within the Great Lakes LGA:

- Open Forest *Corymbia gummifera* – Red Bloodwood (Rare);
- Open Forest *Melaleuca quinquenervia* – Paperbark (Vulnerable);
- Open Forest *Melaleuca quinquenervia/Eucalyptus robusta* – Swamp Mahogany/Paperbark (Vulnerable);
- Open Forest *Eucalyptus robusta* – Swamp Mahogany (Private Land Priority);
- Open Forest *Eucalyptus signata* – Scribbly Gum (Special Ecological Value);

- Open Woodland *Eucalyptus signata* – Scribbly Gum (Special Ecological Value); and

- Woodland *Angophora costata* – Smooth-barked Apple (Special Ecological Value).

3.1.7 Open Woodland Eucalyptus signata Regional Significance

This vegetation community has a limited distribution within the Great Lakes LGA with the majority of the community being mapped by Great Lakes Council within the northern part of the LGA near Forster. Therefore this vegetation community is discussed in more detail.

Small areas have been mapped in the Tea Gardens area with the majority mapped within the study area. Four disturbed remnant fragmented patches and one larger patch occur within the study area. The four fragmented patches have limited potential for regeneration due to their isolation and previous land use practices. It is considered that due to their limited potential and fragmentation that these areas could be removed as part of the proposal. The larger patch, however, has good potential for regeneration due to the connectivity to the adjoining swamp vegetation to the south and potential soil seed bank. This area is currently subjected to grazing by cattle and slashing. If these management practices were to cease within the community the understorey species are still present within the community and it has good potential for regeneration.

3.1.8 Desktop Assessment - Threatened Flora Search Results

An updated threatened flora search was completed to ensure that all species have been considered for potential to occur within the study area. The results of this search indicated numerous threatened flora species have been previously recorded within the locality and/ or have potential habitat within the study area. The following have been recorded within 10 km (DECC Wildlife Atlas 2008) of the study area.

- *Angophora inopina* (Charmhaven Apple);
- *Callistemon linearifolius* (Netted Bottle Brush);
- *Chamaesyce psammogeton* (Sand Spurge);
- *Corybas dowlingii*;
- *Cryptostylis hunteriana* (Leafless Tongue Orchid);
- *Diuris arenaria*;
- *Diuris praecox* (Rough Double Tail);
- *Eucalyptus parramattensis subsp*. *decadens* (Drooping Red Gum);
- *Melaleuca groveana*;
- *Prostanthera densa*;
- *Tetratheca juncea* (Black-eyed Susan).

In addition to the above threatened flora species recorded on the DECC Wildlife Atlas, it was considered the following species may have some potential habitat within the study area and should be considered within this study:

- *Grevillea* parviflora *ssp parviflora* (Little-flower Grevillea);
- *Rhizanthella slateri*; and
- *Syzygium paniculatum* (Magenta Lilly Pilly).

WARNING

No part of this plan should be used for critical design dimensions. Confirmation of critical positions should be obtained from Harper Somers O'Sullivan Pty Ltd.

LEGEND

- Study Area
- *Callistemon linearifolius*
- *Chamaesyce psammogeton*
- *Corybas dowlingii*
- *Cryptostylis hunteriana*
- *Diuris arenaria*
- *Diuris praecox*
- *Eucalyptus parramattensis subsp. decaden*
- *Melaleuca groveana*
- *Prostanthera densa*
- *Tetratheca juncea*

0 2 4km

TITLE: Figure 3-2 NPWS Atlas Flora Records

SCALE: 1: 55000 at A3 Size **DRAWN:** A.Saddington **APPROVED:** D.Landenberger

DATUM: MGA Zone 56 (GDA 94) **DATE:** 21/10/2008

LAYOUT REF:J:\JOBS\24k\24737 Tea Gardens\Drafting\MapInfo\Ecology\Report Workspace\24737 Figure 3-2 NPWS Flora records A A3

CONTOUR INTERVAL: N/A

JOB REF: 24737

CLIENT:
Great Lakes Council

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3.1.9 Threatened Flora Species

One threatened flora species was located within the study area, being *Syzygium paniculatum*. No other threatened flora species were detected within the study area.

Syzygium paniculatum

Conacher Travers (2007) located one individual of this species within the Swamp Forest (*Eucalyptus robusta*) vegetation community (Figure 3-3) in the south of the site. A specimen was sent to the Royal Botanical Gardens in Sydney by Conacher Travers (2007) and was confirmed to be this species. RPS HSO botanists also visited this specimen and searched the immediate area for more individuals but none were found. This individual is isolated and possibly has either been planted or its seeds have been dispersed by birds. The long term viability of this individual is limited as there are no other plants to cross pollinate with and increase genetic strength of the population.

3.1.10 Additional Threatened Flora Species outside the Study Area

One Threatened flora species was located in the lands to the north east of the study area of *Grevillea parviflora subsp*. *parviflora*. This species is discussed in further detail below as the location is the most northerly record of the species recorded to date and the RPS HSO study may afford this species some potential habitat. The Open Forest *Eucalyptus signata* vegetation which provides habitat for this species is restricted to two small patches within the Tea Gardens locality. Thus the vegetation within the study area may be of significance to the survival of this species within the locality.

Grevillea parviflora subsp. parviflora

RPS HSO ecologists located approximately 9 individuals of this species within the Great Lakes Council land to the north east of the RPS HSO study area (Figure 3-3). A specimen was forwarded to Royal Botanical Gardens Sydney and confirmed to *Grevillea parviflora subsp*. *parviflora* by Bob Makinson (Grevillea expert) and in addition to be the most northern record for this species to date (Appendix 3).

Grevillea parviflora ssp. *parviflora* (Plate 3-1) is listed as a Vulnerable species in Schedule 2 of the Threatened Species Conservation Act 1995 (NSW). It is also listed as a nationally vulnerable species under the *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)*.

This species is a low open to erect shrub, 0.3-1m tall with linear leaves mostly 1.5-3.5 cm long and 0.8 to 2mm wide (Harden 2002). Conflorescences are erect and usually 6-12 flowered with white flowers. Flowering time is from July to October. It is likely that the *G. parviflora* complex (and allied species) requires taxonomic revision (B. Makinson pers. comm.). Habitat for this species includes

dry sclerophyll vegetation such as Spotted Gum Ironbark Open Forests, Smooth-barked Apple Open Forests and Scribbly Gum Open Forest (Plate 3-2).

Grevillea parviflora ssp. parviflora is distributed from Prospect to Camden and Appin, with distinct populations occurring near Putty, Cessnock and Cooranbong. Its known northern limit is near Karuah and extends to the south coast of NSW with populations occurring as far down the coast as Bargo. Surveys undertaken within the Cessnock LGA have shown that *Grevillea parviflora ssp .parviflora* is a relatively common understorey species over a large portion of forested lands, including a large population which has been recorded in Kurri Kurri (Harper Somers O'Sullivan 2004). A number of records of the species from the locality are known from secure habitats within Werakata National Park (Bell 2004a; Atlas of NSW Wildlife 2005) and from a number of other 'unprotected' locations around, Heddon Greta (NPWS Atlas of NSW Wildlife 2005), Ellalong (Harper Somers O'Sullivan 2005b) and on the western slopes of the Sugarloaf Range (HSO ecologists pers. obs.).

It is recommended that Great Lakes Council undertake targeted surveys for this species during July to December to determine the extent of the population within the Great Lakes Council Lands to the north east of the study area. It is also recommended that this land be rezoned from Open Space to a conservation zone such as 7(a1) to conserve this population for the future. Any disturbance of the understorey is likely to be detrimental to this species in the long term. Further searches should be undertaken in other areas of know habitat particularly the Scribbly Gum Open Forest Habitats in the northern portion of Great Lakes LGA.

In conclusion, this population is significant locally and regionally, due to the record being the most northerly occurrence of this species. This species may occur to the north of Tea Gardens and this may provide management implications for the Scribbly Gum vegetation communities that remain within the Great Lakes LGA.

Plate 3-1: ***Grevillea parviflora subsp. parviflora***

Plate 3-2: ***Grevillea parviflora subsp. parviflora*** **habitat**

WARNING
No part of this plan should be used for critical design dimensions. Confirmation of critical positions should be obtained from Harper Somers O'Sullivan Pty Ltd.

LEGEND

- Study Area
- Great Lake Council's Land
- *Grevillea parviflora subsp parviflora*
- *Syzgium paniculatum*
- Transition Area
- Proposed 8 Lot Subdivsion
- Pre Approved Hermitage Retirement Village
- Potential Development Area

Hermitage Retirement Village

0 300 600m

TITLE: Figure 3-3 Threatened Flora Records

SCALE: 1: 10000 at A3 Size **DRAWN:** A.Saddington **APPROVED:** D.Landenberger

DATUM: MGA Zone 56 (GDA 94) **DATE:** 21/10/2008

LAYOUT REF:J:\JOBS\24k\24737 Tea Gardens\Drafting\MapInfo\Ecology \Report Workspaces\24737 Figure 3-3 Grev parviflora A A3

CONTOUR INTERVAL: N/A

JOB REF: 24737

CLIENT:
Great Lakes Council

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3.2 SEPP 14 Coastal Wetland

SEPP 14 Wetlands are mapped surrounding the study area from the north-west to the south west and south-south east as illustrated in Figure 3-4. The development of the southern section of the study area is likely to impact upon the SEPP 14 wetlands. Mitigation measures and buffers will be required to prevent negative impacts on the SEPP 14 lands. The impacts of any potential development upon SEPP 14 Wetlands are discussed further in Section 5.

3.3 Zoning 7(a1) Environmental Protection Zone

Land to the south and west of the study area is covered by zoning within the Great Lakes Council Local Environment Plan. These zonings consist of 7(a) Wetlands and Littoral Rainforests and 7(a1) Environmental Protection, shown in Figure 3-4. The impacts of any potential development upon SEPP 14 Wetlands are discussed further in Section 5.

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LEGEND

- Study Area
- SEPP 14 Coastal Wetlands (SEPP 14 Wetland Id No.745-751 & 753a - 755)
- Zone 7(a) Wetlands and Littoral Rainforest
- Zone 7(a1) Environmental Protection

745
746
747
748
749
750
751
753a
754
755

0 0.5 1km

TITLE: Figure 3-4 SEPP 14 Wetlands & GLC Zonings

CLIENT: Great Lakes Council

SCALE: 1: 17500 at A3 Size **DRAWN:** A.Saddington **APPROVED:** D.Landenberger

DATUM: MGA Zone 56 (GDA 94) **DATE:** 21/10/2008

LAYOUT REF:J:\JOBS\24k\24737 Tea Gardens\Drafting\MapInfo\Ecology\Report Workspaces\24737 Figure 3-4 SEPP 14 wetlands A A3

CONTOUR INTERVAL: N/A

JOB REF: 24737

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3.4 Corridors and Connectivity

The vegetated area to the south and west of the study area supports a wildlife corridor that occurs around the southern western and north-western boundary of the study area. This corridor links the remnant vegetation of the Tea Gardens area with habitat areas to the north and west of the study area, as well as tenuous linkages to the Myall Lakes National Park to the north east of Tea Gardens.

The corridor is quite wide and covers a large portion of contiguous intact vegetation providing unrestricted movement for both arboreal and terrestrial fauna species, as well as a flow of genetic material for both native fauna and flora species.

The significance of this corridor has been identified through the zoning to 7(a1) and 7(a) conservation. Land to the south and west of the study area is covered by zoning within the Great Lakes Council Local Environment Plan. These zonings consist of 7(a) Wetlands and Littoral Rainforests and 7(a1) Environmental Protection. The area is considered as an important Regional Habitat Linkage for Squirrel Glider and the local endangered Koala population. In addition many other ecological significant ecosystems, flora and fauna exist within the area mapped as 7(a1) Environmental Protection and wildlife corridor, such as SEPP 14 Wetlands, EEC's and threatened species habitat.

The vegetation in the western and southern portion of the study area has some connection to offsite vegetation, though considered marginal due to the lack of understorey occurring within these communities. Nevertheless, this vegetation does provide an additional buffer to the protected areas.

The northern part of the study area has been mapped by the National Parks and Wildlife Service as a Key Habitat Corridor and links Myall Lakes National Park to remnant vegetation to the west of the study area (Figure 3-5). It is important to retain this linkage to facilitate fauna movement to both the east west. Another reason to retain this corridor is to facilitate pollinator movement as this area provides linkages to the threatened flora species *Grevillea parviflora subsp. parviflora*. Native vegetation occurs outside the study area which could be utilised to maintain this habitat corridor. The vegetation located within the study area is fragmented however it does retain connectivity to the north. Removal of this area whilst not ideal would not significantly affect the native corridor.

Remnant coastal wetland vegetation that occurs adjacent to the study area to the north-west, along the study area boundary to the south connects to remnant

vegetation in the Corrie Island Nature Reserve and southern parts of Myall Lakes National Park.

These corridors are vital for connectivity for flora and fauna of the locality allowing movement for species which have restrictions to their movement / dispersal ability.

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Myall Lakes National Park

Myall Lakes National Park

Corrie Island Nature Reserve

Myall Lakes National Park

LEGEND

- Study Area
- NPWS Key Habitat Linkages
- National Parks Estate
- Key Habitat Linkages
- Broken Habitat Linkage

0 2.5 5km

TITLE: Figure 3-5 Corridors and Connectivity

CLIENT: Great Lakes Council

SCALE: 1: 70000 at A3 Size **DRAWN:** A.Saddington **APPROVED:** D.Landenberger

DATUM: MGA Zone 56 (GDA 94) **DATE:** 21/10/2008

LAYOUT REF:J:\JOBS\24k\24737 Tea Gardens\Drafting\MapInfo\Ecology\Report Workspaces\24737 Fig3-5 Corridors and connectivity A A3

CONTOUR INTERVAL: N/A

JOB REF: 24737

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3.5 Fauna

3.5.1 Habitat Description

The study area was found to contain several habitat types including cleared/pasture, sand mined areas and native vegetation including underscrubbed woodland, swamp forest and dry forest fragmented strips.

The delineated forested vegetation communities generally equate to Woodland and Open Forest habitat types with a modified understorey. While the quality of this habitat is reduced by the modification of the understorey the canopy is relatively intact within the southern and western portion of the study area and connected to the Forest vegetation quality within the 7(a) and 7 (a1) conservation area.

The cleared areas existing across the majority of the study area provide limited habitat for native fauna species. At best, they are likely to present habitat for common species including Macropods, rural environ birds and grazing fauna, all of which are adapted to disturbed environs. The ecotone along the edge of the forested areas would also provide habitat for hunting bats. The presence of seasonally flowering native trees within these communities provide a regular food source for both nectar and insect feeding species. Refer to Table 3-2 below.

Table 3-2: Flowering Period of Dominant Tree and Shrub Species

Species	*Common Name*	TSC listed	EPBC listed	Habitats (within the study area, but not confined to) Map units REMS	Potential Threatened Fauna Species that May be attracted by Blossom	Flowering Period in Months of the Year											
						Su		A			W			Sp			Su
						J	F	M	A	M	J	J	A	S	O	N	D
Angophora costata	Smooth-barked Apple	-	-	33	Micro bats (insects), gliders.	■	■								■	■	■
Callistemon citrinus	Crimson Bottlebrush	-	-	34, 36, 44	Micro bats (insects), Flying-Foxes, Gliders											■	■
Callistemon pachyphyllus	Wallum Bottlebrush	-	-	34, 36, 44	Micro bats (insects), Flying-Foxes, Gliders	■	■										■
Corymbia gummifera	Red Bloodwood	-	-	33, 34	Micro bats (insects), Flying-Foxes, Gliders	■	■	■	■								
Eucalyptus robusta	Swamp Mahogany	-	-	37	Micro bats (insects), Flying-Foxes, Gliders, Regent Honeyeater, Swift Parrot					■	■	■					
Eucalyptus signata	Scribbly Gum	-	-	33, 34	Micro bats (insects), Flying-Foxes, Gliders									■	■	■	■
Leptospermum juniperinum	Prickly Tea Tree	-	-	13	Micro bats (insects), Gliders											■	
Melaleuca quinquenervia	Broad-leafed Paperbark	-	-	37	Micro bats (insects), Flying-Foxes, Gliders			■	■	■	■	■	■				
Banksia aemula	Wallum Banksia	-	-	33, 34, 36	Micro bats (insects), Flying-Foxes, Gliders			■	■	■	■						
Banksia serrata	Old Man Banksia	-	-	33, 34, 36	Micro bats (insects), Flying-Foxes, Gliders	■	■	■	■	■	■						

Terrestrial Mammals

The Open Forest and Woodland communities within the study area provide marginal habitat for a number of terrestrial mammals. Habitat quality is dependent upon the amount of available groundcover, density and floristic diversity of shrubs and grasses and land use history (e.g. selective logging, clearing, grazing and study area management practices). All of the vegetated communities, with the exception of the Open Forest *Corymbia maculata & Eucalyptus siderophloia*, identified within the RPS HSO Vegetation Map were found to contain a heavily modified understorey due to grazing and bushfire management practices.

The areas to the south and west of the study area, within the 7(a) and 7 (a1) conservation area represent quality habitat for small and medium terrestrial species. This is due to the quality of understorey, forest debris and dense groundcover present.

Arboreal Mammals

The Open Forest and Woodland communities contain potential foraging resources such as foliage, pollen, nectar and invertebrates for Possums and Gliders. Combined with the Forested vegetation to the south and west of the study area, the diversity of tree species provides a foraging resource for nectivorous species all year round. The Open Forest and Woodland communities occurring within the southern and western portion of the study area contain nesting habitat in the form of various sized hollow-bearing trees.

The areas to the south and west of the Study Area, within the 7(a) and 7 (a1) conservation area represent quality habitat for arboreal species. This is due to the quality of understorey, forest debris and dense groundcover present.

Bats

The Open Forest and Woodland with adjacent open areas within the study area provide extensive foraging habitat for a range of microchiropteran bats, due to insect populations they are likely to harbour. Waterbodies would also provide opportunity for species that preferentially hunt over and around such features. Potential roosting sites within the study area for those species that utilise tree hollows is contained within the western and southern portion of the study area. No cave roosting habitats were identified within the study area.

Blossom of *Eucalyptus sp*. within the study area may provide seasonal foraging opportunities for Grey-headed Flying-foxes and Blossom Bats.

Frogs

Wetland habitats and ponds are found across the study area. The quality of vegetation surrounding the wetland areas of Swamp Forest and the drainage

areas contained within the central area of the study area provides quality foraging and breeding habitat for frog species. The Swamp Forest and associated drainage found within the central and south western area of the study area within paperbark forest constitutes a "Wallum" habitat providing quality habitat for the threatened species *Crinia tinnula* (Wallum Froglet). Wooded habitats are likely to provide foraging and shelter opportunities for frog species.

Reptiles

The Open Forest and Woodland provides an array of shelter, basking and foraging opportunities for a diversity of reptile species.

Ponds and wetlands within the study area and adjacent lands are likely to provide foraging opportunities for common snake and turtle species, particularly within areas of swamp forest, that have quality riparian vegetation that includes dense sedges and ground debris. The wooded areas are likely to represent habitat for lizard, snake and monitor species, particularly within the western and southern portion of the study area, due to the connectivity of these sections to larger areas of forest with debris and dense groundcover on adjacent lands.

Avifauna

The wooded areas provide suitable foraging resources (e.g. invertebrate habitat and blossom) and nesting and roosting opportunities for a variety of sedentary and migratory birds. Hollow bearing trees may provide nesting habitat for hollow dependant birds such as Owls, Treecreepers, Parrots, Kingfishers and Woodswallows.

The presence of winter flowering *Eucalyptus spp*. may offer seasonal habitat to nomadic nectivorous species such as the Swift Parrot and Regent Honeyeater. The capacity of the study area's wooded habitats to carry populations of arboreal mammals and bats (Possums, Gliders and Flying-foxes) in turn provides potential hunting habitat for forest owls.

Ponds and wetlands within the study area are likely to provide foraging opportunities for wetland avifauna, particularly within the permanent water body in the north western area of the study area, due to the quality of riparian vegetation that includes dense sedges and ground debris.

The disturbed environs, cleared grassland and ecotone along the edge of the forested areas provide quality hunting and nesting habitat for diurnal raptor avifauna.

3.5.2 NPWS Threatened Fauna Species Database Search Results

The results of the above search indicated that thirty-one (31) threatened fauna species have been previously recorded within 10km (DECC Wildlife Atlas 2008)

of the study area. Figure 3 6 indicates the location of these local records in relation to the study area. Of these species, 15 have been recorded within the RPS HSO study area (PB records indicated by an asterisk (*), RPS HSO records indicated by an (1) and CT records indicated by an (2)). Section 4 provides an assessment of the likelihood of occurrence of these threatened species within the study area based on the presence of local records, findings of previous surveys and the presence of suitable habitat.

- *Crinia tinnula** [1] [2] — Wallum Froglet*[1] [2]
- *Ephippiorhynchus asiaticus** [2] — Black-necked Stork* [2]
- *Pandion haliaetus** [2] — Osprey* [2]
- *Haematopus fuliginosus** [2] — Sooty Oystercatcher* [2]
- *Haematopus longirostris*[2] — Pied Oystercatcher[2]
- *Sterna albifrons* — Little Tern
- *Ptilinopus magnificus* — Wompoo Fruit-dove
- *Ptilinopus regina* — Rose-crowned Fruit-Dove
- *Ptilinopus superbus* — Superb Fruit-dove
- *Callocephalon fimbriatum* — Gang-gang Cockatoo
- *Calyptorhynchus lathami* — Glossy Black-Cockatoo
- *Lathamus discolor* — Swift Parrot
- *Xanthomyza Phrygia* — Regent Honeyeater
- *Ninox connivens* — Barking Owl
- *Ninox strenua** [2] — Powerful Owl* [2]
- *Tyto novaehollandiae* — Masked Owl
- *Dasyurus maculatus* — Spotted-tailed Quoll
- *Phascogale tapoatafa* — Brush-tailed Phascogale
- *Phascolarctos cinereus** [1] [2] — Koala* [1] [2]
- *Cercartetus nanus*[2] — Eastern Pygmy-possum[2]
- *Squirrel Glider** [2] — Squirrel Glider* [2]
- *Potorous tridactylus* — Long-nosed Potoroo
- *Pteropus poliocephalus** [2] — Grey-headed Flying-fox* [2]
- *Mormopterus norfolkensis*[2] — Eastern Freetail-bat[2]
- *Chalinolobus dwyeri* — Large-eared Pied Bat
- *Miniopterus australis*[2] — Little Bentwing-bat[2]
- *Miniopterus schreibersii oceanensis* — Eastern Bentwing-bat
- *Myotis adversus*[2] — Large-footed Myotis[2]
- *Scoteanax rueppellii*[2] — Greater Broad-nosed Bat[2]
- *Pseudomys gracilicaudatus*[2] — Eastern Chestnut Mouse[2]
- *Petalura gigantea* — Giant Dragonfly

In addition to the above threatened species a number of threatened oceanic fauna species, including oceanic bird species and whale species, occurred within a 10km perimeter buffer of the study area, as a consequence of the study area's proximity to oceanic habitats. These species have not been included within the

above 10km threatened species list as potential impacts within the study area will not include the habitats of those oceanic species.

A small number of species for which records do not occur within 10km of the study area (due in part, to a measure of difficulty in their surveying and limits on previous and current survey works) are considered as having a moderate or greater opportunity of occurring within the study area on at least an intermittent basis. For this reason those species are included below:

- *Hoplocephalus bitorquatus* Pale-headed Snake
- *Hoplocephalus stephensii* Stephen's Banded Snake
- *Lophoictinia isura* Square-tailed Kite
- *Saccolaimus flaviventris* Yellow-bellied Sheathtail-bat

WARNING

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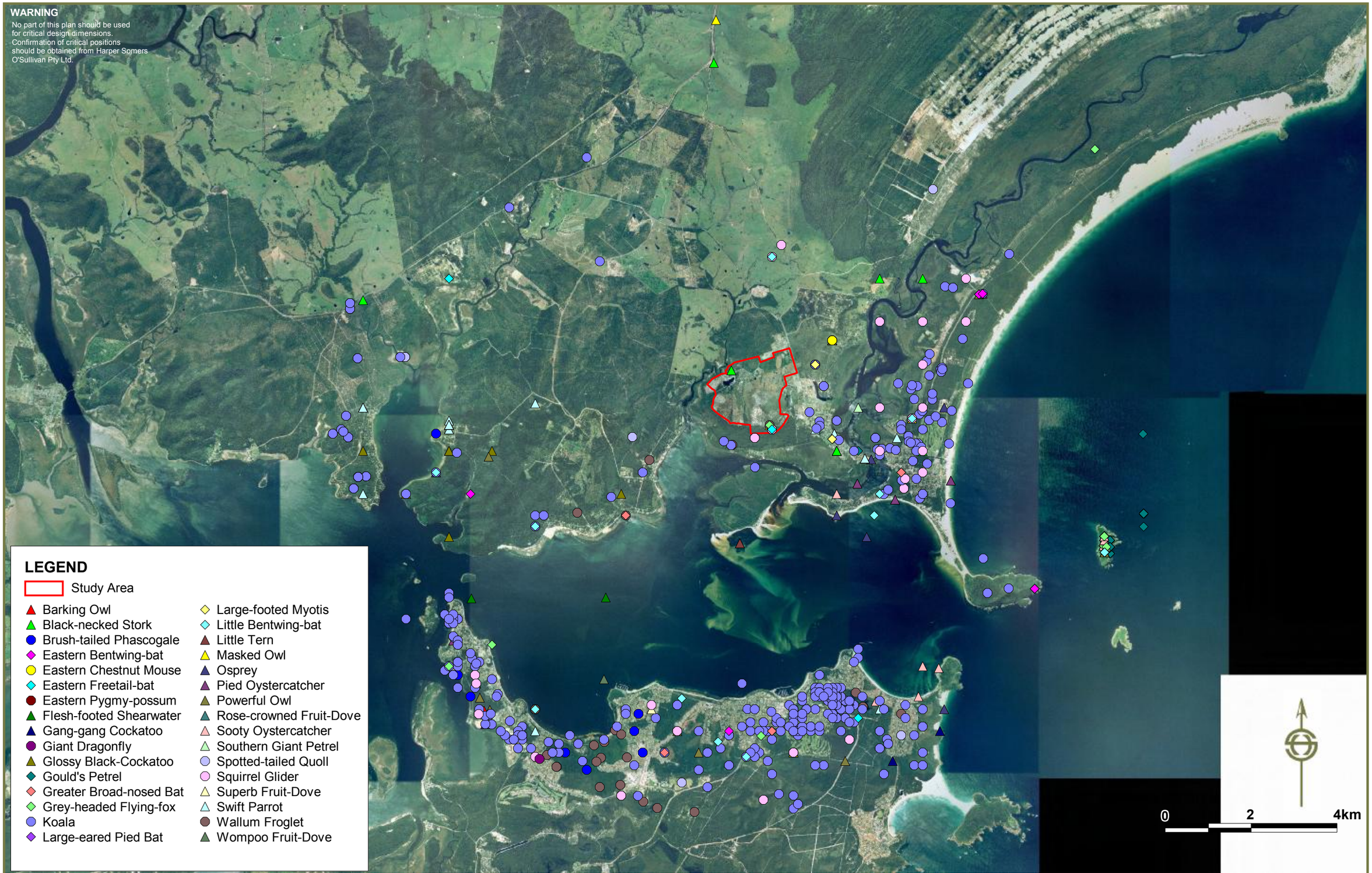

TITLE: Figure 3-6 NPWS Atlas Fauna Records

CLIENT: Great Lakes Council

SCALE: 1: 83000 at A3 Size **DRAWN:** A.Saddington **APPROVED:** D.Landenberger

DATUM: MGA Zone 56 (GDA 94) **DATE:** 21/10/2008

LAYOUT REF:J:\JOBS\24k\24737 Tea Gardens\Drafting\MapInfo\Ecology\Report Workspaces\24737 Figure 3-6 NPWS Fauna records A A3

CONTOUR INTERVAL: N/A

JOB REF: 24737

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3.5.3 Threatened Fauna Species

The results of the threatened fauna database searches and fauna surveys are discussed below. Please refer to previous survey reports (Parsons Brinkerhoff 2003 & Conacher Travers 2005) and Appendix 2 for a full species list and details of the findings of previous investigations.

The following threatened fauna species were recorded during the surveys:

Wallum Froglet

This species was recorded throughout the study areas by RPS HSO and during previous surveys of the area (Figure 3-7). The species was confined to pond and ephemeral areas and areas of temporal ponding and poor drainage following rain.

Black-necked Stork

This species was observed on one occasion by Conacher Travers (2005) within the sand mine area in the northwest of the study area. The species was observed to be foraging within the retained water body associated with the previous sand mining.

Osprey

Several observations of Osprey flying over the study area have been made during previous survey work, along with previous nesting within adjacent areas. While no hunting habitat occurs within the study area for this species it is possible for this species to utilise the forested vegetation for a nest site.

Pied Oystercatcher

This species was observed by Conacher Travers (2005) to be foraging within the tidal flats and oyster leases associated with Pindimar Bay and Myall River.

Powerful Owl

This species was recorded on a number occasions during previous studies in several locations throughout the study area. It is likely to be utilising both the Forest and Woodland areas within the study area for hunting. No nesting trees have been identified within the study area during the previous surveys.

Masked Owl

This species has been recorded within the Conacher Travers (2005) study area but was not identified during 2003 and 2005 surveys despite extensive survey work. This species is likely to utilise the study area for hunting.

Koala

Koalas have been observed during previous survey work within the study area, and the study area is known to provide habitat for at least two Koalas. Suitable feed trees within the Tea Gardens and Hawks Nest area include but not confined to *Eucalyptus robusta* (Swamp Mahogany), *Eucalyptus microcorys* (Tallowwood) and *Eucalyptus pilularis* (Blackbutt).

Squirrel Glider

The Squirrel Glider has been identified throughout the study area on numerous occasions during previous surveys. This species is likely to utilise both the Forest and Woodland areas within the study area for foraging, ranging throughout the study area in association with availability of seasonal flowering resources. A SGHMP has been prepared to provide detailed objectives to restore and enhance habitat for this species identified to the south and west of the study Area and including land proposed for an 8 Lot Rural residential subdivision. Consideration of the SGHMP pertaining to the proposed subdivision is discussed further within this report.

Eastern Pygmy-possum

This species was identified by an individual hair sample taken from Swamp Forest to the south of the study area. This species has the potential to utilise both the Forested and Woodland areas within the study area for foraging, ranging throughout the study area in association with availability of seasonal flowering resources.

Eastern Chestnut Mouse

An Eastern Chestnut Mouse was recorded by Parsons Brinckerhoff (2003) on the eastern side of the study area within paperbark swamp forest. This species has the potential to utilise swamp forest and wet heathlands within the Tea Gardens and Hawks Nest area.

Eastern Blossom Bat

This species was identified by Parsons Brinckerhoff (2003) to be foraging within a Coastal Banksia during spotlighting surveys. The Swamp Forest and Heathlands are likely to be utilised by this species during flowering periods.

Grey-headed Flying-fox

This species has been recorded on numerous occasions within the Tea Gardens Hawks Nest area during previous surveys. This species is likely to utilise both the Forest and Woodland areas of the study area during flowering periods of Eucalypt species. No roosting sites have been identified to occur within the Tea Gardens area.

Micro-chiropteran Bat Species

Several Micro-chiropteran bat species have been recorded within the study area during previous survey work and include:

- Eastern Freetail-bat
- Little Bentwing-bat
- Large Bentwing-bat
- Greater Broad-nosed Bat
- Large-footed Myotis

Several other species of threatened Micro-chiropteran bats have the potential to utilise the study area. Foraging habitat for these species occur across the entire study area and adjacent lands. In addition roosting habitat for hollow dependant species occurs within these lands.

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LEGEND

- Study Area
- Wallum Froglet

0 300 600m

TITLE: Figure 3-7 Wallum Froglet Record

CLIENT: Great Lakes Council

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SCALE: 1: 10000 at A3 Size **DRAWN:** A.Saddington **APPROVED:** D.Landenberger

DATUM: MGA Zone 56 (GDA 94) **DATE:** 21/10/2008

LAYOUT REF: J:\JOBS\24k\24737 Tea Gardens\Drafting\MapInfo\Ecology\Report Workspaces\24737 Figure 3-7 Threatened flauna A A3

CONTOUR INTERVAL: N/A

JOB REF: 24737

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4.0 THREATENED SPECIES AND COMMUNITIES ASSESSMENT

4.1 Introduction

This section discusses the likelihood of occurrence for threatened species and endangered ecological communities listed under the *TSC Act* and/or *EPBC Act* within the study area. The aim of this section is to provide an overall assessment of the potential habitat for threatened species and/or communities for Tea Gardens and takes into consideration the study area and adjacent lands within the Tea Gardens area, including the identified 7 (a) and 7(a1) conservation area. These assessments rely on habitat assessment and targeted surveys undertaken by RPS HSO during recent investigations in addition to information provided within previous assessments undertaken by CTs (2007) and PB (2003).

Threatened flora and fauna species (listed under the *TSC Act 1995* and the *EPBC Act 1999*) that have been gazetted / recorded from within the vicinity of the study area have been considered within this assessment. EEC's and Endangered Populations known from the broader area have also been addressed. Each species / community / population is considered for its potential to occur within the study area.

4.2 Assessment of Likelihood of Occurrence of Threatened Species and Communities

Those species / communities that have been identified as having either a moderate level of impact (or greater) as a result of the proposed rezoning or that have been recorded within the study area during field investigations have been subject to further assessment within Section 5 of this report.

'Species' or 'EEC / Population' – Lists each threatened species / EEC / population known from the vicinity of the study area. The status of each threatened species under the *TSC Act 1995* and *EPBC Act 1999* is also provided.

'Habitat Description and Known Populations' or 'Habitat Description and Known Stands / Populations' – Provides a brief account of the species / community / population and the preferred habitat attributes required for the existence / survival of each species / community / population.

'Chance of Occurrence within the Study Area – Assesses the likelihood of each species / community / population to occur within the study area in terms of the aforementioned habitat description and taking into account local habitat

preferences, results of recent field investigations, data gained from various sources and previously gained knowledge via fieldwork undertaken within other ecological assessments in the locality.

Notes: (V) = Vulnerable Species listed under the Threatened Species Conservation Act 1995.
(E) = Endangered Species listed under the Threatened Species Conservation Act 1995.
(V*) = Vulnerable Species listed under the Commonwealth EPBC Act 1999.
(E*) = Endangered Species listed under the Commonwealth EPBC Act 1999.
(M*) = Migratory Species listed under the Commonwealth EPBC Act 1999.

Table 4-1: Threatened Species and Communities Chance of Occurrence on Study area

Species / Community	Habitat Description	Chance of Occurrence On Study area
Angophora inopina Charmhaven Apple (V, V*)	Small to medium tree found in shallow sandy soils in open woodland, swamp woodland and wet heath. The main occurrences of this species are in the Wyong and Lake Macquarie LGA's (from Charmhaven to Wyee and Morisset, and north to near Toronto), with disjunct populations also in Port Stephens LGA (south of Karuah) and in Myall Lakes and Wallingat National Parks to the north of Karuah.	**Low / Moderate** This species is known from the south of Karuah to the north of the study area and on the Central Coast. Potential habitat exists in the form of Open Forest – *Eucalyptus signata* and Woodland – *Eucalyptus signata* vegetation communities. However no individuals have been recorded within the study area despite two targeted surveys performed By Conacher Travers in 2005. The nearest records are approximately 20km to the north at Bulahdelah. It is unlikely that this species is present within the study area due to the low lying nature and regular inundation of water into the study area.
Callistemon linearifolius (V)	Shrub that grows in dry sclerophyll forest on the coast and adjacent ranges. Significant populations recently found within the Lower Hunter, including Werakata National Park. Re-sprouting / juvenile specimens difficult to distinguish from other *Callistemon* species such as *C. rigidus* or *C. linearis* without the aid of flowering parts. Locally this species has been recorded where dry forest habitats interface with salt tolerant vegetation communities, such as Swamp Oak Rushland Forest and Riparian Melaleuca forest.	**Low / Moderate** Potential habitat for this species occurs in the swamp forests which are present within the study area particularly in the Open Forest – *Eucalyptus robusta* and Open Forest – *Corymbia maculata* & *Eucalyptus siderophloia* vegetation communities located within the drainage lines. No DECC database atlas records exist for this species in the Tea Gardens area, however a large number of records exist within the Tomaree Peninsula and Soldiers Point in Port Stephens. Targeted surveys by Conacher Travers in 2005 failed to locate this species during targeted flora surveys. The author has observed this species growing in similar habitat at North Arm Cove to the south and there is potential for this species to occur within the study area.
Chamaesyce psammogeton	Perennial prostrate herb, which grows on sand dunes near the sea. Within the region records exist from Myall Lakes	**Low** Habitat for this species would occur on the sand dunes

Species / Community	Habitat Description	Chance of Occurrence On Study area
(E)	National Park and Wamberal Lagoon Nature Reserve.	within the coastal areas, such as Jimmys Beach within the Tea Gardens local area. However, the species was not recorded during flora surveys. No habitat for this species is present within the study area.
Cryptostylis hunteriana Leafless-tongue Orchid (V, V*)	A cryptic Saprophytic orchid species that flowers between December and February. Distribution limits N-Gibraltar Range S- south of Eden. Grows in a variety of habitats from tall open forests to swamp heath on sandy soils. A large population of this species has recently been found to the north of the study area at Bulahdelah.	**Low / Moderate** Potential habitat if the form of Open Forest – *Eucalyptus signata* and Woodland – *Eucalyptus signata* and sub-optimal habitat within the Open Forest - *Corymbia maculata* vegetation communities occurs within the study area. However the absence of the other species of the same genus, such as *C. subulata* and *C. erecta,* and the saline nature of the soils it is unlikely that this species is expected to occur within the study area. In addition, targeted searches by Conacher Travers in 2005 for this species failed to locate it within proposed development lands. Whilst some potentially suitable habitat may be present, the habitat is considered marginal due to the periodic inundation which occurs throughout the study area. However, due to the cryptic nature of this species its presence within the study area cannot be discounted.
Corybas dowlingii Red Lanterns (E)	A very small terrestrial orchid with a solitary red helmet flower that occur from June to August. This species grows in the gullies of tall open forests on well-drained gravelly soils at elevations of 10-200m (Jones 2006). This orchid has been recorded from 4 localities including Bulahdelah, Soldiers Point and Freemans Waterhole.	**Low / Moderate** Potential habitat for this species would occur within the drier vegetation communities such as Open Forest - *Corymbia maculata* within the study area. However due the regular inundation which occurs within the study area it is unlikely that potential habitat does occur within the remainder of the Study Area. This is a newly described orchid (2004) which is difficult to detect. Targeted surveys for this species have not been undertaken within the study area.

Species / Community	Habitat Description	Chance of Occurrence On Study area
Diuris arenaria Sand Doubletail (E)	A small terrestrial orchid known only from the Tomaree Peninsula where it occurs in coastal heathy dry sclerophyll forest. It produces 20-30mm wide light purple to mauve flowers during August and September and usually possesses two basal leaves measuring 15-50cm long by 2-6mm wide.	**Low** This species has habitat within Coastal Heath on Tomaree Peninsula to the south of the Study Area. The species was not recorded during targeted surveys during the flowering period of this species by Conacher Travers in 2005. In addition no habitat exists within the study area and thus it is highly unlikely that this species will occur.
Diuris praecox Newcastle Doubletail (V, V*)	Found predominantly in coastal Eucalypt forests on hilltops or slopes and in coastal heathlands. This species has been recorded at a number of dry woodland locations to the south east of Lake Macquarie.	**Moderate / High** Onsite habitat in the vicinity is commensurate with the sites of other records in the area. The species was not recorded during targeted surveys during the flowering period of this species by Conacher Travers in 2005. The nearest records are approximately 20km to the north at Bulahdelah. It is unlikely that this species is present within the study area due to the low lying nature and regular inundation of water into the study area. However, due to the cryptic nature of this species (i.e. does not flower every year) the presence of this species within the proposed development lands cannot be discounted.
Eucalyptus parramattensis ssp. *decadens* Drooping Red Gum (V, V*)	Red Gum species that grows in dry sclerophyll woodland on sandy soils, often in low damp sites. This species has been recorded on the Tomago Sand Beds at Williamtown and with records stretching west to the Cessnock area.	**Low / Moderate** Potential habitat for this species occurs throughout the dry sclerophyll areas, particularly in the Open Forest – *Eucalyptus signata* and Open Woodland – *Eucalyptus signata* vegetation communities. However no individuals have been recorded within the study area. This species is easily identified and it is highly unlikely that this species is present within the study area.

Species / Community	Habitat Description	Chance of Occurrence On Study area
Grevillea parviflora *subsp. parviflora* (V, V*)	Occurs in light, clayey soils in woodlands. Most plants appear capable of suckering from a rootstock. Relatively widespread within the Cessnock LGA, and occurs within Werakata National Park. Other populations known from the North Cooranbong area. Much confusion surrounds the taxonomy of this species and other similar *Grevillea* taxa (S. Bell *pers. comm.*), and a NPWS-funded study of the species is currently in progress.	**High** Potential habitat for this species occurs throughout the dry sclerophyll areas, particularly in the Open Woodland – *Eucalyptus signata* vegetation communities. This species was recorded within 1km of the study area. This record is highly significant as it is the most northerly occurrence of *Grevillea parviflora* subsp. *parviflora.*
Melaleuca groveana Grove's Paperbark (V)	Restricted to exposed heath and heath woodland, mainly at high altitudes in coastal and sub-coastal districts. Hunter Region records exist from the Tomaree and Yengo National Parks (Atlas of NSW Wildlife data).	**Low** There is no exposed heath or heath woodland habitat for this species within the study area. Therefore, it is considered unlikely to exist within the study area.
Prostanthera densa Villous Mint-bush (V, V*)	This species is an erect mint smelling shrub to 2m tall. Flowering occurs throughout the year. Habitat is generally on sandstone with dry sclerophyll forest and in coastal shurbland. Distribution includes Jervis Bay in the south, Royal National Park and Cronulla in Sydney and within near Nelson Bay at Port Stephens.	**Low** This species has been recorded in Coastal Shurbland within Nelson Bay on the southern side of Port Stephens. There is no habitat for this species within the study area.
Syzygium paniculatum Magenta Lilly Pilly (V, V*)	A shrub to small tree, found in sub-tropical and littoral rainforest on sandy soils or sheltered gullies mostly near water courses. Distribution between Bulahdelah and Jervis Bay.	**High** One individual was identified by Conacher Travers 2005 within the proposed rural development area. Preferred Habitat for this species is within sub-tropical and littoral rainforest. With only one species present it is possible that this species has been planted or more likely naturally dispersed from birds.

Species / Community	Habitat Description	Chance of Occurrence On Study area
Tetratheca juncea Black-eyed Susan (V)	Occurs in a variety of forested and heathy habitats. Locally found in Open Forests and Woodlands with dense, undisturbed understorey, often in association with *Angophora costata* / *Corymbia gummifera* on slopes with south-easterly aspects. A number of records exist from the local area including several records from Karuah and North Arm Cove to the south and Bulahdelah to the north of the study area (Atlas of NSW Wildlife data).	**Low – Moderate** Potential habitat for this species occurs throughout the dry sclerophyll areas, particularly in the Open Forest – *Eucalyptus signata,* Open Woodland – *Eucalyptus signata*, Open Forest – *Corymbia gummifera* and Open Forest *Angophora costata* vegetation communities. Extensive targeted surveys undertaken by Conacher Travers in 2005 within the flowering period, failed to locate any individuals of this species. Habitat for this species is present within the study area, however the regular inundation provides only sub-optimal habitat for this species. Therefore as no individuals were located during any of the flora surveys within the study area this species is highly unlikely to occur.
Herpetofauna		
Crinia tinnula Wallum Froglet (V)	Occurs in coastal, low-lying acid Paperbark forest, within the 'wallum country' (often on sandy soils). Regional records for this species are confined to three main areas; Lake Macquarie, Central Coast and Medowie and Port Stephens (DEC 2005).	**High** Habitat for this species occurs within the freshwater paperbark complex found within the southwestern part of the study area, and periodically in other areas of the study area in response to flux in hydrological conditions. This species was heard to call, from several locations, within the study area during the fieldwork period.

Species / Community	Habitat Description	Chance of Occurrence On Study area
Litoria aurea Green and Golden Bell Frog (E, V*)	Inhabits swamps, lagoons, streams and ponds as well as dams, drains and storm water basins. Thought to be displaced from more established study areas by other frog species, thus explaining its existence on disturbed study areas. Previously widespread within the region, but now sparsely distributed within the Lower Hunter and Central Coast areas. A relatively stable population occurs on Kooragang Island.	**Low / Moderate** – This species was not recorded within the study area during targeted surveys. Potential habitat for this species occurs within the drainage lines, though perceived as marginal due to the high frequency of other frog species.
Hoplocephalus bitorquatus Pale-headed Snake (V)	A nocturnal and partially arboreal snake, which inhabits a wide range of habitats from rainforest to drier Eucalypt forest. This species is patchily distributed from Tuggerah to Cape York Peninsula (Cogger 1996). Records in the Hunter Sub-bioregion exist from Paterson (Atlas of NSW Wildlife data).	**Low / Moderate** This species was not recorded within the study area during surveys. Potential habitat for this species occurs within the study area, though perceived as marginal due to degraded nature of understorey.
Hoplocephalus stephensii Stephen's Banded Snake (V)	A nocturnal and partially arboreal snake which inhabits a range of habitats from rainforests to both wet and dry sclerophyll forests from Gosford north into southern QLD (Swan *et. al*. 2004).	**Low / Moderate** This species was not recorded within the study area during surveys. Potential habitat for this species occurs within the study area, though perceived as marginal due to degraded nature of understorey.
Avifauna		
Pandion haliaetus Osprey (V, M*)	Requires water bodies for fishing in close proximity (usually <1km) to suitably tall nesting study area such as dead tree, power pole etc. Recorded from various study areas around Lake Macquarie, Port Stephens and the Hunter River Estuary.	**Low / Moderate** This species was recorded within the study area during surveys. Preferred hunting habitat for this species is not available within the study area. The study area is not considered to offer a suitable nesting location, given the distance from preferred hunting habitat in the locality.

Species / Community	Habitat Description	Chance of Occurrence On Study area
Lophoictinia isura Square-tailed Kite (V)	Inhabits open forests and woodlands, particularly those on fertile soils with abundant passerines. They may also range in nearby open habitats but not into extensive treeless regions. This species is notably absent from alpine regions and small isolated remnant woodlands in large open areas. Records exist from the Cessnock and Maitland LGA's and there are records for this species from Cooranbong in the southwest of the Lake Macquarie LGA (Atlas of NSW Wildlife data; HBOC records). Records for this species within the Lower Hunter are generally limited to Autumn.	**Low / Moderate** Due to the generalist habitat requirements of this species, it could potentially occur within the study area on a seasonal basis. Records in the Hunter Sub-bioregion are generally sparse and it would be difficult to locate during targeted surveys.
Ephippiorhynchus asiaticus Black-necked Stork (E)	Inhabits swamps associated with river systems and large permanent pools but sometimes appears on the coast or in estuaries. It has also been recorded on farm dams and sewage treatment ponds.	**Moderate** This species was recorded within the study area during previous surveys. Potential habitat occurs for this species within the various water bodies, and in other low lying areas of the study area. Whilst some potentially suitable habitat may be present, the habitat is considered marginal.
Haematopus longirostris Pied Oystercatcher (V)	This species prefers undisturbed sandy shell-grit or pebble beaches, sandspits and sandbars, tidal mudflats and estuaries, coastal islands. Occasionally rocky reefs, shores rock-stacks, brackish or saline wetlands. Also grassy paddocks, golf-courses or parks near coast. Forages for molluscs, crustaceans, polychaetes, ascidians, echinoderms and small fish, probes for worms in short wet grass.	**Low** This species may fly over the study area and has been recorded nearby. However, the study area does not offer suitable sandy beach habitat and the species is considered unlikely to utilise the study area.
Sterna albifrons Little Tern (E)	Migratory bird from eastern Asia, which occurs in sheltered coastal environments. This species has been recorded in Hexham Swamp, Stockton Bridge, Swansea and Newcastle Bars (HBOC, 1996).	**Low** This species was not recorded within the study area during fieldwork. No preferred habitat is available within the study area for this species due to the lack of estuarine habitat. Superior habitat is located in proximity within Pindimar Bay.

Species / Community	Habitat Description	Chance of Occurrence On Study area
Ptilinopus magnificus Wompoo Fruit-Dove (V)	Frugivorous bird favouring rainforest, occasionally straying to other forest types containing fruiting trees. A nomadic species that sometimes roosts in dry forest adjacent to rainforest habitats and is known to access small rainforest remnants.	**Low** This species was not recorded within the study area during fieldwork. Preferred habitat for this species does not exist within the study area.
Ptilinopus regina Rose-crowned Fruit-Dove (V)	Generally lives in rainforest, though it also frequents brushes of coastal districts as well as forests and mangroves.	**Low** This species was not recorded within the study area during fieldwork. Preferred habitat for this species does not exist within the study area. Preferred habitat is located in proximity to Tea Gardens
Ptilinopus superbus Superb Fruit-dove (V)	Occurs in rainforest and similar closed forests including, monsoon forest, regrowth, lantana thickets, woodland adjoining rainforest at all altitudes.	**Low** This species was not recorded within the study area during fieldwork. Preferred habitat for this species does not exist within the study area or its locality.
Callocephalon fimbriatum Gang-gang Cockatoo (V)	Occurs in forests and woodlands where it forages on the seed capsules of Eucalypts. Sedentary, seasonally nomadic or part-migratory, this species shows a general trend to leave highland habitats in winter for more lowland districts. Requires large Eucalypt tree hollows for nesting. Records exist from the Watagan Mountains and adjacent lowlands and foot hills (Atlas of NSW Wildlife data; Author pers. obs.).	**Low / Moderate** This species was not recorded within the study area during surveys. Potential habitat for this species occurs within the study area, though perceived as marginal.
Calyptorhynchus lathami Glossy Black-Cockatoo (V)	Occurs in forests and woodlands where it forages predominantly on *Allocasuarina* cones. Requires large Eucalypt tree hollows for nesting.	**Low** This species was not recorded within the study area during fieldwork. Preferred habitat in the form of Allocasuarina feed trees does not exist within the study area.

Species / Community	Habitat Description	Chance of Occurrence On Study area
Xanthomyza phrygia Regent Honeyeater (E, E*)	Nomadic Honeyeater that disperses to non-breeding areas, including the coast, in winter, where flowering trees are sought. Within the Lake Macquarie LGA this species is generally associated with *Eucalyptus robusta* (Swamp Mahogany). Local occurrences are during winter months when this species flowers, although their stronghold is west of the great divide and it appears that movements to the coast only occur when foraging resources to the west and, to some extent, the Central to Lower Hunter Valley fail.	**Moderate** (on a seasonal basis) – This species was not recorded within the study area during fieldwork. Potential seasonal habitat exists in parts of the study area, predominantly in the form of scattered winter-flowering Eucalypts (*E. robusta*).
Lathamus discolor Swift Parrot (E, E*)	On the mainland this species frequents Eucalypt forests and woodlands with large trees having high nectar production during winter. Mainland winter foraging study areas often vary from year to year. Nests only in Tasmania.	**Moderate** (on a seasonal basis) – This species was not recorded within the study area during fieldwork. This species utilises the region only during the winter periods outside of which it is absent. Potential seasonal habitat exists in parts of the study area, predominantly in the form of scattered winter-flowering Eucalypts (*E. robusta*).
Ninox strenua Powerful Owl (V)	Occurs in sclerophyll forests and woodlands where suitable prey species occur (being predominantly arboreal mammals). Requires large hollows, usually in Eucalypt trees, for nesting. Roosts in dense vegetation within such areas.	**Moderate / High** This species was recorded within the study area during previous surveys. Potential habitat within the study area is available within the forested areas for this species. Preferred prey species (possum and gliders) occur within the forested areas. However, as it is unlikely that the study area would be able to support this species in isolation, it may represent part of a larger home range for locally-occurring individuals.

Species / Community	Habitat Description	Chance of Occurrence On Study area
Tyto novaehollandiae Masked Owl (V)	Found in a range of habitats, locally within sclerophyll forests and woodlands where appropriate / preferred prey species occur (being predominantly terrestrial mammals). Requires large Eucalypt hollows for nesting and prefers to roost in these hollows as well.	**Moderate** This species was not recorded within the study area during previous surveys. Potential habitat within the study area is available within the forested areas for this species. Preferred prey species (possum and gliders) occur within the forested areas. However, as it is unlikely that the study area would be able to support this species in isolation, it may represent part of a larger home range for locally-occurring individuals.
Climacteris picumnus Brown Treecreeper (V)	Frequents drier forests and woodlands, particularly open woodland lacking a dense understorey. Also found in grasslands in proximity to wooded areas where there are sufficient logs, stumps and dead trees nearby. Feeds on invertebrate larvae and small insects, particularly ants. Utilises hollows for roosting/nesting. Appears not to persist in remnants less than 200ha.	**Low / Moderate** This species was not recorded within the study area during fieldwork. Habitat for this species is marginal due to the lack of preferred habitat. Records for this species within coastal regions are scarce to absent. The species is considered unlikely to utilise the study area.
Dasyurus maculatus Spotted-tailed Quoll (V, V*)	Found in a variety of forested habitats. This species creates a den in fallen hollow logs or among rocky outcrops. Generally does not occur in otherwise suitable habitats that are in close proximity to urban development.	**Low** This species was not recorded within the study area during fieldwork. Occurrence of this species is considered unlikely due to the degraded nature of habitat within the study area.
Phascogale tapoatafa Brush-tailed Phascogale (V)	Inhabits dry open forest and woodlands, often in areas with sparse groundcover. It is one of the most arboreal Dasyurids and hunts mainly invertebrates, although some vertebrate prey is taken on occasion. Utilises small tree hollows for nesting and refuge study areas. Within the Hunter Region, records south of the Hunter River are scarce. Other records in the region occur from Medowie (HSO pers. obs.) and Tomago (DEC 2005).	**Moderate** This species was not recorded within the study area during fieldwork. Potential habitat is available for this species within the western portion of the study area. Whilst some potentially suitable habitat may be present, the habitat is considered marginal and there is a lack of local records for the species.

Species / Community	Habitat Description	Chance of Occurrence On Study area
Cercartetus nanus Eastern Pygmy Possum (V)	Occurs from rainforest through sclerophyll forest to tree heath. Favoured food includes banksias, myrtaceous shrubs and trees and insects. Nesting study areas are generally in drier habitats. Records in the Hunter Sub-bioregion are very scarce. Within the Greater Hunter Region records exist from the Watagan Mountains and Barrington Tops National Park (Atlas of NSW Wildlife data).	**High** This species has been identified within the study area by the use of hair analysis (CT 2005). This species has the potential to utilise both the Forested and Woodland areas within the study area for foraging, ranging throughout the study area in association with availability of seasonal flowering resources.
Petaurus norfolcensis Squirrel Glider (V)	Occurs in Eucalypt Forests and Woodlands where it feeds on sap exudates and blossoms. In these areas tree hollows are utilised for nesting study areas. Also requires winter foraging resources when the availability of normal food resources may be limited, such as winter-flowering shrub and small tree species. Widely distributed across the lower hunter region (DEC 2005).	**Moderate / High** This species was recorded during previous studies throughout the Study area. Potential habitat is available for this species within the western portion of the study area, and it is known from areas connected tenuously to the study area.
Pseudomys gracilicaudatus Eastern Chestnut Mouse (V)	Favours dense, wet heath and swamp habitats that are in a state of intermediate disturbance recovering from fire. It is displaced by *Rattus lutreolus* in mature more heathland such that its numbers fall in these habitats.	**Moderate / High** This species was recorded during previous studies (Parsons Brinckerhoff, 2003) within the study area. The species has the potential to utilise paperbark swamp forest within the study area.
Potorous tridactylus Long-nosed Potoroo (V, V*)	Prefers cool rainforest, wet sclerophyll forest and heathland. Sleeps by day in a nest on the ground, and digs for succulent roots, tubers, fungi and subterranean insects. Some diggings seemingly attributable to this species may belong to Bandicoots. Records exist from the Karuah vicinity (Gunninah 1999) and the Gosford LGA (DEC 2005). Individuals are mainly solitary, non-territorial and have home range sizes ranging between 2-5 ha (DEC 2005).	**High** This species has been identified within the study area by the use of hair analysis undertaken on study area. Habitat is available across the study area within forested areas with dense understorey, with occasional open areas.

Species / Community	Habitat Description	Chance of Occurrence On Study area
Phascolarctos cinereus Koala (V)	Occurs in forests and woodlands where it requires suitable feed trees (particular *Eucalyptus* spp.) and habitat linkages. Will occasionally cross open areas, although it becomes more 'Vulnerable' to predator attack and road mortality during these excursions. Records from the Lower Hunter Region are largely confined to the greater Port Stephens area, the Lake Macquarie hinterland and the Watagan Mountains, with a small number of records from Cessnock LGA (DEC 2005).	**High** This species was observed in three locations over two nights of spotlighting within the western portion of the study area. Vegetation communities with the dominant tree species *E. robusta* (Swamp Mahogany) represent preferred koala habitat. *E. haemastoma* (Scribbly Gum) is also present and is a known koala food tree.
Pteropus poliocephalus Grey-headed Flying-fox (V, V*)	Forages over a large area for nectar / fruits etc. Seasonally roosts in communal base camps situated within wet sclerophyll forests or rainforest. Frequently observed to forage in flowering Eucalypts. May occur anywhere within the Hunter Region where food or roosting resources are available.	**Moderate / High** This species was observed within the study area. Due to its largely generalist habitat requirements, this species is considered likely to occur within any of the wooded habitats on the study area on a seasonal flowering basis. No existing or potential roost study areas for this species were observed during field surveys.
Chalinolobus dwyeri Large-eared Pied Bat (V)	This species forages in tall open forests, including dry forests and the edges of rainforest. It roosts in mine shafts and similar structures. Hunter Region records for this species are largely confined to the Watagan Mountains well to the west of the study area (Atlas of NSW Wildlife data).	**Moderate** This species has been not recorded in the study area and no roosting habitat (caves and similar) exists within the study area. However marginal habitat occurs within the LES study area.
Miniopterus schreibersii Eastern Bentwing-Bat (V)	This species utilises a range of habitats for foraging, including rainforest, wet and dry sclerophyll forests, woodlands and open grasslands. Requires caves or similar structures for roosting habitat. Widely distributed across the Lower Hunter Region (DEC 2005).	**Moderate/High** This species was not detected during targeted field surveys. Habitat is available for this species within woodland areas and associated ecotones with cleared / managed areas. Preferred roosting habitat (caves and similar) is not available within the study area.

Species / Community	Habitat Description	Chance of Occurrence On Study area
Miniopterus australis Little Bentwing-bat (V)	Prefers to forage in well-vegetated areas, such as within wet and dry sclerophyll forests and rainforests. Requires caves or similar structures for roosting habitat. Largely confined to more coastal areas in the Lower Hunter Region (DEC 2005).	**High** This species was not detected during targeted field surveys. Habitat is available for this species within woodland areas and associated ecotones with cleared / managed areas. Preferred roosting habitat (caves and similar) is not available within the study area.
Mormopterus norfolkensis Eastern Freetail-bat (V)	This species forages predominantly in dry forests and woodlands east of the divide. It roosts in tree hollows, under bark and within man-made structures. Widely distributed within across the Lower Hunter Region (DEC 2005).	**High** This species was detected during nocturnal surveys on the study area. Habitat is available for this species within woodland areas and associated ecotones with cleared / managed areas.
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat (V)	Range of habitats from rainforest to arid shrubland, roosts in tree-hollows. Limited number of records occur on the central coast and the Lower Hunter Region (DEC 2003).	**Moderate** This species was not detected during targeted field surveys. Habitat is available for this species within woodland areas and associated ecotones with cleared/ managed areas.
Falsistrellus tasmaniensis Eastern False Pipistrelle (V)	This species is found in a variety of forest types such as open forests, woodlands and wetter sclerophyll forests (usually with trees >20m). This species roosts in tree hollows. Appears to locally favour upland habitats. A limited number of records occur on the central coast and the Lower Hunter Region (DEC 2005).	**Moderate** This species was not detected during targeted field surveys. Habitat is available for this species within woodland areas and associated ecotones with cleared / managed areas.
Myotis adversus Large-footed Myotis (V)	Usually found near bodies of water, including estuaries, lakes, reservoirs, rivers and large streams, often in close proximity to their roost study area. Although usually recorded foraging over wet areas, it also utilises a variety of wooded habitats adjacent to such areas including rainforest, wet and dry sclerophyll forest, woodland, and	**High** This species was detected during nocturnal surveys on the study area. Habitat is available for this species within the open areas of the wetland complex. Preferred roosting habitat (caves and similar) is not available within the study

Species / Community	Habitat Description	Chance of Occurrence On Study area
	swamp forest. Roosts in small colonies of between 15 and several hundred individuals in caves, mines and disused railway tunnels. A number of records from the Central Coast, with fewer numbers in the Lower Hunter Region (DEC 2005) and Central Hunter Region (HSO pers. obs.).	area.
Scoteanax rueppellii Greater Broad-nosed Bat (V)	Forages in moister gullies and wet sclerophyll forests as well as in lightly wooded areas and open spaces / ecotones. This species roosts in tree hollows and is relatively widespread within the Lower Hunter Region (DEC 2005).	**High** This species was detected during nocturnal surveys on the study area. Habitat is available for this species within woodland areas and associated ecotones with cleared/ managed areas.
Coastal Saltmarsh	Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner occurs in the intertidal zone on the shores of estuaries and lagoons, including where they are intermittently closed along the NSW coast. Classified by the Lower Hunter Central Coast Regional Biodiversity Conservation Strategy (LHCCREMS) as Map Unit (MU) 47a.	**Low** The floristic composition and geomorphological characteristics of this Endangered Ecological Community are not present within the Study area. However this community does occur within the conservation zoned lands within the Conacher Travers study area in the southern portions of the study area adjoining the estuarine areas.

Species / Community	Habitat Description	Chance of Occurrence On Study area
Freshwater Wetlands on Coastal Floodplains	Associated with periodic or semi-permanent inundation by freshwater, although there may be minor saline influences in some wetlands. They typically occur on silts, muds or humic loams in depressions, flats, drainage lines, backswamps, lagoons and lakes associated with coastal floodplains. Wetlands or parts of wetlands that lack standing water most of the time are usually dominated by dense grassland or sedgeland vegetation, often forming a turf less than 0.5 metre tall and dominated by amphibious plants including *Paspalum distichum*, *Leersia hexandra* and *Carex appressa*. Wetlands or parts of wetlands subject to regular inundation and drying may include large emergent sedges over 1 metre tall, such as *Baumea articulata, Eleocharis equisetina* and *Lepironia articulata*. Correlates with LHCCREMS Map Unit (MU) 46 – 'Freshwater Wetland Complex'.	**Low** The floristic composition and geomorphological characteristics of this Endangered Ecological Community are not present within the study area.
River-flat Eucalypt forest on coastal floodplains	Associated with silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains. Composition of the tree stratum varies considerably, the most widespread and abundant dominant trees include *Eucalyptus tereticornis* (Forest Red Gum), *E. amplifolia* (Cabbage Gum), *Angophora floribunda* (Rough-barked Apple) and *A. subvelutina* (Broad-leaved Apple). Correlates with LHCCREMS communities - 'Central Hunter Riparian Forest' Map Unit (MU) 13, 'Wollombi Redgum-River Oak Woodland' MU14 and 'Redgum Rough-barked Apple Swamp Forest' MU38.	**Low** The floristic composition and geomorphological characteristics of this Endangered Ecological Community are not present within the study area.
Swamp Oak Floodplain Forest	This community is associated with periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains, typically occurring on	**Low** The floristic composition and geomorphological characteristics of this Endangered Ecological Community

Species / Community	Habitat Description	Chance of Occurrence On Study area
	grey-black clay-loams and sandy loams. Usually occurring below 20 m altitude.	are not present within the Study area. However this EEC does occur within the Conacher Travers study area adjoining Kore Kore Creek and in the south east of the study area with the conservation zoned lands
Swamp Sclerophyll Forest on Coastal Floodplains	The community is associated with humic clay or sandy loams on waterlogged or episodically flooded alluvial flats and drainage lines within coastal floodplains. It is generally characterised by an open to dense canopy of eucalypts and / or paperbarks. Canopy heights generally vary from 8m to 25m depending on species composition. In the Hunter Region the canopy often contains *Eucalyptus robusta* and / or *Melaleuca quinquenervia* although other plant species, such as *Callistemon salignus*, *Casuarina glauca*, *Eucalyptus resinifera* subsp. *Hemilampra* or *Livistonia australis* may be present. Small trees and shrubs, including *Melaleuca* sp., *Glochidion ferdinandi*, *Acacia* sp. *Leptospermum polygalifolium* subsp. *polygalifolium* and *Dodanaea triquetra*, are often present in the lower strata. Correlates with LHCCREMS Map Unit (MU) 42 'Riparian Melaleuca Swamp Woodland', MU42a – 'Melaleuca Scrub', MU43 – 'Wyong Paperbark Swamp Forest' , MU43a – 'Melaleuca Scrub' and MU37 'Swamp Mahogany-Paperbark Forest'.	**Moderate to Low** The Open Forest *Melaleuca quinquenervi/Eucalyptus robusta community* present within the Study area has the floristic composition which corresponds to this endangered ecological community but is not located on a coastal floodplain. According to Conacher Travers Site Geomorphology Report (2006), the soils of the study area are not coastal floodplains but coastal windblown sands, or dunes. This EEC is defined as occurring only within coastal floodplains and therefore, the vegetation found on study area does not classify as EEC.

Key: (V) = *'Vulnerable' Species listed under Threatened Species Conservation Act 1995 (TSC Act 1995).*

(E) = *Endangered Species listed under TSC Act 1995.*

(M*) = *Migratory listed under Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999).*

(V*) = *'Vulnerable' Species listed under EPBC Act 1999.*

(E*) = *Endangered Species listed under EPBC Act 1999.*

(CE*) = *Critically Endangered Species listed under EPBC Act 1999*

4.3 Endangered Koala Population Hawks Nest and Tea Gardens

The Recovery Plan for Hawks Nest and Tea Gardens Koalas has identified habitat loss and fragmentation, mortalities from vehicle collisions and attacks by domestic and wild dogs as the key threats to this population. The occurrence of preferred Koala Habitat in the form of Open Forest *Eucalyptus robusta* within the southern portion of the study area and the Open Forest *Eucalyptus signata* within the eastern portion of the study area is of potential concern.

It is therefore recommended that identified Koala Habitat be considered for retention as part of any future development. Any potential loss of Koala Habitat via proposed development will need to be carefully assessed in regards to identification, mitigation and control of impacts to acceptable levels. Future landscaping within buffers and drainage lines should utilise Preferred Koala Feed trees to improve and maintain connectivity with retained habitat and habitat occurring within the local area.

In addition to the above recommendations any future development application will require a Koala Plan of Management to be prepared for the study area.

SEPP 44 Koala Habitat Protection

SEPP 44 - Koala Habitat Protection aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline.

- ***First Consideration – Is the Land 'Potential Koala Habitat'?***

Schedule 2 of State Environmental Planning Policy (SEPP) No. 44 – 'Koala Habitat Protection' lists 10 tree species that are considered indicators of 'Potential Koala Habitat'. The presence of any of the species listed on a site proposed for development triggers the requirement for an assessment for 'Potential Koala Habitat'. SEPP 44 defines potential Koala Habitat as:

> *"areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component".*

This section of the study area was found to contain potential Koala habitat as defined by SEPP 44 due to the following Schedule 2 species compositions at greater than 15% of the total number of trees being; *Eucalyptus robusta* (Swamp Mahogany) forested areas and *Eucalyptus signata* (Scribbly Gum) forested area.

- **Second Consideration – Is the Land 'Core Koala Habitat?'**

Searches were made for any secondary indications of Koalas within the study area including scats, scratches on tree trunks, scent markings on tree trunks, tracks in the soil and audible noises including territorial or mating calls, fighting and movement in the trees. Searches for direct observations of Koalas were also conducted during nocturnal surveys. Previous studies by Conacher Travers and Parsons Brinckerhoff along with RPS HSO all recorded the presence of Koalas within the study area. There is also an abundance of local records (299) for Koalas within a 10km radius of the study area.

Due to the presence of Koalas within the study area along with an abundance of local records (311 records within 10km of the study area) the study area is considered 'Core Koala Habitat'.

In conclusion, as several Koalas were observed throughout the study area, it is considered likely that the study area represents Core Koala habitat as defined by SEPP 44. Council may require a Koala Plan of Management be prepared prior to any development consent being granted for the study area.

5.0 CONSTRAINTS AND OPPORTUNITIES

As a result of the above assessment carried out across the study area the following constraints and opportunities are relevant. The constraints for the study area have been divided up into three sections of the study area as outlined in Figure 1-3.

5.1 Proposed 8 Lot Rural Residential Subdivision

5.1.1 Threatened Flora

One threatened flora species of *Syzygium paniculatum* was recorded within this section of the study area. This individual is isolated possible a result of a single bird dispersal or it has been planted. The viability of this individual to reproduce in the long term is limited as no nearby species are present to cross pollinate. However, retention of this individual would be ecologically favourable, as this species would provide foraging resources for a number of threatened fauna such as Swift Parrot, Regent Honeyeater, Grey-headed Flying Fox and blossom bats. As the location of the individual is situated near the Aboriginal Midden site recorded within the north western portion of the proposed 8 lot subdivision, it is recommended that this individual could be retained as part of the possible retention for an Aboriginal Midden that occurs within the same area.

5.1.2 Threatened Fauna

Several threatened fauna species have been recorded and would be impacted upon by the proposed rural subdivision, within this portion of the study area and these include:

1. Wallum Froglet
2. Powerful Owl
3. Masked Owl
4. Squirrel Glider
5. Koala
6. Little Bentwing bat
7. Eastern Freetail-bat

These fauna species are discussed in further detail below and any potential impacts which may arise from development within habitats within this section of the study area.

Wallum Froglet

The Wallum Froglet was recorded throughout the study area during current and previous studies. Habitat for this species occurs within the freshwater paperbark

complex in this section of the study area, and periodically in other areas of the study area in response to flux in hydrological conditions. Key potential impacts that could result from the 8 lot development proposal are habitat removal.

Other indirect impacts may include sedimentation, alteration in hydrology and drainage channel profiles associated with stormwater runoff from any development.

Sediment and water management strategies will need to be incorporated into the planning, construction and occupation phases of any proposed development to ensure that potential impacts to downstream wetland habitats are prevented.

The proposal is not considered likely to isolate Wallum Froglet since connectivity is maintained from the SEPP 14 wetland to the west following suitable habitat in drainage lines.

Therefore this section of the study area will be constrained by potential impacts and future development would require appropriate impact assessment.

Powerful Owl

Powerful Owl was recorded within the study area during previous studies conducted by Conacher Travers and Parsons Brinckerhoff. Potential foraging and breeding habitat does occur within this section of the study area.

As Powerful Owls are highly mobile and capable of travelling long distances this section of the study area is not considered important habitat for the species. Therefore no constraints in regards to Powerful Owls are relevant to this section of the study area.

Masked Owl

The Masked Owl was recorded within the study area during previous studies by Ecotone (2005). Due to the increased occurrence of residential development within the vicinity of the study area, habitat within the site may no longer constitute high value to this species. In addition, no evidence of use of any appropriate hollows within the 8-lot subdivision was observed during intensive surveys by Conacher Travers (2007). However, due to the occurrence of previous records, potential foraging habitat and an abundance of suitable nesting opportunities (14 hollow-bearing trees with large hollows >30cm) its use of this portion of the study area cannot be discounted.

As Masked Owl are a highly mobile species and larger areas of quality habitat within the locality occur, combined with the lack of evidence of breeding within the study area, it is not considered important habitat for the species. Therefore

no constraints in regards to Masked Owls are required to this section of the study area.

Squirrel Glider

The Squirrel Glider was recorded within the study area during previous surveys conducted by Conacher Travers and Parsons Brinckerhoff. Potential habitat occurs throughout this section of the study area, and is also known from areas connected to the proposed 8 lot rural subdivision.

Proposed conservation lands adjacent to the study area will see the retention of a large portion of potential habitat for the species. These proposed conservation lands have been recognised within a SGHMP, with objectives to restore and enhance habitat for the Squirrel Glider. This section of the study area is identified as part of the conservation lands for the SGHMP. Therefore this section of the study area will be constrained by potential impacts and future development would require appropriate impact assessment. This is discussed further in the section below:

Squirrel Glider Habitat Management Plan

Extensive survey work has been undertaken within the study area and this has been thoroughly referenced within the Species Impact Statement (SIS) undertaken by Conacher Travers (2007). These results indicate Squirrel Glider to occur within the southern and western portion of the study area within Open Forest vegetation with appropriate habitat. Home range studies that included radiotracking (Goldingay & Sharpe 2006) produced in conjunction with the SIS (2007) indicates that Squirrel Glider movement is mostly confined to the southern portion of the study area and lands adjacent to the study area. Habitat within the Study area for this species is considered by RPS HSO to be confined to the Open Forest *Corymbia gummifera* and Open Forest *Eucalyptus robusta* in the form of seasonally flowering nectar and tree sap sources. Suitable den and breeding sites are located, within the Study area, within the numerous tree hollows present.

A SGHMP has been prepared for the Squirrel Glider Population to address agreements, prohibitions and actions to protect habitat area of the Squirrel Glider. This Plan was prepared as a result of an appeal to the Land and Environment Court in relation to a Development Application for the Hermitage retirement village on Part Lot 404 DP 1048133. The detailed plan provides objectives to restore and enhance habitat for this species identified to the south and west of the Study area and including land proposed for the 8 Lot Rural residential subdivision.

Under the requirements of the SGHMP no development or vegetation clearing is to be carried out within the areas identified within the SGHMP, with the exception

of ongoing Bushfire Hazard Management (Section 2.5) for the adjacent retirement village. Under these actions the proposed rural residential subdivision is currently not permissible and the subdivision would require Court Consent to modify the SGHMP.

The SIS considers that there may be allowances to permit the single dwelling constructions without significantly impacting on SG population due to the retention of the majority of canopy within the indicative concept plan. It is considered that any changes to the SGHMP to allow the inclusion of the subdivision would require full attention to the proposed management actions in the SGHMP to minimise vegetation removal and enhance habitat restoration.

For example, the SGHMP stipulates that habitat restoration and revegetation require an increase by 20% for crown protective cover (cpc), including the planting of Banksia's and other tree species. If this is to be addressed as part of the SIS, further quantitative data is required that identifies the amount of cpc to be removed as part of the proposal and identify revegetation areas that allow for the elected increase while complying with APZ requirements.

Koala

The Koala was observed in three locations and the Hawks Nest and Tea Gardens Koala Population is listed as an Endangered Population under the New South Wales Threatened Species Conservation Act 1995. Potential habitat exists within vegetation communities with dominant tree species of *Eucalyptus robusta* (Swamp Mahogany), *Eucalyptus microcorys* (Tallowwood) and *Eucalyptus signata* (Scribbly Gum). Secondary tree species identified to be utilised to a lesser extent by Koala within the study area include *Melaleuca quinquenervia* (Broad-leaved Paperbark), *Eucalyptus pilularis* (Blackbutt), *Corymbia gummifera* (Bloodwood) and *Angophora costata* (Smooth-barked Apple).

While the habitat could not be consider pristine due to the disturbed (slashed) nature of the majority of the study area, the abundance of local records indicate the area to be used by a resident Koala population, and the site would have good regeneration potential. Any proposed development within this area would need to clearly show that Koala feed trees are retained as much as possible, and that any proposed losses are assessed and mitigated accordingly. This part of the study area has been identified in Section 4.3 as Core Koala Habitat and therefore it is important that as many feed trees are retained to maintain the current population within the Tea Gardens locality.

Little Bentwing-Bat

Little Bentwing bat was recorded within this section of the study area.

No potential cave roost habitat was recorded within the area. There is some potential foraging habitat within this section which is also present within adjacent lands.

As this species is highly mobile and capable of travelling long distances the presence of preferred habitat in the proposed 8 lot subdivision area is not likely to place constraints on future development.

Eastern Freetail-Bat

No potential cave roost habitat was recorded within this section of the study area and as such breeding habitat would not be affected by the proposal.

The Eastern Freetail Bat is a highly mobile species capable of travelling long distances and as such is not considered likely to be isolated by any future development.

Therefore no constraints in regards to Eastern Freetail bats are relevant to this section of the study area.

Other Threatened Fauna Species

The following threatened fauna have been recorded within close vicinity or this portion of the study area contains potential habitat:

1. Swift Parrot
2. Regent Honeyeater
3. Grey-headed Flying Fox
4. Brush-tailed Phascogale
5. Long Nosed Potaroo
6. Eastern Pygmy Possum
7. Eastern Chestnut Mouse (PB 2003)
8. Eastern Bentwing-Bat
9. Large-eared Pied Bat
10. Yellow-bellied Sheathtail-Bat
11. Eastern False Pipistrelle
12. Large-footed Myotis
13. Greater Broad-nosed Bat

Direct impacts associated with the proposal consist of the removal of a small amount of potential habitat for these species. However proposed conservation lands adjacent to the study area will see the retention of a large portion of potential habitat for the species. In addition to the proposed conservation lands,

large areas of potential habitat occur within the wider locality for these species. It is therefore considered unlikely that the proposal will result in a significant impact on the above species in the locality.

5.1.3 Vegetation Communities

The areas mapped as Open Forest *Eucalyptus robusta*, floristically meet the criteria for being the Swamp Sclerophyll Forest on Coastal Floodplains EEC. As these vegetation communities occur on Aeolian sands rather than coastal floodplain, they do not meet the geomorphological criteria of being the EEC mentioned. Conacher Travers (2006) has undertaken extensive soil testing within their study area and these results confirmed that the study area was Aeolian sands. Therefore, they concluded that no EECs occur within the study area. RPS HSO is in agreement with this opinion, however this vegetation is considered to be regionally significant due to the habitat it provides for a number of threatened flora and fauna. These include, *Syzygium paniculatum*, Wallum Froglet, Powerful Owl, Masked Owl, Squirrel Glider, Koala, Little Bentwing bat and Eastern Freetail-bat.

5.1.4 Conclusions for Proposed 8 Lot Subdivision

The following considerations and recommendations are to be incorporated into future development design.

- Retention of the *Syzygium paniculatum,* where possible and implement a buffer of at least 50 metres to protect this plant from any proposed building envelopes;

- This section has been identified as Core Koala habitat. A Koala Plan of Management will need to be prepared for the whole study area to ensure adequate habitat and linkage is retained throughout the ***study area*** in conjunction with any development proposal;

- A SGHMP has been prepared and should be duly considered to ensure that Squirrel Glider habitat is adequately protected;

- This part of the site is identified as Squirrel Glider habitat. In particular, canopy trees which maintain connectivity. Should any development proceed in this area and vegetation is removed, revegetation within allotments and adjacent buffers will need to occur.

- Indirect impacts to the Wallum Froglet may occur as a result of any development. If any development proceeds appropriate sediment and water management strategies will need to be implemented to offset any impacts for this species;

- A 40m buffer be implemented around the 7(a1) Environmental Protection Zoned land to protect native vegetation to the south.

5.2 Transition Area

5.2.1 Threatened Flora

No threatened flora species have been recorded within this portion of the study area. However there is potential habitat for *Grevillea parviflora subsp. parviflora* within the Open Woodland Eucalyptus signata vegetation.

The impact of removal of this remnant stand of habitat, located within the study area, for this species is considered to be a significant impact, due to the rarity of this species within the Great Lakes LGA.

5.2.2 Threatened Fauna

One threatened fauna species has been recorded, Squirrel Glider and thus maybe impacted upon by future development, within this portion of the study area.

Squirrel Glider

The Squirrel Glider was recorded within the north-western section of the transition area during previous surveys conducted by Conacher Travers and Parsons Brinckerhoff.

Proposed conservation lands adjacent to the study area will see the retention of a large portion of potential habitat for the species. These proposed conservation lands have been recognised within a SGHMP, with objectives to restore and enhance habitat for the Squirrel Glider. The north-western section of the potential development area is identified as part of the conservation lands for the SGHMP. Therefore this section of the study area will be constrained by potential impacts and future development would require appropriate impact assessment

Other Threatened Fauna Species

The following threatened fauna have been recorded within close vicinity or this portion of the study area contains potential habitat:

1. Wallum Froglet
2. Swift Parrot
3. Regent Honeyeater
4. Masked Owl
5. Powerful Owl
6. Koala
7. Grey-headed Flying Fox

8. Brush-tailed Phascogale
9. Long Nosed Potaroo
10. Eastern Pygmy Possum
11. Eastern Chestnut Mouse (PB 2003)
12. Little Bentwing-bat
13. Eastern Freetail-bat
14. Eastern Bentwing-Bat
15. Large-eared Pied Bat
16. Yellow-bellied Sheathtail-Bat
17. Eastern False Pipistrelle
18. Large-footed Myotis
19. Greater Broad-nosed Bat

Direct impacts associated with the proposal consist of the removal of a small amount of potential habitat for these species. However proposed conservation lands adjacent to the study area will see the retention of a large portion of potential habitat for the species. In addition to the proposed conservation lands, large areas of potential habitat occur within the wider locality for these species. It is therefore considered unlikely that the proposal will result in a significant impact on the above species in the locality.

5.2.3 Vegetation Communities

The largest portion of Open Woodland *Eucalyptus signata* vegetation community mapped within the study area is considered regionally significant with regeneration potential. A vehicle reconnaissance of other areas mapped by the Great Lakes Council vegetation project found that the vegetation within the study area and the portion located on Viney Creek Road were the only examples of this vegetation type left within Tea Gardens. A thorough search of the remaining areas of native vegetation within Tea Gardens has not been performed. This vegetation community also contains habitat for the threatened flora species *Grevillea parviflora subsp. parviflora* and therefore should be retained within the study area. The community onsite occurs in five fragmented portions. The four small portions are considered to be highly disturbed and fragmented and they are considered to have limited ecological value.

The larger portion has connectivity to the native vegetation portions of the study area and has a good diversity of natives in the understory. This portion has the greatest chance of recovery in the long term.

It is recommended that the largest portion of this vegetation community be retained due to high regional significance and high probability of regeneration.

5.2.4 Endangered Ecological Community

The areas mapped as Open Forest *Eucalyptus robusta* floristically meet the criteria for being the Swamp Sclerophyll Forest on Coastal Floodplains EEC. As these vegetation communities occur on Aeolian sands rather than coastal floodplain, they do not meet the geomorphological criteria of being the EEC mentioned. Conacher Travers (2006) has undertaken extensive soil testing within their study area and these results confirmed that the study area was Aeolian sands. Therefore, they concluded that no EECs occur within the study area. Therefore, it can be concluded that no EECs occur within the study area. RPS HSO is in agreement with this opinion, however this vegetation is considered to be regionally significant due to the habitat it provides for a number of threatened flora and fauna. These include, *Syzygium paniculatum*, Wallum Froglet, Powerful Owl, Masked Owl, Squirrel Glider, Koala, Little Bentwing bat and Eastern Freetail-bat.

5.2.5 Conclusions for Transition Area

The Open Forest *Eucalyptus signata* vegetation located within this portion of the study area is recommended for retention. The Open Forest *Melaleuca quinquinervia/Eucalyptus robusta* should also be retained as part of any development proposal to maintain connectivity between the conservation lands and the Open Forest *Eucalyptus signata*. This will ensure regeneration of the remaining vegetation within the study area. The area to the north of the large dam could be made available for development as this area is highly disturbed and contains limited habitat for threatened flora and fauna. In summary:

- Development Principles should be generated for this area via an appropriate planning mechanism to ensure that the value and function of the zone is reflected in any land use proposals within and adjacent to this zone.

- It is recommended that the large area of Open Forest *Eucalyptus signata* vegetation community located within this area be retained;

- From an ecological perspective, there is no reason development cannot proceed within the northern portion of this area which is mapped as Disturbed / Cleared Land;

- A 40m buffer should be implemented around the 7(a1) Environmental Protection Zoned land to protect native vegetation to the west;

- A 100 m buffer should be implemented around the SEPP 14 Wetland mapped to the west to protect sensitive ecosystems.

5.3 Potential Development Area

5.3.1 Threatened Flora

Callistemon linearifolius

Targeted searches for this species by Conacher Travers (2007) did not locate any individuals of this species. However, suitable habitat for the species exists within the Open Forest *Eucalyptus robusta* vegetation community within this portion of the study area. This vegetation community was detected by Conacher Travers (2007) as only occurring within the southern portion of the study area; however the current survey mapped an additional area in the north east of the study area. Whilst this additional area is small the community occurred along a drainage line and had good diversity of native species present providing good habitat for this species.

An incremental loss of a small amount of suitable habitat in the locality would occur as a result of the proposal. However, this species was not recorded during the survey period and suitable habitat will be protected within the conservation zoned areas to the south of the study area.

Given that a relatively large area of habitat for this species will be reserved within the Conservation zoned lands to the south, it is considered highly unlikely that removal of habitat within the study area will significantly impact upon this species.

Grevillea parviflora subsp. parviflora

This species was not recorded within this portion of the study area, however potential habitat in the form of Open Forest *Eucalyptus signata*. The examples of this habitat which are present within this portion of the study area are fragmented. These examples hold limited potential habitat for this species and development within these areas are not considered to be a significant impact upon this species.

5.3.2 Threatened Fauna

Several threatened fauna species have been recorded, within this portion of the study area and maybe impacted upon by future development these include the following:

1. Grey-headed Flying Fox
2. Squirrel Glider
3. Black Neck Stork
4. Eastern Freetail-bat
5. Little Bentwing-bat
6. Wallum Froglet

Grey-headed Flying Fox

Potential foraging habitat for the Grey-headed Flying Fox exists within the Potential development area due to the presence of flowering myrtaceous tree species. No camps or potential camp sites for the Grey-headed Flying Fox occur within the area and as such are unlikely to be impacted by the proposal.

As this species is highly mobile and capable of travelling long distances the presence of preferred habitat in the potential development area is not likely to place constraints on future development.

Squirrel Glider

The Squirrel Glider was recorded within the north-western section of the potential development area during previous surveys conducted by Conacher Travers and Parsons Brinckerhoff.

Proposed conservation lands adjacent to the study area will see the retention of a large portion of potential habitat for the species. These proposed conservation lands have been recognised within the SGHMP, with objectives to restore and enhance habitat for the Squirrel Glider. The north-western section of the potential development area is identified as part of the conservation lands for the SGHMP. Therefore this section of the study area will be constrained by potential impacts and future development would require appropriate impact assessment.

Black Necked Stork

The Black Necked Stork was recorded within the potential development area during previous surveys conducted by Conacher Travers and Parsons Brinckerhoff. Habitat for this species occurs within the various water bodies and in other low-lying areas in the north-western section of the potential development area.

As areas deemed suitable habitat for this species would not be suitable for development purposes, it is considered that no constraints would arise due to this species occurring on site.

Eastern Freetail-Bat

No potential cave roost habitat was recorded within the potential development area and as such breeding habitat would not be affected by the proposal.

The Eastern Freetail Bat is a highly mobile species capable of travelling long distances and as such is not considered likely to be isolated by any future development.

Therefore no constraints in regards to Eastern Freetail bats are relevant to this section of the study area.

Little Bentwing-Bat

Little Bentwing bat was recorded within the vicinity of the transition area.

No potential cave roost habitat was recorded within the potential development area. There is some potential foraging habitat within the area which is also present within adjacent lands.

As this species is highly mobile and capable of travelling long distances the presence of preferred habitat in the transition area is not likely to place constraints on future development.

Wallum Froglet

The Wallum Froglet was recorded throughout the study area during current and previous studies. Habitat for this species occurs within the freshwater paperbark complex in the south-western part of the study area, and periodically in other areas of the study area in response to flux in hydrological conditions.

The drainage lines that run throughout this section of the study area have recorded Wallum Froglets.

As these areas are considered suitable habitat for Wallum Froglets and there has been recordings of the species there would be constraints upon future development within identified Wallum habitat and further impact assessments would need to be undertaken prior to any development.

Koala

The retention of Open Woodland *Eucalyptus signata* and the retention and revegetation of drainage lines that consist of *E. robusta* and *M. quinquenervia* within concept planning for the study area will reduce impacts to the local population such that local extinctions would occur. In addition the conservation lands to the south, which includes extensive preferred Koala habitat in the form of *E. robusta* Forest, of the study area along with areas within the study area not proposed for development will ensure Koala corridors are retained in the area.

Other Threatened Fauna

The following threatened fauna have been recorded within close vicinity of this section of the study area and these include:

1. Swift Parrot
2. Regent Honeyeater
3. Masked Owl
4. Powerful Owl
5. Brush-tailed Phascogale

6. Long Nosed Potaroo
7. Eastern Pygmy Possum
8. Eastern Chestnut Mouse (PB 2003)
9. Eastern Bentwing-Bat
10. Large-eared Pied Bat
11. Yellow-bellied Sheathtail-Bat
12. Eastern False Pipistrelle
13. Large-footed Myotis
14. Greater Broad-nosed Bat

Direct impacts associated with the proposal consist of the removal of a small amount of potential habitat for these species. However proposed conservation lands adjacent to the study area will see the retention of a large portion of potential habitat for the species. In addition to the proposed conservation lands, large areas of potential habitat occur within the wider locality for these species. It is therefore considered unlikely that the proposal will result in a significant impact on the above species in the locality.

5.3.3 Vegetation Communities

The majority of the vegetation communities within this portion of the study area are highly modified or isolated. Whilst some areas contain some potential habitat for threatened flora species the majority are highly disturbed. The vegetation communities of Cleared Land and Pine / Modified Vegetation are either, not of sufficient extent (some linear) to support threatened fauna species in isolation, or they do not conform to habitat which might be highly suitable to locally occurring mammal species. Therefore it is considered that the majority of the vegetation within this portion of the study would not be constrained by any potential development.

5.3.4 Drainage lines

The Study area is low lying and subjected to regular inundation due to the close proximity of the SEPP 14 wetland and high water table. The original vegetation mapping prepared by Conacher Travers excluded several drainage lines which were present within the eastern and central parts of the study area. These drainage lines contain surrounding vegetation and have been delineated within the current mapping. A 40 m drainage buffer has been recommended around these drainage lines to protect potential habitat for Wallum Froglet and the Koala. It is recommended that the more disturbed areas of the drainage lines be revegetation with natural vegetation to provide habitat for these two species.

5.3.5 Conclusions for the Potential Development Area

- The four remaining fragmented patches of the Open Forest *Eucalyptus signata* vegetation community are considered to have limited ability for regeneration due to their isolation, fragmentation and small size. Therefore

removal of these areas is considered to unlikely to have a significant impact upon this vegetation community within the locality. Nonetheless, it is recommended that the Open Forest *Eucalyptus signata* vegetation community within this area be retained, where possible;

- A 40 m buffer should be implemented around the drainage lines within this area;
- A 40m buffer should be implemented around the 7(a1) Environmental Protection Zoned lands to protect native vegetation;
- Retention of the mapped areas of Koala and Wallum Froglet habitat within this area is recommended.

5.4 SEPP 14 Wetland 100m buffer

As mentioned in Section 3.2 above a SEPP 14 Wetland has been mapped within close proximity of the study area. It is recommended that at least 100m buffer be implemented from this wetland to ensure protection of the endangered ecological communities of Coastal Saltmarsh and Swamp Oak Floodplain Forest located within the conservation zoned lands. This buffer has been mapped in Figure 7-1.

The close proximity of the SEPP 14 wetland to the study area (approximately 80m south of the southern boundary and entering the study area on the north western edge) is of potential concern. Due to the close proximity of the SEPP 14 wetland (a small area of the study area is mapped as SEPP 14 wetlands), future development of the study area has the potential to influence the sensitive receiving environment of the wetland. Due to the low-lying nature and complex hydrology of wetlands, even potential impacts that may occur near the downstream outlet may also potentially impact on the remainder of the wetland upstream. Such examples include pollutant dispersal, increases in water levels due to climate change, erosion and sedimentation, and resultant impacts on habitats, vegetation and micro ecological niches.

Potential impacts on the wetland as a result of developing the study area include:

- Alteration in the amount and type of flow entering the wetland and potential subsequent impacts on wetland and heath vegetation;
- Addition of pollutants to the wetland from construction machinery, residential vehicle traffic and stormwater;
- Erosion and sedimentation within the wetland resulting from construction in upslope areas;

- Removal of wetland vegetation; and

- Invasion of weeds through vegetation clearance and residential land use.

Strict measures will need to be implemented to minimise the potential impacts on SEPP 14 wetlands that are likely to be associated with the proposal on the study area. A riparian buffer may be implemented that aim to protect the integrity of the SEPP 14 wetland such as:

- A primary riparian buffer of 100m from wetland vegetation, where no land uses are permitted that significantly detract from the potential of the buffer to achieve the goal of wetland protection. This buffer would consist predominantly of existing fringing vegetation.

Where this buffer is unable to be adequately implemented within the proposed development design, additional control measures should be investigated in consultation with experienced wetland hydrologists and engineers to ensure that potential impacts on the SEPP 14 wetland are avoided.

Other general recommendations to minimise potential impacts on the SEPP 14 wetland include:

- Where feasible, roads should enclose the residential development to avoid encroachment of residences into surrounding bushland;

- A weed management and monitoring plan should be developed and implemented to minimise the potential for the invasion of aquatic and terrestrial weed species into the SEPP 14 wetland and buffer zones; and

- Stormwater treatment as appropriate should be undertaken to minimise potential impacts on the SEPP 14 wetland.

5.5 Zone 7(a1) Environmental Protection 40m buffer

As mentioned in Section 3.3 above zoning within the Great Lakes Shire Council Local Environment Plan consist of 7(a) Wetlands and Littoral Rainforests and 7(a1) Environmental Protection.

Strict measures would need to be implemented to minimise any potential impacts on Zoning 7(a1) and 7(a) that are likely to be associated with any proposed development of the study area. A 40m buffer may be implemented that aims to protect the integrity of the 7(a1) Environmental Protection and 7(a) Wetlands zones. The 40m buffer is based on vegetated buffers and core riparian zones for

the use in protection of estuaries and wetlands, as per Guidelines for controlled activities *Water Management Act 2000*.

Buffer would provide a transitional zone and perform a range of important environmental functions in mitigating edge effects such as:

- Increased drying out of soils and hence changes to the vegetation at the boundary of the park
- Declines in fauna species that are sensitive to changes in vegetation along newly created edges
- Visual, odour, noise, air quality impacts and amenity, and
- Threats to ecological connectivity
- Management implications, associated with pests and weeds associated with edge effects
- Increased predation in the vicinity of the zone boundary associated with large aggressive species that occur in open situations (e.g. nest predation by Ravens and Currawongs) (DECC 2007).

The buffer would be maintained in such a way as to mitigate any edge effects while providing for particular land uses. The buffer can provide for future community opportunities as part of future concept planning that would include but not be limited to appropriate Asset Protection Zones (APZ), drainage basins, pedestrian and cycleway, as well as for adding aesthetic value. Heavy use activities that would potentially increase pest and weed species should be avoided and include residential properties and road infrastructure.

Where this buffer is unable to be adequately implemented within the proposed development design, additional control measures should be investigated in consultation with experienced ecologists.

5.6 Conclusion

In conclusion a constraints map (Figure 5-1) has been developed incorporating all of the aforementioned constraints to give a possible development area which is most likely to have the least impact upon native flora, fauna and ecological communities.

The conclusions for each section are listed above and contain recommendations for potential development therein. In addition to those constraints, buffers are

recommended for the SEPP 14 Wetland and the 7(a) and 7(a1) Environmental Protection Zones. These buffers have been incorporated into the constraints map to provide Great Lakes Council with a potential development area for the entire Myall River Downs Site.

WARNING
No part of this plan should be used for critical design dimensions. Confirmation of critical positions should be obtained from Harper Somers O'Sullivan Pty Ltd.

LEGEND

- Study Area
- Drainage Line
- Zone 7(a) Wetlands and Littoral Rainforest
- Zone 7 (1a) Environmental Protection
- Squirrel Glider Management Plan Areas

POTENTIAL DEVELOPMENT

- Potential Development Area

ECOLOGICAL CONSTRAINTS

- Preferred Koala Feed Tree Habitat Area
- Wallum Frog Habitat Area
- Open Woodland Eucalyptus signata
- 40m Drainage Buffer
- SEPP 14 Coastal Wetland 100m Buffer
- 7(a1) Environmental Protection 40m Buffer

Hermitage Retirement Village

0 300 600m

TITLE: Figure 5-1 Constraints Map

CLIENT: Great Lakes Council

SCALE: 1: 10000 at A3 Size **DRAWN:** A.Saddington **APPROVED:** D.Landenberger

DATUM: MGA Zone 56 (GDA 94) **DATE:** 21/10/2008

LAYOUT REF:J:\JOBS\24k\24737 Tea Gardens\Drafting\MapInfo\Ecology \Report Workspaces\24737 Figure 3-3 Grev parviflora A A3

CONTOUR INTERVAL: N/A

JOB REF: 24737

PLANNING SURVEYING ECOLOGY

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6.0 CONCLUSION

RPS Harper Somers O'Sullivan Pty Ltd (RPS HSO) has been commissioned by Great Lakes Council to review and update the original Local Environmental Study prepared by Parsons Brinkerhoff (2003) for Myall River Downs. This ecological study is to take into account more recent survey works and investigations with some additional survey to be included in the Local Environmental Study (LES) over land at Myall River Downs, Tea Gardens.

In addition to the conclusions which have been made in Section 5 the following conclusions have been made in respect to the entire study area:-

Constraints and Opportunities

Due to the previous planning history of the Myall River Downs site for pragmatic reasons the study area was divided into three sections (Figure 1-3):

1. Proposed 8-lot subdivision in the southern part of the site;
2. A 'Transition Area' in the western part of the site;
3. The remainder of the Myall River Downs study area, which for the purposes of this report is identified as the 'Potential Development area'.

The conclusions for each of these sections are listed below and contain recommendations for potential development therein. In addition, buffers are recommended for the SEPP 14 Wetland and the 7(a1) Environmental Protection Zones. These buffers have been incorporated into the constraints map to provide Great Lakes Council with a potential development area for the entire Myall River Downs Site from an ecological perspective.

The following are a summary of the recommendations

Proposed 8- lot Rural Subdivision

Retention of the *Syzygium paniculatum*, where possible and implement a buffer of at least 50 metres to protect this plant from any proposed building envelopes;

This section has been identified as Core Koala habitat. A Koala Plan of Management will need to be prepared for the whole ***study area*** to ensure adequate habitat and linkage is retained throughout the study area in conjunction with any development proposal;

- A SGHMP has been prepared and should be duly considered to ensure that Squirrel Glider habitat is adequately protected;

- This part of the site is identified as Squirrel Glider habitat. In particular, canopy trees which maintain connectivity. Should any development proceed

in this area and vegetation is removed, revegetation within allotments and adjacent buffers will need to occur.

- Indirect impacts to the Wallum Froglet may occur as a result of any development. If any development proceeds appropriate sediment and water management strategies will need to be implemented to offset any impacts for this species;

- A 40m buffer be implemented around the 7(a1) Environmental Protection Zoned land to protect native vegetation to the south.

Therefore, in conclusion, should the proposed 8 lot rural subdivision proceed the above recommendations will need to be addressed.

Transition Area

- Development Principles should be generated for this area via an appropriate planning mechanism to ensure that the value and function of the zone is reflected in any land use proposals within and adjacent to this zone.

- It is recommended that the large area of Open Forest Eucalyptus signata vegetation community located within this area be retained;

- From an ecological perspective, there is no reason development cannot proceed within the northern portion of this area which is mapped as Disturbed / Cleared Land;

- A 40m buffer should be implemented around the 7(a1) Environmental Protection Zoned land to protect native vegetation to the west;

- A 100 m buffer should be implemented around the SEPP 14 Wetland mapped to the west to protect sensitive ecosystems.

Potential Development Area

- The four remaining fragmented patches of the Open Forest *Eucalyptus signata* vegetation community are considered to have limited ability for regeneration due to their isolation, fragmentation and small size. Therefore removal of these areas is considered to unlikely to have a significant impact upon this vegetation community within the locality. Nonetheless, it is recommended that the Open Forest *Eucalyptus signata* vegetation community within this area be retained, where possible;

- A 40 m buffer should be implemented around the drainage lines within this area;

- A 40m buffer should be implemented around the 7(a1) Environmental Protection Zoned lands to protect native vegetation;

- Retention of the mapped areas of Koala and Wallum Froglet habitat within this area is recommended.

It is also recommended that Great Lakes Council undertake targeted surveys for *Grevillea parviflora ssp parviflora* species during July to December to determine the extent of the population within the Great Lakes Council Lands to the north east of the study area. It is also recommended that this land be rezoned from Open Space to a conservation zone such as 7(a1) to conserve this population for the future. Any disturbance of the understorey is likely to be detrimental to this species in the long term. Further searches should be undertaken in other areas of know habitat particularly the Scribbly Gum Open Forest Habitats in the northern portion of Great Lakes LGA.

7.0 RECOMMENDATIONS

The following recommendations have been outlined to ensure that the ecological impact of any future development is minimised as far as possible:

- The minimum amount of clearing should take place as a general objective of the project, particularly within those areas that currently contain identified native vegetation communities. These areas have been described within this report.

- Map and document the hollow bearing trees within the study area and ensure that no more than 5% of hollow bearing trees are removed by the proposed development without further impact assessment. Mature and / or hollow-bearing trees should be retained wherever feasible and with regards to public safety within the development framework.

- Retain the *Syzygium paniculatum* individual that was identified where possible. Implement a buffer of at least 50m to protect this plant from any proposed building envelopes within the proposed rural residential subdivision.

- Retain, cease slashing and fence the larger portion of the Open Woodland *Eucalyptus signata* to allow regeneration. Implement a vegetation management plan to guide rehabilitation of the community. Great Lakes Council rezone the Open Forest *Eucalyptus signata* vegetation *community within* its lands to 7(a1) Environmental Protection to conserve the population of *Grevillea parviflora subsp. parviflora* found therein. Targeted surveys should be undertaken within these lands to determine the size and extent of the population.

- Core Koala Habitat should be *considered for retention* as part of any future concept plan along with planting of Preferred Koala Feed trees within landscaping to improve and maintain connectivity with retained habitat and habitat occurring within the local area. Any proposed development within such areas will need to clearly show that impacts are adequately mitigated to acceptable levels.

- Proposed sediment retention ponds should be landscaped with fringing wetland vegetation (e.g. *Typha sp.*) to provide habitat for guilds such as frogs and waterbirds, including the threatened Wallum Froglet which inhabits the study area.

- Retain a 100m buffer between any development and the areas mapped as SEPP 14 wetlands.

- Retain a 40m buffer between any development and the area zoned and mapped by Great Lake Council as 7(a1) Environmental Protection and 7(a) Wetland.

- A weed management and monitoring plan for the study area should be developed and implemented to minimise the potential for the invasion of aquatic and terrestrial weed species into the SEPP 14 wetland and buffer zones. The weed management and monitoring plan should be developed in consultation with DECC to ensure consistency with management strategies undertaken for the adjacent Myall Lakes National Park and Corrie Island Nature Reserve.

Development and Construction Recommendations

- During any construction phase, for any tree removal within forested areas, and in particular where hollow-bearing trees may be removed, all works should be supervised by an ecologist to recover any native fauna that are potentially displaced. Furthermore, where such risks occur, site-specific ecological advice should be sought to minimise impacts during the entire process. A clearing protocol should be adopted for the removal of trees containing suitable habitat hollows as follows (this is considered as a guideline, variations on the methods employed may be required to accommodate site specific factors):

    - All hollow bearing trees are to be flagged by an ecologist prior to the commencement of works within the study area.

    - Underscrubbing of the entire study area should be carried out by a 4x4 tractor with a slashing deck, this will minimise the establishment of degradation processes and leave a layer of mulch to aid in soil retention in the event of adverse weather. At this time felling of non habitat trees can take place, however a matrix of trees *must* be maintained to allow animal movement into the designated refuge area.

    - After a period of two weeks, clearing of habitat trees should commence. Clearing must be carried out moving from the fringe of the matrix towards the refuge area. Trees should be 'soft felled' and inspected immediately by an ecologist for displaced fauna. All trees must be left for a minimum of two nights prior to being moved to a stockpile, to allow resident fauna to vacate tree hollows.

- Strict management of stormwater runoff and sediment control from the study area must occur to minimise potential impacts on SEPP 14 wetlands and Wallum Froglet habitat.

- Where possible, earthworks (and certainly all works in the vicinity of drainage lines) should be undertaken during appropriate (i.e. dry) weather conditions. This will ensure that any potential erosion events will be intercepted and that no downstream impacts occur within any of the drainage lines. This will help to maintain existing habitat characteristics for native fauna in those areas, including those for threatened species.

- Nutrient and sediment control devices should be erected pre-clearing and post-construction works in sensitive areas where degradation processes may be triggered such as areas adjacent to watercourses until suitable rehabilitation has occurred to maintain surface integrity. Furthermore, stockpiles should be subject to individual sediment and nutrient control devices.

- Pre-clearing inspections should be undertaken by an ecologist in wooded areas where threatened fauna species have been recorded or are considered likely to occur. This is particularly important in areas where threatened fauna have been noted during recent surveys either breeding or nest-building. No breeding attempts should be disrupted during the course of the project, particularly by threatened fauna.

Note: Clearing should ideally take place outside of the main breeding seasons of resident fauna, preferably during late autumn and winter.

Post Development Recommendations

- Species selection for future landscaping works and seed stock for revegetation should, where possible, collected from locally occurring native species to maintain local genetic diversity. These species should include *Eucalyptus robusta, Eucalyptus signata* and other regionally significant species.

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APPENDIX 1

Flora Species List

FLORA SPECIES LIST

The following list includes all species of vascular plants observed within the study area during fieldwork. It should be noted that such a list should not be considered comprehensive, but rather indicative of the flora present on the study area. It can take many years of flora surveys to record all of the plant species occurring within any area, especially plant species that are only apparent in some seasons such as orchids.

A number of species cannot always be accurately identified during a brief survey, generally due to a lack of suitable flowering and/or fruiting material. Any such species are identified as accurately as possible, and are indicated in the list as indicated:

- specimens that could only be identified to genus level are indicated by the generic name followed by the abbreviation “sp.”, indicating an unidentified species of that genus;

- specimens for which identification of the genus was uncertain are indicated by a question mark (“?”) placed in front of the generic, which is followed by the abbreviation “sp.”; and

- specimens that could be accurately identified to genus level, but could be identified to species level with only a degree of certainty are indicated by a (“?”) placed in front of the epithet.

Authorities for the scientific names are not provided in the list. These follow the references outlined below.

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Names of families and higher taxa follow a modified Cronquist System (1981). Introduced species are indicated by an asterisk “*”.

Threatened species listed under the Threatened Species Conservation Act 1995 (*TSC Act 1995*) or the Environmental Protection of Biodiversity and Conservation (*EPBC Act 1999*) and / or Rare or Threatened Australian Plant (ROTAP) listed species are indicated in bold font and marked as:

(V) = *Vulnerable Species listed under the TSC Act*
(E) = *Endangered Species listed under the TSC Act*
(EE) = *Species listed under the Commonwealth EPBC Act 1999 as Endangered*
(EV) = *Species listed under the Commonwealth EPBC Act 1999 as Vulnerable*
(R) = *ROTAP as per Briggs and Leigh (1996)*

The following standard abbreviations are used to indicate subspecific taxa:

ssp. -	subspecies
var.-	variety
agg.	Aggregate
x -	hybrid between the two indicated species

Class/Subclass	Family	Scientific Name	Common Name	CT (2007)	PB (2003)	RPS HSO (2008)
Filicopsida	Adiantaceae	*Adiantum aethiopicum*	Common Maidenhair	x		x
Filicopsida	Blechnaceae	*Blechnum camfieldii*	-		x	
Filicopsida	Blechnaceae	*Blechnum cartilagineum*	Gristle Fern	x		x
Filicopsida	Blechnaceae	*Blechnum indicum*	-	x	x	x
Filicopsida	Blechnaceae	*Doodia aspera*	Rasp Fern	x		
Filicopsida	Dennstaedtiaceae	*Hypolepis muelleri*	Harsh Ground Fern	x	x	x
Filicopsida	Dennstaedtiaceae	*Pteridium esculentum*	Bracken	x	x	x
Filicopsida	Dicksoniaceae	*Calochlaena dubia*	False Bracken	x	x	x
Filicopsida	Gleicheniaceae	*Gleichenia dicarpa*	Pouched Coral Fern	x		
Filicopsida	Lindsaeaceae	*Lindsaea linearis*	Screw Fern		x	
Filicopsioda	Polypodiaceae	*Platycerium bifurcatum* subsp. *bifurcatum*	Elkhorn	x		
Filicopsioda	Sinopteridaceae	*Cheilanthes sieberi* subsp. *sieberi*	Poison Rock Fern		x	
Filicopsioda	Sinopteridaceae	*Pellaea falcata*	Sickle Fern		x	
Coniferopsida	Pinaceae	*Pinus elliotti**	Slash Pine	x	x	x
Magnoliidae	Acanthaceae	*Pseuderanthemum variabile*	Pastel Flower	x		x

Class/Subclass	Family	Scientific Name	Common Name	CT (2007)	PB (2003)	RPS HSO (2008)
Magnoliidae	Aizoaceae	*Carpobrotus glaucescens*	Pigface	x	x	
Magnoliidae	Aizoaceae	*Tetragonia tetragonioides*	New Zealand Spinach	x	x	
Magnoliidae	Apiaceae	*Apium prostratum* var. *filiforme*	Sea Celery		x	x
Magnoliidae	Apiaceae	*Centella asiatica*	Swamp Pennywort	x	x	
Magnoliidae	Apiaceae	*Hydrocotyle bonariensis**	Pennywort	x	x	x
Magnoliidae	Apiaceae	*Hydrocotyle peduncularis*	Pennywort	x	x	x
Magnoliidae	Apiaceae	*Platysace ericoides*	Heathy Platysace		x	
Magnoliidae	Apiaceae	*Platysace lanceolata*	Lance-leaf Platysace	x	x	x
Magnoliidae	Apiaceae	*Platysace linearifolia*	Narrow-leafed Platysace	x	x	x
Magnoliidae	Apiaceae	*Trachymene incisa* subsp. *incisa*	Native Parsnip		x	
Magnoliidae	Apiaceae	*Xanthosia tridentata*	Rock Xanthosia			x
Magnoliidae	Apocynaceae	*Parsonsia straminea*	Common Silkpod		x	
Magnoliidae	Araliaceae	*Polyscias sambucifolia*	Elderberry Panax	x	x	x
Magnoliidae	Asclepiadaceae	*Marsdenia rostrata*	Common Milk Vine	x		
Magnoliidae	Asclepiadaceae	*Marsdenia suaveolens*	Scented Marsdenia	x		

Class/Subclass	Family	Scientific Name	Common Name	CT (2007)	PB (2003)	RPS HSO (2008)
Magnoliidae	Asclepiadaceae	*Tylophora barbata*	Bearded Tylophora	x		
Magnoliidae	Asclepidaceae	*Gomphocarpus fruiticosus**	Narrow Leaf Cotton Bush			x
Magnoliidae	Asteraceae	*Actinotus helianthi*	Flannel Flower	x	x	
Magnoliidae	Asteraceae	*Ageratina adenophorum**	Crofton Weed	x	x	x
Magnoliidae	Asteraceae	*Aster subulatus**	Wild Aster		x	
Magnoliidae	Asteraceae	*Bidens pilosa**	Cobbler's Pegs	x	x	x
Magnoliidae	Asteraceae	*Chrysanthemoides monilifera* subsp. *monilifera**	Bitou Bush	x	x	
Magnoliidae	Asteraceae	*Cirsium vulgare**	Spear Thistle	x	x	
Magnoliidae	Asteraceae	*Conyza albida**	Fleabane	x	x	x
Magnoliidae	Asteraceae	*Conyza bonariensis**	Flax-leaf Fleabane	x		x
Magnoliidae	Asteraceae	*Conyza parva**	Fleabane		x	
Magnoliidae	Asteraceae	*Cotula coronopifolia**	Waterbuttons	x		
Magnoliidae	Asteraceae	*Crassocephalum crepidioides**	Thickheads		x	
Magnoliidae	Asteraceae	*Epaltes australis*	-		x	
Magnoliidae	Asteraceae	*Erechtites valerianifolia**	Brazilian Fireweed		x	

Class/Subclass	Family	Scientific Name	Common Name	CT (2007)	PB (2003)	RPS HSO (2008)
Magnoliidae	Asteraceae	*Hypochaeris radicata**	Flatweed	x	x	x
Magnoliidae	Asteraceae	*Ozothamnus diosmifolius*	Ball Everlasting	x	x	
Magnoliidae	Asteraceae	*Senecio madagascariensis**	Fireweed	x	x	x
Magnoliidae	Asteraceae	*Sonchus oleraceus**	Common Sow-thistle		x	
Magnoliidae	Asteraceae	*Vernonia cinerea* var. *cinerea*	-	x	x	x
Magnoliidae	Avicenniaceae	*Avicennia marina* var. *australasica*	Grey Mangrove	x	x	
Magnoliidae	Bignoniaceae	*Pandorea pandorana*	Wonga Vine	x	x	
Magnoliidae	Brassicaceae	*Cakile edentula**	American Sea Rocket	x		
Magnoliidae	Campanulaceae	*Wahlenbergia aridicola*	Bluebell		x	
Magnoliidae	Campanulaceae	*Wahlenbergia stricta* subsp. *stricta*	Austral Bluebell	x		
Magnoliidae	Carophyllaceae	*Cerastium glomeratum**	Mouse-ear Chickweed	x	x	x
Magnoliidae	Casuarinaceae	*Allocasuarina littoralis*	Black She-oak	x		x
Magnoliidae	Casuarinaceae	*Allocasuarina torulosa*	Forest Oak	x	x	x
Magnoliidae	Casuarinaceae	*Casuarina glauca*	Swamp Oak	x	x	
Magnoliidae	Chenopodiaceae	*Sarcocornia quinqueflora*	Glasswort	x	x	

Class/Subclass	Family	Scientific Name	Common Name	CT (2007)	PB (2003)	RPS HSO (2008)
Magnoliidae	Chenopodiaceae	*Suadea australis*	Austral Seablite		x	
Magnoliidae	Clusiaceae	*Hypericum gramineum*	Small St Johns Wort		x	x
Magnoliidae	Convolvulaceae	*Dichondra repens*	Kidney Weed	x	x	x
Magnoliidae	Convolvulaceae	*Ipomoea indica**	Coastal Morning Glory		x	
Magnoliidae	Convolvulaceae	*Polymeria calycina*	Bindweed		x	
Magnoliidae	Cunoniaceae	*Callicoma serratifolia*	Black Wattle	x		
Magnoliidae	Dilleniaceae	*Hibbertia aspera*	Rough Guinea Flower	x		x
Magnoliidae	Dilleniaceae	*Hibbertia empetrifolia subsp. uncinata*	-		x	
Magnoliidae	Dilleniaceae	*Hibbertia fasciculata*	-	x	x	x
Magnoliidae	Dilleniaceae	*Hibbertia linearis*	-	x	x	x
Magnoliidae	Dilleniaceae	*Hibbertia obtusifolia*	Grey Guinea Flower		x	
Magnoliidae	Dilleniaceae	*Hibbertia rufa*	-	x		
Magnoliidae	Dilleniaceae	*Hibbertia scandens*	Climbing Guinea-flower	x	x	x
Magnoliidae	Dilleniaceae	*Hibbertia vestita*	-		x	
Magnoliidae	Droseraceae	*Drosera binata*	Forked Sundew	x		

Class/Subclass	Family	Scientific Name	Common Name	CT (2007)	PB (2003)	RPS HSO (2008)
Magnoliidae	Droseraceae	*Drosera spathulata*	Common Sundew	x	x	
Magnoliidae	Eleocarpaceae	*Elaeocarpus reticulatus*	Blueberry Ash	x		
Magnoliidae	Epacridaceae	*Brachyloma daphnoides*	-		x	
Magnoliidae	Epacridaceae	*Epacris microphylla*	Coral Heath	x	x	
Magnoliidae	Epacridaceae	*Epacris pulchella*	NSW Coral Heath	x	x	
Magnoliidae	Epacridaceae	*Leucopogon ericoides*	-		x	x
Magnoliidae	Epacridaceae	*Leucopogon lanceolatus*	Lance-leaf Beard-heath	x	x	x
Magnoliidae	Epacridaceae	*Leucopogon setiger*	-	x		
Magnoliidae	Epacridaceae	*Monotoca elliptica*	Tree Broom-heath	x	x	x
Magnoliidae	Epacridaceae	*Monotoca scoparia*	Prickly Broom-heath	x	x	x
Magnoliidae	Euphorbiaceae	*Amperea xiphoclada*	Broom Spurge	x	x	x
Magnoliidae	Euphorbiaceae	*Breynia oblongifolia*	Coffee Bush	x	x	x
Magnoliidae	Euphorbiaceae	*Glochidion ferdinandii*	Cheese Tree	x	x	
Magnoliidae	Euphorbiaceae	*Omalanthus populifolius*	Bleeding Heart	x	x	x
Magnoliidae	Euphorbiaceae	*Phyllanthus hirtellus*	Thyme Spurge	x	x	x
Magnoliidae	Euphorbiaceae	*Poranthera microphylla*		x	x	x

Class/Subclass	Family	Scientific Name	Common Name	CT (2007)	PB (2003)	RPS HSO (2008)
Magnoliidae	Euphorbiaceae	*Ricinocarpos pinifolius*	Wedding Bush		x	
Magnoliidae	Fabaceae	*Aotus sp. aff. ericoides*	-		x	
Magnoliidae	Fabaceae	*Bossiaea heterophylla*	Variable Bossiaea	x	x	
Magnoliidae	Fabaceae	*Bossiaea obcordata*	Spiny Bossiaea	x		
Magnoliidae	Fabaceae	*Bossiaea scolopendria*	-	x		
Magnoliidae	Fabaceae	*Daviesia mimosoides*	-			x
Magnoliidae	Fabaceae	*Daviesia ulicifolia*	Gorse Bitter Pea	x	x	x
Magnoliidae	Fabaceae	*Desmodium brachypodum*	Large Tick-trefoil	x		
Magnoliidae	Fabaceae	*Desmodium rhytidophyllum*	-		x	
Magnoliidae	Fabaceae	*Desmodium varians*	-	x	x	x
Magnoliidae	Fabaceae	*Dillwynia floribunda* var. *floribunda*	Parrot Pea		x	
Magnoliidae	Fabaceae	*Dillwynia glaberrima*	Parrot Pea	x	x	
Magnoliidae	Fabaceae	*Dillwynia retorta* var. *retorta*	Eggs and Bacon	x	x	x
Magnoliidae	Fabaceae	*Dillwynia sieberi*	Prickly Parrot-pea	x		
Magnoliidae	Fabaceae	*Glycine clandestina*	Twining Glycine	x	x	

Class/Subclass	Family	Scientific Name	Common Name	CT (2007)	PB (2003)	RPS HSO (2008)
Magnoliidae	Fabaceae	*Gompholobium glabratum*	-	x		x
Magnoliidae	Fabaceae	*Gompholobium latifolium*	Broad-leaf Wedge-pea	x		x
Magnoliidae	Fabaceae	*Gompholobium pinnatum*	-		x	
Magnoliidae	Fabaceae	*Gompholobium virgatum* var. *aspalathoides*	Leafy Wedge Pea		x	
Magnoliidae	Fabaceae	*Hardenbergia violacea*	False Sarsparilla	x	x	x
Magnoliidae	Fabaceae	*Hovea linearis*	-	x		
Magnoliidae	Fabaceae	*Indigofera australis*	Native Indigo	x	x	
Magnoliidae	Fabaceae	*Jacksonia scoparia*	Dogwood	x		
Magnoliidae	Fabaceae	*Kennedia rubicunda*	Dusky Coral Pea	x	x	
Magnoliidae	Fabaceae	*Lotus australis*	-	x		
Magnoliidae	Fabaceae	*Mirbelia rubiifolia*	-			x
Magnoliidae	Fabaceae	*Phyllota phylicoides*	-		x	
Magnoliidae	Fabaceae	*Platylobium formosum* subsp. *formosum*	Handsome Flat-pea	x		
Magnoliidae	Fabaceae	*Podolobium ilicifolium*	Prickly Shaggy Pea	x		
Magnoliidae	Fabaceae	*Pultenaea blakelyi*	-	x	x	

Class/Subclass	Family	Scientific Name	Common Name	CT (2007)	PB (2003)	RPS HSO (2008)
Magnoliidae	Fabaceae	*Pultenaea euchila*	-		x	
Magnoliidae	Fabaceae	*Pultenaea flexilis*	Graceful Bush Pea	x		
Magnoliidae	Fabaceae	*Pultenaea paleacea* var. *paleacea*	-	x		x
Magnoliidae	Fabaceae	*Pultenaea retusa*	-		x	x
Magnoliidae	Fabaceae	*Pultenaea rosmarinifolia*	-	x		
Magnoliidae	Fabaceae	*Pultenaea villosa*	-	x	x	x
Magnoliidae	Fabaceae	*Trifolium arvense**	Haresfoot Clover			x
Magnoliidae	Fabaceae	*Trifolium fragiferum**	-		x	
Magnoliidae	Fabaceae	*Trifolium dubium**	Yellow Suckling Clover			x
Magnoliidae	Fabaceae	*Trifolium pratense**	Red Clover	x		x
Magnoliidae	Fabaceae	*Trifolium repens**	White Clover	x	x	x
Magnoliidae	Fabaceae	*Viminaria juncea*	Native Broom	x	x	
Magnoliidae	Gentianaceae	*Centaurium erythraea**	Pink Stars	x		
Magnoliidae	Goodeniaceae	*Dampiera stricta*	Blue Dampiera		x	
Magnoliidae	Goodeniaceae	*Goodenia bellidifolia*	Daisy-leaved Goodenia	x		

Class/Subclass	Family	Scientific Name	Common Name	CT (2007)	PB (2003)	RPS HSO (2008)
Magnoliidae	Goodeniaceae	*Goodenia heterophylla* subsp. *heterophylla*	Variable Leaved Goodenia	x	x	
Magnoliidae	Goodeniaceae	*Goodenia ovata*	-	x	x	
Magnoliidae	Goodeniaceae	*Goodenia paniculata*	Swamp Goodenia	x	x	
Magnoliidae	Goodeniaceae	*Goodenia stelligera*	-		x	
Magnoliidae	Haloragaceae	*Gonocarpus micranthus* subsp. *micranthus*	-		x	
Magnoliidae	Haloragaceae	*Gonocarpus tetragynus*	Poverty Raspwort	x	x	x
Magnoliidae	Haloragaceae	*Gonocarpus teucroides*	Raspwort	x	x	x
Magnoliidae	Lamiaceae	*Lycopus australis*	-		x	
Magnoliidae	Lamiaceae	*Plectranthus parviflorus*	Cockspur Flower	x		x
Magnoliidae	Lauraceae	*Cassytha filiformis*	-		x	
Magnoliidae	Lauraceae	*Cassytha glabella* forma *glabella*	Slender Devil's Twine		x	
Magnoliidae	Lauraceae	*Cassytha pubescens*	Common Devil's Twine	x	x	x
Magnoliidae	Lauraceae	*Cinnamomum camphora**	Camphor Laurel	x	x	
Magnoliidae	Lauraceae	*Endiandra sieberi*	Corkwood	x	x	

Class/Subclass	Family	Scientific Name	Common Name	CT (2007)	PB (2003)	RPS HSO (2008)
Magnoliidae	Lobeliaceae	*Lobelia alata*	-	x	x	
Magnoliidae	Lobeliaceae	*Pratia purpurascens*	Whiteroot	x	x	
Magnoliidae	Loganiaceae	*Mitrasacme paludosa*	-	x		
Magnoliidae	Loganiaceae	*Mitrasacme polymorpha*	Mitrewort		x	
Magnoliidae	Loranthaceae	*Amyema cambagei*	Mistletoe		x	
Magnoliidae	Loranthaceae	*Muellerina celastroides*	Mistletoe	x	x	
Magnoliidae	Malvaceae	*Sida rhombifolia**	Paddy's Lucerne	x	x	x
Magnoliidae	Meliaceae	*Synoum glandulosum*	Scentless Rosewood	x	x	
Magnoliidae	Menispermiaceae	*Sarcopetalum harveyanum*	Pearl Vine	x		x
Magnoliidae	Menispermiaceae	*Stephania japonica* var. *discolor*	Snake Vine	x	x	
Magnoliidae	Menyanthaceae	*Villarsia exaltata*	Yellow Marsh Flower	x	x	
Magnoliidae	Mimosaceae	*Acacia binervia*	Coast Myall	x		
Magnoliidae	Mimosaceae	*Acacia elongata*	-	x	x	x
Magnoliidae	Mimosaceae	*Acacia falcata*	Sickle Wattle		x	
Magnoliidae	Mimosaceae	*Acacia irrorata* subsp. *irrorata*	Green Wattle	x		

Class/Subclass	Family	Scientific Name	Common Name	CT (2007)	PB (2003)	RPS HSO (2008)
Magnoliidae	Mimosaceae	*Acacia longifolia* var. *longifolia*	Sydney Golden Wattle	x	x	x
Magnoliidae	Mimosaceae	*Acacia longifolia* var. *sophorae*	-	x		x
Magnoliidae	Mimosaceae	*Acacia maidenii*	Maiden's Wattle		x	
Magnoliidae	Mimosaceae	*Acacia myrtifolia*	Red Stem Wattle	x	x	x
Magnoliidae	Mimosaceae	*Acacia suaveolens*	Sweet Scented Wattle	x	x	
Magnoliidae	Mimosaceae	*Acacia terminalis*	Sunshine Wattle		x	
Magnoliidae	Mimosaceae	*Acacia ulicifolia*	Prickly Moses	x	x	x
Magnoliidae	Moraceae	*Ficus rubiginosa*	Port Jackson Fig	x		
Magnoliidae	Myrsinaceae	*Aegiceras corniculatum*	River Mangrove	x	x	
Magnoliidae	Myrsinaceae	*Rapanea variabilis*	Muttonwood	x		
Magnoliidae	Myrtaceae	*Acmena smithii*	Lillypilly	x		x
Magnoliidae	Myrtaceae	*Angophora costata*	Smooth-barked Apple	x	x	x
Magnoliidae	Myrtaceae	*Baeckea diosmifolia*	-	x	x	
Magnoliidae	Myrtaceae	*Baeckea imbricata*	-		x	
Magnoliidae	Myrtaceae	*Callistemon citrinus*	Crimson Bottlebrush		x	
Magnoliidae	Myrtaceae	*Callistemon linearis*	Narrow-leaved Bottlebrush		x	

Class/Subclass	Family	Scientific Name	Common Name	CT (2007)	PB (2003)	RPS HSO (2008)
Magnoliidae	Myrtaceae	*Callistemon pachyphyllus*	Wallum Bottlebrush	x	x	
Magnoliidae	Myrtaceae	*Callistemon salignus*	Willow Bottlebrush	x	x	
Magnoliidae	Myrtaceae	*Calytrix tetragona*	-	x		
Magnoliidae	Myrtaceae	*Corymbia gummifera*	Red Bloodwood	x	x	x
Magnoliidae	Myrtaceae	*Corymbia maculata*	Spotted Gum	x	x	x
Magnoliidae	Myrtaceae	*Darwinia leptantha*	-		x	
Magnoliidae	Myrtaceae	*Eucalyptus agglomerata*	Blue-leaved Stringybark	x		
Magnoliidae	Myrtaceae	*Eucalyptus biturbinata*	-		x	
Magnoliidae	Myrtaceae	*Eucalyptus capitellata*	Brown Stringybark	x		x
Magnoliidae	Myrtaceae	*Eucalyptus carnea*	Broad-leaved White Mahogany	x	x	x
Magnoliidae	Myrtaceae	*Eucalyptus globoidea*	White Stringybark	x	x	
Magnoliidae	Myrtaceae	*Eucalyptus grandis*	Flooded gum		x	
Magnoliidae	Myrtaceae	*Eucalyptus microcorys*	Tallowwood	x	x	x
Magnoliidae	Myrtaceae	*Eucalyptus pilularis*	Blackbutt	x	x	x
Magnoliidae	Myrtaceae	*Eucalyptus piperita* subsp. *piperita*	Sydney Peppermint		x	

Class/Subclass	Family	Scientific Name	Common Name	CT (2007)	PB (2003)	RPS HSO (2008)
Magnoliidae	Myrtaceae	*Eucalyptus propinqua* var. *propinqua*	Small Fruited Grey Gum	x		
Magnoliidae	Myrtaceae	*Eucalyptus punctata*	Grey Gum	x		x
Magnoliidae	Myrtaceae	*Eucalyptus robusta*	Swamp Mahogany	x	x	x
Magnoliidae	Myrtaceae	*Eucalyptus siderophloia*	Northern Grey Ironbark	x	x	x
Magnoliidae	Myrtaceae	*Eucalyptus signata*	Scribbly Gum	x	x	x
Magnoliidae	Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum	x		x
Magnoliidae	Myrtaceae	*Eucalyptus umbra* subsp. *umbra*	Broad-leaved White Mahogany	x		x
Magnoliidae	Myrtaceae	*Kunzea capitata*	Pink Buttons		x	
Magnoliidae	Myrtaceae	*Leptospermum arachnoides*	-		x	
Magnoliidae	Myrtaceae	*Leptospermum juniperinum*	Prickly Tea-tree	x	x	x
Magnoliidae	Myrtaceae	*Leptospermum laevigatum*	Coast Tea-tree	x		x
Magnoliidae	Myrtaceae	*Leptospermum liversidgei*	-		x	
Magnoliidae	Myrtaceae	*Leptospermum polygalifolium* subsp. *polygalifolium*	Lemon Scented Tea-tree	x	x	x
Magnoliidae	Myrtaceae	*Leptospermum trinervium*	Flaky-barked Tea-tree	x	x	x

Class/Subclass	Family	Scientific Name	Common Name	CT (2007)	PB (2003)	RPS HSO (2008)
Magnoliidae	Myrtaceae	*Melaleuca armillaris*	Bracelet Honey Myrtle	x		
Magnoliidae	Myrtaceae	*Melaleuca ericifolia*	Swamp Paperbark	x	x	x
Magnoliidae	Myrtaceae	*Melaleuca linariifolia*	Snow in Summer	x		x
Magnoliidae	Myrtaceae	*Melaleuca nodosa*	Ball Honey Myrtle	x	x	
Magnoliidae	Myrtaceae	*Melaleuca quinquenervia*	Broad-leaved Paperbark	x	x	x
Magnoliidae	Myrtaceae	*Melaleuca sieberi*	-	x	x	x
Magnoliidae	Myrtaceae	*Melaleuca thymifolia*	Thyme Honey Myrtle		x	
Magnoliidae	Myrtaceae	*Ochrosperma lineare*	-		x	
Magnoliidae	Myrtaceae	*Syzygium oleosum*	Blue lillypilly	x	x	
Magnoliidae	Myrtaceae	*Syzygium paniculatum*	Magenta Lilly Pilly	x		x
Magnoliidae	Olaceae	*Olax stricta*	-		x	
Magnoliidae	Oleaceae	*Notelaea longifolia*	Mock Olive	x		
Magnoliidae	Onagraceae	*Oenothera sp.*	Evening Primrose		x	
Magnoliidae	Philydraceae	*Philydrum lanuginosum*	Woolly Frogmouth	x		x
Magnoliidae	Phytolaccaceae	*Phytolacca octandra**	Inkweed	x		
Magnoliidae	Pittosporaceae	*Billardiera scandens* var.	Apple Dumplings	x	x	x

Class/Subclass	Family	Scientific Name	Common Name	CT (2007)	PB (2003)	RPS HSO (2008)
		scandens				
Magnoliidae	Pittosporaceae	*Bursaria spinosa* var. *spinosa*	Blackthorn	x		
Magnoliidae	Pittosporaceae	*Pittosporum revolutum*	Yellow Pittosporum	x		
Magnoliidae	Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum	x	x	
Magnoliidae	Plantaginaceae	*Plantago lanceolata**	Ribwort	x		x
Magnoliidae	Polygalaceae	*Comesperma defoliatum*	-		x	
Magnoliidae	Polygalaceae	*Comesperma ericinum*	Matchheads			x
Magnoliidae	Polygonaceae	*Persicaria decipiens*	Slender Knotweed	x		x
Magnoliidae	Polygonaceae	*Rumex crispus**	Curled Dock	x		x
Magnoliidae	Primulaceae	*Samolus repens*	Creeping Brookweed	x	x	
Magnoliidae	Proteaceae	*Banksia aemula*	Wallum Banksia	x	x	x
Magnoliidae	Proteaceae	*Banksia ericifolia* var. *ericifolia*	Heath-leaved Banksia	x		
Magnoliidae	Proteaceae	*Banksia integrifolia* subsp. *integrifolia*	Coast Banksia	x	x	
Magnoliidae	Proteaceae	*Banksia oblongifolia*	-	x	x	x
Magnoliidae	Proteaceae	*Banksia robur*	Wallum Banksia	x	x	x

Class/Subclass	Family	Scientific Name	Common Name	CT (2007)	PB (2003)	RPS HSO (2008)
Magnoliidae	Proteaceae	*Banksia serrata*	Old Man Banksia	x	x	x
Magnoliidae	Proteaceae	*Banksia spinulosa* var. *collina*	Hairpin Banksia	x		x
Magnoliidae	Proteaceae	*Grevillea parviflora* subsp. *parviflora*	-			x
Magnoliidae	Proteaceae	*Hakea dactyloides*	Broad-leaved Hakea	x		x
Magnoliidae	Proteaceae	*Hakea sericea*	Needlebush	x		x
Magnoliidae	Proteaceae	*Isopogon anemonifolius*	Flat-leaved Drumsticks		x	
Magnoliidae	Proteaceae	*Lomatia silaifolia*	Crinkle Bush			x
Magnoliidae	Proteaceae	*Persoonia lanceolata*	Lance-leaved Geebung		x	
Magnoliidae	Proteaceae	*Persoonia levis*	Broad-leaved Geebung	x	x	x
Magnoliidae	Proteaceae	*Persoonia linearis*	Narrow-leaved Geebung	x	x	x
Magnoliidae	Proteaceae	*Petrophile canescens*	Conesticks		x	
Magnoliidae	Proteaceae	*Petrophile pedunculata*	Conesticks	x		
Magnoliidae	Proteaceae	*Xylomelum pyriforme*	Woody Pear	x		x
Magnoliidae	Ranunculaceae	*Clematis aristata*	Old Man's Beard	x	x	
Magnoliidae	Ranunculaceae	*Clematis glycinoides* var. *glycinoides*	Clematis		x	

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Magnoliidae	Ranunculaceae	*Ranunculus inundatus*	River Buttercup	x		x
Magnoliidae	Rhamnaceae	*Alphitonia excelsa*	Red Ash	x		
Magnoliidae	Rhamnaceae	*Pomaderris ferruginea*	-		x	
Magnoliidae	Rosaceae	*Rubus parvifolius*	Native Raspberry	x	x	
Magnoliidae	Rosaceae	*Rubus ulmifolius**	Blackberry		x	
Magnoliidae	Rubiaceae	*Galium binifolium*	-		x	
Magnoliidae	Rubiaceae	*Opercularia diphylla*	-		x	
Magnoliidae	Rubiaceae	*Pomax umbellata*	Pomax	x	x	x
Magnoliidae	Rutaceae	*Boronia parviflora*	Swamp Boronia		x	
Magnoliidae	Rutaceae	*Boronia pinnata*	Pinnate Boronia		x	
Magnoliidae	Rutaceae	*Boronia polygalifolia*	Milkwort Boronia	x	x	x
Magnoliidae	Rutaceae	*Eriostemon australasius* subsp. *australasius*	Pink Wax Flower		x	
Magnoliidae	Rutaceae	*Zieria smithii*	Sandfly Zieria	x	x	
Magnoliidae	Santalaceae	*Exocarpos cupressiformis*	Native Cherry	x	x	
Magnoliidae	Santalaceae	*Leptomeria acida*	Native Currant	x	x	

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Magnoliidae	Sapindaceae	*Dodonaea triquetra*	Hop Bush	x	x	x
Magnoliidae	Selaginallaceae	*Selaginella uliginosa*	Swamp Selaginella	x	x	
Magnoliidae	Solanaceae	*Duboisia myoporoides*	Corkwood	x		
Magnoliidae	Solanaceae	*Solanum americanum**	Glossy Nightshade		x	
Magnoliidae	Stackhousiae	*Stackhousia nuda*	-		x	
Magnoliidae	Sterculiaceae	*Lasiopetalum ferrugineum* var. *ferrugineum*	Rusty Velvet-bush	x		
Magnoliidae	Stylidiaceae	*Stylidium debile var. paniculatum*	Trigger Plant		x	
Magnoliidae	Stylidiaceae	*Stylidium graminifolium*	Trigger Plant	x	x	
Magnoliidae	Thymelaeaceae	*Pimelea linifolia* subsp. *linifolia*	Slender Rice Flower		x	x
Magnoliidae	Tremandraceae	*Tetratheca thymifolia*	Black-eyed Susan	x	x	x
Magnoliidae	Verbenaceae	*Clerodendrum tomentosum*	Hairy Clerodendrum	x	x	
Magnoliidae	Verbenaceae	*Lantana camara**	Lantana	x	x	
Magnoliidae	Verbenaceae	*Verbena bonariensis**	Purpletop	x	x	x
Magnoliidae	Verbenaceae	*Verbena officinalis**	Common Verbena	x		
Magnoliidae	Violaceae	*Hybanthus monopetalus*	Slender Violet		x	x

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Magnoliidae	Violaceae	*Viola hederacea*	Ivy-leaved Violet	x	x	
Magnoliidae	Vitaceae	*Cayratia clematidea*	Slender Grape		x	
Magnoliidae	Vitaceae	*Cissus hypoglauca*	Water Vine	x		
Liliidae	Anthericaceae	*Caesia parviflora* var. *parviflora*	Pale Grass Lily	x	x	
Liliidae	Anthericaceae	*Sowerbaea juncea*	Vanilla Lily		x	
Liliidae	Anthericaceae	*Thysanotus tuberosus*	Fringed Lily		x	
Liliidae	Anthericaceae	*Tricoryne elatior*	Yellow Rush Lily		x	
Liliidae	Arecaceae	*Livistona australis*	Cabbage Tree Palm	x	x	x
Liliidae	Asparagaceae	*Protasparagus aethiopicus**	Asparagus Fern	x		
Liliidae	Blandfordiaceae	*Blandfordia grandiflora*	Christmas Bell		x	
Liliidae	Blandfordiaceae	*Blandfordia nobilis*	Christmas Bells	x		
Liliidae	Burmanniaceae	*Burmannia disticha*	-		x	
Liliidae	Commelinaceae	*Commelina cyanea*	Wandering Jew		x	
Liliidae	Cyperaceae	*Baumea acuta*	-	x		
Liliidae	Cyperaceae	*Baumea articulata*	Jointed Twig-Rush	x	x	

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Liliidae	Cyperaceae	*Baumea juncea*	-	x	x	
Liliidae	Cyperaceae	*Baumea gunnii*	-		x	
Liliidae	Cyperaceae	*Baumea muelleri*	-		x	
Liliidae	Cyperaceae	*Baumea rubignosa*	Twig Rush	x	x	
Liliidae	Cyperaceae	*Baumea teretifolia*	Wrinkle-nut Twig Rush		x	
Liliidae	Cyperaceae	*Bolboschoenus fluviatilis*	Marsh Clubrush	x		
Liliidae	Cyperaceae	*Carex appressa*	Tall Sedge	x	x	
Liliidae	Cyperaceae	*Carex longebrachiata*	Bergalia Tussock	x		
Liliidae	Cyperaceae	*Caustis flexuosa*	Curly Sedge	x		
Liliidae	Cyperaceae	*Caustis recurvata* var. *recurvata*	-		x	
Liliidae	Cyperaceae	*Chorizandra cymbaria*	Heron Bristle Rush		x	
Liliidae	Cyperaceae	*Cyperus congestus**	-	x		
Liliidae	Cyperaceae	*Cyperus eragrostis**	Umbrella Sedge	x		
Liliidae	Cyperaceae	*Cyperus polystachyos*	-		x	
Liliidae	Cyperaceae	*Fimbristylis dichotoma*	Common Fringe-rush	x		x

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Liliidae	Cyperaceae	*Fimbristylis ferruginea*	-		x	
Liliidae	Cyperaceae	*Gahnia aspera*	Saw Sedge	x		
Liliidae	Cyperaceae	*Gahnia clarkei*	Tall Saw-sedge	x	x	x
Liliidae	Cyperaceae	*Gahnia melanocarpa*	Black-fruit Saw-sedge	x		
Liliidae	Cyperaceae	*Gahnia radula*	-		x	
Liliidae	Cyperaceae	*Gahnia sieberiana*	Red-fruited Saw-sedge	x	x	x
Liliidae	Cyperaceae	*Isolepis inundata*	Swamp Club-rush	x		
Liliidae	Cyperaceae	*Isolepis nodosa*	-	x	x	
Liliidae	Cyperaceae	*Lepidosperma elatius*	Tall Sword-sedge	x		
Liliidae	Cyperaceae	*Lepidosperma filiforme*	-		x	
Liliidae	Cyperaceae	*Lepidosperma laterale*	Variable Sword-sedge	x	x	
Liliidae	Cyperaceae	*Lepidosperma quadrangulatum*	-		x	
Liliidae	Cyperaceae	*Ptilothrix deusta*	-			x
Liliidae	Cyperaceae	*Schoenoplectus mucronatus*	River Clubrush	x		
Liliidae	Cyperaceae	*Schoenus apogon*	Fluke Bog-rush	x	x	x

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Liliidae	Cyperaceae	*Schoenus ericetorum*	Heath Bog-rush		x	
Liliidae	Doryanthaceae	*Doryanthes excelsa*	Gymea Lily	x		
Liliidae	Iridaceae	*Patersonia glabrata*	Leafy Purple-flag	x		
Liliidae	Iridaceae	*Patersonia sericea*	Wild Iris	x		x
Liliidae	Juncaceae	*Juncus acutus**	-	x		
Liliidae	Juncaceae	*Juncus cognatus**	-	x		
Liliidae	Juncaceae	*Juncus continuus*	-	x		
Liliidae	Juncaceae	*Juncus krausii*	Sea Rush	x	x	
Liliidae	Juncaceae	*Juncus planifolius*	Broad Rush	x		
Liliidae	Juncaceae	*Juncus prismatocarpus*	Branching Rush	x	x	x
Liliidae	Juncaceae	*Juncus usitatus*	Common Rush	x		x
Liliidae	Juncaginaceae	*Triglochin procerum*	Water Ribbons		x	
Liliidae	Juncaginaceae	*Triglochin striata*	Streaked Arrow-grass	x	x	
Liliidae	Lomandraceae	*Lomandra confertifolia*	-	x		
Liliidae	Lomandraceae	*Lomandra filiformis* subsp. *filiformis*	Wattle Mat-rush	x		x

Class/Subclass	Family	Scientific Name	Common Name	CT (2007)	PB (2003)	RPS HSO (2008)
Liliidae	Lomandraceae	*Lomandra glauca* subsp. *glauca*	-		x	x
Liliidae	Lomandraceae	*Lomandra longifolia*	Spiky-headed Mat-rush	x	x	x
Liliidae	Lomandraceae	*Lomandra multiflora*	Many-flowered Mat-rush	x	x	x
Liliidae	Lomandraceae	*Lomandra obliqua*	Twisted Mat-rush	x	x	x
Liliidae	Luzuriagaceae	*Eustrephus latifolius*	Wombat Berry	x	x	x
Liliidae	Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling Lily	x		x
Liliidae	Orchidaceae	*Caladenia carnea*	Pink Finger Orchid	x		
Liliidae	Orchidaceae	*Caladenia catenata*	White Finger Orchid	x		
Liliidae	Orchidaceae	*Caleana major*	Large Duck Orchid	x		
Liliidae	Orchidaceae	*Cryptostylis erecta*	Bonnet Orchid	x	x	
Liliidae	Orchidaceae	*Cryptostylis subulata*	Large Tongue Orchid	x		
Liliidae	Orchidaceae	*Dipodium variegatum*	Blotched Hyacinth Orchid	x		
Liliidae	Orchidaceae	*Microtis unifolia*	Common Onion Orchid	x		
Liliidae	Orchidaceae	*Spiranthes sinensis*	Austral Ladies Tresses	x		
Liliidae	Orchidaceae	*Thelymitra purpurata*	Sun Orchid	x		

Class/Subclass	Family	Scientific Name	Common Name	CT (2007)	PB (2003)	RPS HSO (2008)
Liliidae	Phormiaceae	*Dianella caerulea* var. *producta*	Blue Flax Lily	x	x	x
Liliidae	Phormiaceae	*Dianella revoluta* var. *revoluta*	Spreading Flax Lily	x	x	x
Liliidae	Poaceae	*Andropogon virginicus**	Whisky Grass	x	x	x
Liliidae	Poaceae	*Aristida ramosa*	Wire Grass		x	
Liliidae	Poaceae	*Aristida vagans*	Three-awn Speargrass	x	x	x
Liliidae	Poaceae	*Aristida warburgii*	Wire Grass		x	
Liliidae	Poaceae	*Austrodanthonia sp.*	Wallaby Grass			x
Liliidae	Poaceae	*Avena sativa**	Oats	x		
Liliidae	Poaceae	*Axonopus affinis**	Narrow-leaved Carpet Grass	x	x	
Liliidae	Poaceae	*Bothriochloa decipiens*	Redleg Grass	x		
Liliidae	Poaceae	*Briza maxima**	Quaking Grass	x	x	x
Liliidae	Poaceae	*Briza minor**	Shivery Grass	x	x	x
Liliidae	Poaceae	*Chloris gayana**	Rhodes Grass	x		
Liliidae	Poaceae	*Cymbopogon refractus*	Barbwire Grass		x	
Liliidae	Poaceae	*Cynodon dactylon*	Common Couch	x	x	x

Class/Subclass	Family	Scientific Name	Common Name	CT (2007)	PB (2003)	RPS HSO (2008)
Liliidae	Poaceae	*Dichelachne micrantha*	Short-hair Plume Grass	x		x
Liliidae	Poaceae	*Digitaria parviflora*	Small-flowered Finger Grass	x		
Liliidae	Poaceae	*Digitaria sanguinalis**	Crab Grass	x		
Liliidae	Poaceae	*Echinochloa colona*	Awnless Barnyard Grass	x		
Liliidae	Poaceae	*Echinopogon caespitosus* var. *caespitosus*	Tufted Hedgehog Grass	x	x	
Liliidae	Poaceae	*Ehrharta erecta**	Panic Veldtgrass	x		x
Liliidae	Poaceae	*Entolasia marginata*	Bordered Panic		x	
Liliidae	Poaceae	*Entolasia stricta*	Wiry Panic	x	x	x
Liliidae	Poaceae	*Eragrostis brownii*	Brown's Lovegrass	x		
Liliidae	Poaceae	*Eragrostis leptostachya*	Paddock Lovegrass	x		
Liliidae	Poaceae	*Hemarthria uncinata var. uncinata*	Matgrass	x	x	x
Liliidae	Poaceae	*Imperata cylindrica* var. *major*	Blady Grass	x	x	x
Liliidae	Poaceae	*Isachaemum australe* var. *australe*	-		x	
Liliidae	Poaceae	*Oplismenus aemulus*	Basket Grass	x	x	

Class/Subclass	Family	Scientific Name	Common Name	CT (2007)	PB (2003)	RPS HSO (2008)
Liliidae	Poaceae	*Panicum simile*	Two Colour Panic	x	x	
Liliidae	Poaceae	*Paspalidium distans*	-	x	x	
Liliidae	Poaceae	*Paspalum dilatatum**	Paspalum	x		x
Liliidae	Poaceae	*Paspalum orbiculare*	Ditch Millet	x		
Liliidae	Poaceae	*Paspalum urvillei**	Vasey Grass	x	x	x
Liliidae	Poaceae	*Pennisetum clandestinum**	Kikuyu	x	x	x
Liliidae	Poaceae	*Phragmites australis*	Common Reed	x	x	
Liliidae	Poaceae	*Poa labillardieri* var. *labillardieri*	Tussock Grass	x	x	x
Liliidae	Poaceae	*Sacciolepis indica*	-		x	
Liliidae	Poaceae	*Setaria pumila**	Pale Pigeon Grass	x	x	x
Liliidae	Poaceae	*Spinifex sericeus*	-	x		
Liliidae	Poaceae	*Sporobolus virginicus*	Sand Couch	x	x	
Liliidae	Poaceae	*Themeda australis*	Kangaroo Grass	x	x	x
Liliidae	Restionaceae	*Baloskion pallens*	-		x	
Liliidae	Restionaceae	*Baloskion tetraphyllum* subsp. *meiostachyum*		x	x	x

Class/Subclass	Family	Scientific Name	Common Name	CT (2007)	PB (2003)	RPS HSO (2008)
Liliidae	Restionaceae	*Empodisma minus*	-	x	x	x
Liliidae	Restionaceae	*Hypolaena fastigata*	Tassel Rope-rush		x	
Liliidae	Restionaceae	*Leptocarpus tenax*	Slender Twine-rush	x	x	
Liliidae	Restionaceae	*Lepyrodia interrupta*	Scale Rush		x	
Liliidae	Restionaceae	*Lepyrodia muelleri*	Scale Rush		x	
Liliidae	Smilacaceae	*Smilax australis*	Lawyer Vine	x		
Liliidae	Smilacaceae	*Smilax glyciphylla*	Sarsaparilla	x	x	
Liliidae	Typhaceae	*Typha orientalis*	Cumbungi		x	
Liliidae	Xanthorrhoaceae	*Xanthorrhoea fulva*	-		x	
Liliidae	Xanthorrhoaceae	*Xanthorrhoea latifolia* subsp. *latifolia*	-			x
Liliidae	Xanthorrhoaceae	*Xanthorrhoea macronema*	-		x	
Liliidae	Xyridaceae	*Xyris gracilis*	Slender Yellow-eye	x	x	
Liliidae	Xyridaceae	*Xyris operculata*	Tall Yellow-eye		x	

APPENDIX 2

Fauna Species List

EXPECTED FAUNA SPECIES LIST

Below is a list of fauna species that could be reasonably expected to be found within the study area at some occurrence. Such an approach has been taken given the unlikelihood to record *all* potentially occurring species within an area during formal fauna surveys (due to seasonality, climatic limitations, crypticism etc).

Family sequencing and taxonomy follow for each fauna class:

Birds – Christidis and Boles (2007).
Herpetofauna - Cogger (1996).
Mammals - Strahan (ed) (1995) and Churchill (1998).

KNOWN AND EXPECTED BIRD LIST

Appendix Key:
✓ = Species Detected
* = Introduced species
(E) = Species listed under NSW TSC Act 1995 as Endangered.
(V) = Species listed under NSW TSC Act 1995 as Vulnerable.
(V*) = Species listed under the Commonwealth EPBC Act 1999 as Vulnerable
(E*) = Species listed under the Commonwealth EPBC Act 1999 as Endangered
(M*) = Species listed under the Commonwealth EPBC Act as Migratory
Species indicated in **BOLD** font are those threatened species known from within 10km of study area (Atlas of NSW Wildlife 2008)

Data Source:
1 = Species recorded during this survey **(RPS HSO, 2008)**
2 = Species recorded previously on adjacent lands **(PB, 1999 - 2000)**
3 = Species recorded previously on adjacent lands **(Conacher Travers, 2003 - 2005)**

Detection code: (Use only on FF inventories!)
o = observed
h = heard call
s = secondary indication (eg feathers, nests)
ov = observed overhead and unlikely to utilise the study area

Family Name	Scientific Name	Common Name	RPS	PB	CT
Casuariidae (Emu)	*Dromaius novaehollandiae*	Emu			
Megapodiidae (Mound Builders)	*Alectura lathami*	Australian Brush-turkey			
Phasianidae (True Quails, Pheasants and Fowls)	*Coturnix pectoralis*	Stubble Quail			
	Coturnix ypsilophora	Brown Quail		✓	✓
Anseranatidae (Magpie Goose)	***Anseranas semipalmata***	**Magpie Goose (V)**			

Family Name	Scientific Name	Common Name	RPS	PB	CT
Anatidae (Swans, Geese and Ducks)	*Anas castanea*	Chestnut Teal			
	Anas gracilis	Grey Teal			
	Anas castanea	Chestnut Teal	✓	✓	✓
	Anas platyrhynchos	*Mallard			
	Anas superciliosa	Pacific Black Duck	✓	✓	✓
	Aytha australis	Hardhead (EM)			✓
	Chenonetta jubata	Australian Wood Duck)			
	Cygnus atratus	Black Swan (EM)			✓
	Oxyura australis	**Blue-billed Duck (V)**			
	Stictonetta naevosa	**Freckled Duck (V)**			
Podicipedidae (Grebes)	*Tachybaptus novaehollandiae*	Australasian Grebe			✓
	Podiceps cristatus	Great Crested Grebe			
Anhingidae (Darters)	*Anhinga novaehollandiae*	Australasian Darter			✓
Phalacrocoracidae (Cormorants)	*Phalacrocorax carbo*	Great Cormorant			✓
	Phalacrocorax melanoleucos	Little Pied Cormorant		✓	✓
	Phalacrocorax sulcirostris	Little Black Cormorant		✓	✓
	Phalacrocorax varius	Pied Cormorant			✓
Pelecanide (Pelicans)	*Pelecanus conspicillatus*	Australian Pelican		✓	✓
Ardeidae (Herons, Bitterns and Egrets)	*Ardea pacifica*	White-necked Heron			✓
	Egretta novaehollandiae	White-faced Heron	✓	✓	✓
	Ardea ibis	Cattle Egret (C, M*)			✓

Family Name	Scientific Name	Common Name	RPS	PB	CT
	Egretta garzetta	Little Egret		✓	✓
	Egretta sacra	Eastern Reef Egret (C,			
	Ardea modesta	Eastern Great Egret (C,J, M*)			✓
	Ardea intermedia	Intermediate Egret			
	Nycticorax caledonicus	Nankeen Night Heron			
	Ixobrychus dubius	Australian Little Bittern			
	Butorides striatus	Striated Heron			
	Ixobrychus flavicollis	**Black Bittern (V)**			
	Botaurus poiciloptilus	**Australasian Bittern (V)**			
	Ixobrychus minutus	**Yellow Bittern**		✓	
Threskiornithidae (Ibises and Spoonbills)	*Platalea flavipes*	Yellow-billed Spoonbill		✓	
	Platalea regia	Royal Spoonbill			✓
	Plegadis falcinellus	Glossy Ibis			
	Threskiornis molucca	Australian White Ibis		✓	✓
	Threskiornis spinicollis	Straw-necked Ibis	✓		✓
Ciconiidae (Storks)	***Ephippiorhynchus asiaticus***	**Black-necked Stork (E)**		✓	✓
Accipitridae (Hawks, Kites and Eagles)	*Accipiter fasciatus*	Brown Goshawk			
	Accipiter cirrhocephalus	Collared Sparrowhawk			
	Accipiter novaehollandiae	Grey Goshawk			✓
	Aquila audax	Wedge-tailed Eagle			✓
	Aviceda subcristata	Pacific Baza			
	Circus approximans	Swamp Harrier			✓
	Circus aeruginosus	Marsh Harrier		✓	

Family Name	Scientific Name	Common Name	RPS	PB	CT
	Circus assimilis	Spotted Harrier			
	Elanus axillaris	Black-shouldered Kite		✓	
	Haliaeetus leucogaster	White-bellied Sea-Eagle		✓	✓
	Haliastur sphenurus	Whistling Kite (EM)	✓	✓	✓
	Hamirostra melanosternon	**Black-breasted Buzzard (V)**			
	Hieraaetus morphnoides	Little Eagle			✓
	Pandion cristatus	**Eastern Osprey (V)**			
	Pandion haliaetus	Osprey		✓	✓
Falconidae (Falcons)	*Falco berigora*	Brown Falcon		✓	✓
	Falco cenchroides	Nankeen Kestrel			✓
	Falco longipennis	Australian Hobby			
	Falco peregrinus	Peregrine Falcon			
	Falco subniger	Black Falcon			
Rallidae (Crakes, Rails and Gallinules)	*Fulica atra*	Eurasian Coot			
	Gallinula philippensis	Buff-banded Rail			
	Gallinula tenebrosa	Dusky Moorhen		✓	
	Porphyrio porphyrio	Purple Swamphen			
	Porzana fluminea	Australian Spotted Crake			
	Porzana pusilla	Baillon's Crake			
	Porzana tabuensis	Spotless Crake			
	Rallus pectoralis	Lewin's Rail			
Burhinidae (Stone-curlews))	***Burhinus grallarius***	**Bush Stone-curlew (E)**			
	Burhinus neglectus	Beach Stone-curlew			

Family Name	Scientific Name	Common Name	RPS	PB	CT
Turnicidae (Button-Quails)	*Turnix varia*	Painted Button-quail			
Scolopacidae (Snipe, Godwits, Curlews, Sandpipers, Stints & Phalaropes)	*Gallinago hardwickii*	Latham's Snipe (M*)			
	Limosa lapponica	Bar-tailed Godwit (M*)			
	Limosa limosa	**Black-tailed Godwit (V, M*)**			
	Numenius madagascariensis	Eastern Curlew (M*)			
	Numenius phaeopus	Whimbrel (M*)			
	Numenius minutes	Little Curlew (M*)			
	Tringa nebularia	Common Greenshank (M*)			
	Tringa stagnatilis	Marsh Sandpiper (M*)			
	Tringa brevipes	Grey-tailed Tattler (M*)			
	Actitis hypoleucos	Common Sandpiper (M*)			
	Xenus cinereus	Terek Sandpiper (M*)			
	Arenaria interpres	Ruddy Turnstone (M*)			
	Calidris canutus	Red Knot (M*)			
	Calidris tenuirostris	Great Knot (M*)			
	Calidris alba	Sanderling (M*)			
	Calidris ruficollis	Red-necked Stint (M*)			
	Calidris acuminata	Sharp-tailed Sandpiper (M*)			
	Calidris melanotus	Pectoral Sandpiper (M*)			
	Calidris ferruginea	Curlew Sandpiper (M*)			
	Limicola falcinellus	Broad-billed Sandpiper (M*)			
Jacanidae	***Irediparra gallinacea***	**Comb-crested Jacana**			

Family Name	Scientific Name	Common Name	RPS	PB	CT
(Jacanas))		**(V)**			
Rostratulidae (Painted Snipe)	***Rostratula australis***	**Australian Painted Snipe (M* V)**			
Haematopodidae (Oystercatchers)	***Haematopus longirostris***	**Australian Pied Oystercatcher (V)**			✓
	Haematopus fuliginosus	**Sooty Oystercatcher (V)**		✓	✓
Recurvirostridae (Stilts & Avocets)	*Himantopus himantopus*	Black-winged Stilt			
	Recurvirostra novaehollandiae	Red-necked Avocet			
Charadriidae (Lapwings, Plovers and Dottrels)	*Pluvialis fulva*	Pacific Golden Plover (M*)			
	Pluvialis squatarola	Grey Plover			
	Charadrius ruficapillus	Red-capped Plover			
	Charadrius bicinctus	Double-banded Plover			
	Charadrius mongolus	**Lesser Sand Plover (V, M*)**			
	Charadrius leschenaultii	**Greater Sand Plover (V, M*)**			
	Erythrogonys cinctus	Red-kneed Dotterel			
	Elseyornis melanops	Black-fronted Dotterel		✓	✓
	Vanellus miles	Masked Lapwing	✓	✓	✓
Laridae (Gulls and Terns)	*Chroicoephalus novaehollandiae*	Silver Gull		✓	✓
	Chlidonias hybridus	Whiskered Tern			
	Chidonias leucopterus	White-winged Black Tern (M*)			
	Hydroprogne caspia	Caspian Tern (M*)			
	Gelochelidon nilotica	Gull-billed Tern			

Family Name	Scientific Name	Common Name	RPS	PB	CT
	Thalasseus bergii	Crested Tern			
	Sterna striata	White-fronted Tern			
	Sterna hirundo	Common Tern (M*)			✓
	Sternula albifrons	**Little Tern (E, M*)**			
Columbidae (Pigeons and Doves)	**Columba livia*	Rock Dove			
	Chalcophaps indica	Emerald Dove			✓
	Columba leucomela	White-headed Pigeon		✓	✓
	Geopelia humeralis	Bar-shouldered Dove		✓	✓
	Geopelia striata	Peaceful Dove		✓	✓
	Leucosarcia picata	Wonga Pigeon			✓
	Macropygia amboinensis	Brown Cuckoo-Dove		✓	
	Ocyphaps lophotes	Crested Pigeon	✓	✓	✓
	Phaps chalcoptera	Common Bronzewing			
	Phaps elegans	Brush Bronzewing			
	Ptilinopus magnificus	**Wompoo Fruit-dove (V)**			
	**Streptopelia chinensis*	Spotted Dove	✓	✓	✓
Cacatuidae (Cockatoos)	***Calyptorhynchus lathami***	**Glossy Black-Cockatoo (V)**			
	Calyptrohynchus funereus	Yellow-tailed Black-Cockatoo	✓	✓	✓
	Lophochroa leadbeateri	**Major Mitchell's Cockatoo (V)**			
	Callocephalon fimbriatum	**Gang-gang Cockatoo (V)**			
	Eolophus roseicapilla	Galah	✓	✓	✓
	Cacatua tenuirostris	Long-billed Corella			✓
	Cacatua sanguinea	Little Corella			
	Cacatua galerita	Sulphur-crested	✓		✓

Family Name	Scientific Name	Common Name	RPS	PB	CT
		Cockatoo			
Psittacidae (Parrots)	*Alisterus scapularis*	Australian King Parrot			
	Lathamus discolor	**Swift Parrot (E, E*)**			
	Neophema pulchella	**Turquoise Parrot (V)**			
	Platycercus elegans	Crimson Rosella			
	Platycercus eximius	Eastern Rosella	✓	✓	✓
	Psephotus haematonotus	Red-rumped Parrot			
	Trichoglossus haematodus	Rainbow Lorikeet	✓	✓	✓
	Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet	✓		✓
	Glossopsitta concina	Musk Lorikeet			✓
	Glossopsitta pusilla	Little Lorikeet			
Cuculidae (Old World Cuckoos)	*Cuculus saturatus*	Oriental Cuckoo (EM)			
	Cacomantis flabelliformis	Fan-tailed Cuckoo		✓	✓
	Cacomantis variolosus	Brush Cuckoo			
	Chalcites basalis	Horsfield's Bronze-Cuckoo			
	Chrysococcyx lucidus	Shining Bronze-Cuckoo			
	Cuculus pallidus	Pallid Cuckoo			✓
	Eudynamys orientalis	Eastern Koel		✓	✓
	Scythrops novaehollandiae	Channel-billed Cuckoo			✓
Centropodidae (Coucals)	*Centropus phasianinus*	Pheasant Coucal		✓	✓
Strigidae (Hawk Owls)	***Ninox strenua***	**Powerful Owl (V)**		✓	✓
	Ninox connivens	**Barking Owl (V)**			

Family Name	Scientific Name	Common Name	RPS	PB	CT
	Ninox boobook	Southern Boobook		✓	✓
Tytonidae (Barn Owls)	*Tyto javanica*	Eastern Barn Owl			✓
	Tyto longimembris	**Eastern Grass Owl (V)**			
	Tyto novaehollandiae	**Masked Owl (V)**			
Podargidae (Frogmouths)	*Podargus strigoides*	Tawny Frogmouth		✓	✓
Caprimulgidae (Nightjars)	*Eurostopodus mystacalis*	White-throated Nightjar		✓	
Aegothelidae (Owlet-nightjars)	*Aegotheles cristatus*	Australian Owlet-nightjar			
Apodidae (Typical Swifts)	*Hirundapus caudacutus*	White-throated Needletail (EM)			✓
	Apus pacificus	Fork-tailed Swift (EM)			✓
Alcedinidae (True Kingfishers)	*Alcedo azurea*	Azure Kingfisher		✓	
Halcyonidae (Kingfishers and Kookaburras)	*Dacelo novaeguineae*	Laughing Kookaburra	✓	✓	✓
	Todiramphus sanctus	Sacred Kingfisher			✓
	Todiramphus macleayii	Forest Kingfisher		✓	
Meropidae (Bee-eaters)	*Merops ornatus*	Rainbow Bee-eater (M*)	✓	✓	✓
Coraciidae (Typical Rollers)	*Eurystomus orientalis*	Dollarbird		✓	✓
Menuridae (Lyrebirds)	*Menura novaehollandiae*	Superb Lyrebird		✓	
Climacteridae (Australo-Papuan Treecreepers)	*Cormobates leucophaeus*	White-throated Treecreeper			✓
	Climacteris picumnus	**Brown Treecreeper (V)**		✓	

Family Name	Scientific Name	Common Name	RPS	PB	CT
Maluridae (Fairy-Wrens and Emu-Wrens)	*Malurus cyaneus*	Superb Fairy-wren	✓	✓	✓
	Malurus lamberti	Variegated Fairy-wren		✓	✓
	Stipiturus malachurus	Southern Emu-wren		✓	✓
Pardalotidae (Pardalotes, Scrubwrens, Thornbills)	*Pardalotus punctatus*	Spotted Pardalote	✓	✓	✓
	Paradalotus striatus	Striated Pardalote		✓	✓
	Sericornis frontalis	White-browed Scrubwren	✓	✓	✓
	Chthonicola sagittata	**Speckled Warbler (V)**			
	Gerygone mouki	Brown Gerygone	✓	✓	✓
	Gerygone albogularis	White-throated Gerygone		✓	✓
	Gerygone levigaster	Mangrove Gerygone		✓	
	Acanthiza pusilla	Brown Thornbill	✓	✓	✓
	Acanthiza reguloides	Buff-rumped Thornbill	✓	✓	
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill	✓		✓
	Acanthiza nana	Yellow Thornbill			✓
	Acanthiza lineata	Striated Thornbill		✓	✓
	Hylacola pyrrhopygia	Chestnut-rumped Heathwren			
Meliphagidae (Honeyeaters)	*Anthochaera carunculata*	Red Wattlebird	✓	✓	✓
	Plectrhyncha lanceolata	Striped Honeyeater			
	Anthochaera chrysoptera	Little Wattlebird		✓	✓
	Philemon corniculatus	Noisy Friarbird	✓	✓	✓
	Philemon citerogularis	Little Friarbird			
	Anthochaera phrygia	**Regent Honeyeater (E, E*)**			

Family Name	Scientific Name	Common Name	RPS	PB	CT
	Manorina melanophrys	Bell Miner			
	Manorina melanocephala	Noisy Miner			✓
	Meliphaga lewinii	Lewin's Honeyeater	✓	✓	✓
	Lichenostomus chrysops	Yellow-faced Honeyeater	✓	✓	✓
	Lichenostomus melanops	Yellow-tufted Honeyeater			
	Lichenostomus fuscus	Fuscous Honeyeater			✓
	Lichenostomus penicillatus	White-plumed Honeyeater			
	Melithreptus albogularis	White-throated Honeyeater		✓	
	Melithreptus brevirostris	Brown-headed Honeyeater			✓
	Melithreptus lunatus	White-naped Honeyeater			✓
	Melithreptus gularis	**Black-chinned Honeyeater (V)**			
	Entomyzon cyanotis	Blue-faced Honeyeater			✓
	Lichmera indistincta	Brown Honeyeater			✓
	Lichenostomus leucotis	White-eared Honeyeater		✓	
	Phylidonyris novaehollandiae	New Holland Honeyeater		✓	✓
	Phylidonyris nigra	White-cheeked Honeyeater		✓	✓
	Acanthorhynchus tenuirostris	Eastern Spinebill	✓	✓	✓
	Myzomela sanguinolenta	Scarlet Honeyeater		✓	✓
	Epthianura albifrons	White-fronted Chat			
Eopsaltriidae (Robins)	*Microeca fascinans*	Jacky Winter		✓	✓
	Petroica multicolor	Scarlet Robin			
	Petroica phoenicea	Flame Robin		✓	
	Petroica rosea	Rose Robin			

Family Name	Scientific Name	Common Name	RPS	PB	CT
	Eopsaltria australis	Eastern Yellow Robin	✓	✓	✓
	Melanodryas cucullata	**Hooded Robin (V)**			
Orthonychidae Logrunners	*Orthonyx temminckii*	Australian Logrunner			
Pomatostomidae (Australo-Papuan Babblers)	***Pomatostomus temporalis***	**Grey-crowned Babbler (V)**			
Cinclosomidae (Quail-thrushes and allies)	*Psophodes olivaceus*	Eastern Whipbird	✓	✓	✓
	Cinclosoma punctatum	Spotted Quail-thrush			
Neosittidae (Sittellas)	*Daphoenositta chrysoptera*	Varied Sittella		✓	✓
Pachycephalidae (Whistlers, Shrike-tit, Shrike-thrushes)	*Falcunculus frontatus*	Crested Shrike-tit			✓
	Pachycephala pectoralis	Golden Whistler		✓	✓
	Pachycephala rufiventris	Rufous Whistler		✓	✓
	Colluricincla harmonica	Grey Shrike-thrush	✓	✓	✓
Dicruridae (Monarchs, Fantails and Drongo)	*Monarcha melanopsis*	Black-faced Monarch			
	Carterornis leucotis	**White-eared Monarch (V)**			
	Myiagra cyanoleuca	Satin Flycatcher			
	Myiagra rubecula	Leaden Flycatcher		✓	✓
	Myiagra inquieta	Restless Flycatcher			
	Grallina cyanoleuca	Magpie-lark		✓	✓
	Rhipidura rufifrons	Rufous Fantail		✓	
	Rhipidura albiscarpa	Grey Fantail		✓	✓
	Rhipidura leucophyrs	Willie Wagtail		✓	

Family Name	Scientific Name	Common Name	RPS	PB	CT
f	*Dicrurus bracteatus*	Spangled Drongo		✓	✓
Campephagidae (Cuckoo-shrikes and Trillers)	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike		✓	✓
	Coracina papuensis	White-bellied Cuckoo-shrike			
	Coracina tenuirostris	Cicadabird			
	Lalage sueurii	White-winged Triller			✓
Oriolidae (Orioles and Figbird)	*Oriolus sagittatus*	Olive-backed Oriole			✓
	Sphecotheres vieilloti	Australasian Figbird			✓
Artamidae (Woodswallows, Butcherbirds, Currawongs)	*Artamus leucorynchus*	White-breasted Woodswallow			✓
	Artamus cyanopterus	Dusky Woodswallow			✓
	Cracticus torquatus	Grey Butcherbird	✓	✓	✓
	Cracticus nigrogularis	Pied Butcherbird	✓	✓	✓
	Gymnorthina tibicen	Australian Magpie	✓	✓	✓
	Strepera graculina	Pied Currawong	✓	✓	✓
Corvidae (Crows and allies)	*Corvus coronoides*	Australian Raven	✓	✓	✓
	Corvus orru	Torresian Crow		✓	✓
	Corvus tasmanicus	Forest Raven	✓	✓	
Cororacidae (Mud-nesters)	*Corcorax melanorhamphos*	White-winged Chough		✓	✓
Ptilinorhynchidae (Bowerbirds)	*Ptilonorhynchus violaceus*	Satin Bowerbird			✓
Motacillidae (Old World Wagtails,Pipits)	*Anthus novaeseelandiae*	Australasian (Richard's) Pipit		✓	✓

Family Name	Scientific Name	Common Name	RPS	PB	CT
Passeridae (Sparrows, Weaverbirds, Waxbills)	**Passer domesticus*	House Sparrow			✓
	Taeniopygia guttata	Zebra Finch			
	Taeniopygia bichenovii	Double-barred Finch		✓	
	Neochmia temporalis	Red-browed Finch		✓	✓
	Lonchura castaneothorax	Chestnut-breasted Mannikin			
Dicaeidae (Flowerpeckers)	*Dicaeum hirundinaceum*	Mistletoebird			✓
Hirundinidae (Swallows and Martins)	*Hirundo neoxena*	Welcome Swallow	✓	✓	✓
	Petrochelidon nigricans	Tree Martin			
	Petrochelidon ariel	Fairy Martin			
Sylviidae (Old World Warblers)	*Acrocephalus stentoreus*	Clamorous Reed Warbler			
	Cincloramphus mathewsi	Rufous Songlark			
	Cisticola exilis	Golden-headed Cisticola			✓
	Megalurus gramineus	Little Grassbird			
	Megalurus timorensis	Tawny Grassbird			
Zosteropidae (White-eyes)	*Zosterops lateralis*	Silvereye		✓	✓
Muscicapidae (Thrushes)	*Zoothera lunulata*	Bassian Thrush			
	Zoothera heinei	Russet-tailed Thrush			
Sturnidae (Starlings and allies)	*Sturnus vulgaris*	*Common Starling			
	Sturnus tristis	*Common Mynah			✓

KNOWN AND EXPECTED MAMMAL LIST

Appendix Key:
✓ = Species Detected
* = Introduced species
(E) = Species listed under NSW TSC Act 1995 as Endangered.
(V) = Species listed under NSW TSC Act 1995 as Vulnerable.
(V*) = Species listed under the Commonwealth EPBC Act 1999 as Vulnerable
(E*) = Species listed under the Commonwealth EPBC Act 1999 as Endangered
(M*) = Species listed under the Commonwealth EPBC Act as Migratory
Species indicated in **BOLD** font are those threatened species known from within 10km of study area (Atlas of NSW Wildlife 2005)

Data Source:
1 = Species recorded during this survey **(HSO, 2003)**
2 = Species recorded previously on adjacent lands **(PPK, 1998)**
3 = Species recorded previously on adjacent lands **(Conacher Travers, 1998)**
4 = Species recorded previously on adjacent lands **(GECon, 1998)**

Detection code: (Only use within FF inventories)
o = observed
h = heard call
s = secondary indication (eg. scats, scratches etc)
hr = hair analysis
a = Anabat detection
t = trapped

Family Name	Scientific Name	Common Name	RPS	PB	CT
Tachyglossidae (Echidnas)	*Tachyglossus aculeatus*	Short-beaked Echidna		✓	
Family Ornithorhynchidae (Platypus)	*Ornythorhynchus anatinus*	Platypus			
Dasyuridae (Dasyurids)	*Antechinus flavipes*	Yellow-footed Antechinus		✓	
	Antechinus stuartii	Brown Antechinus		✓	✓
	Antechinus swainsonii	Dusky Antechinus			
	Dasyurus maculatus	**Tiger Quoll (V, V*)**			
	Phascogale tapoatafa	**Brush-tailed Phascogale (V)**			
	Planigale maculata	**Common Planigale (V)**			
	Sminthopsis murina	Common Dunnart			
Peramelidae (Bandicoots and Bilbies)	*Isoodon macrourus*	Northern Brown Bandicoot		✓	✓
	Peremeles nasuta	Long-nosed Bandicoot		✓	
Phascolarctidae (Koala)	***Phascolarctos cinereus***	**Koala (V)**		✓	✓

Family Name	Scientific Name	Common Name	RPS	PB	CT
Vombatidae (Wombats)	*Vombatus ursinus*	Common Wombat			
Petauridae (Wrist-winged Gliders)	*Petaurus breviceps*	Sugar Glider		✓	
	Petaurus norfolcensis	**Squirrel Glider (V)**		✓	✓
	Petaurus australis	**Yellow-bellied Glider (V)**			
Pseudocheiridae (Ringtail Possums, Greater Glider)	*Petauroides volans*	Greater Glider			
	Pseudocheirus peregrinus	Common Ringtail Possum		✓	✓
Acrobatidae (Feathertail Glider)	*Acrobates pygmaeus*	Feathertail Glider		✓	✓
Phalangeridae (Brushtail Possums and Cuscuses)	*Trichosurus vulpecula*	Common Brushtail Possum		✓	✓
Potoroidae (Potoroos and Bettongs)	***Potorous tridactylus***	**Long-nosed Potoroo (V, V*)**			
Macropodidae (Wallabies and Kangaroos)	*Macropus giganteus*	Eastern Grey Kangaroo	✓	✓	✓
	Macropus robustus	Common Wallaroo			
	Macropus rufogriseus	Red-necked Wallaby		✓	✓
	Petrogale penicillata	**Brush-tailed Rock-Wallaby (E, V*)**			
	Wallabia bicolor	Swamp Wallaby		✓	✓
Pteropodidae (Flying-foxes, Blossom-bats)	***Pteropus poliocephalus***	**Grey-headed Flying-fox (V, V*)**		✓	✓
	Pteropus scapulatus	Little Red Flying-fox		✓	
	Syconycteris australis	Eastern Blossom Bat		✓	

Family Name	Scientific Name	Common Name	RPS	PB	CT
Rhinolophidae (Horseshoe-bats)	*Rhinolophus megaphyllus*	Eastern Horseshoe-bat			
Emballonuridae (Sheathtail-bats)	***Saccolaimus flaviventris***	**Yellow-bellied Sheathtail-bat (V)**			
Molossidae (Freetail-bats)	***Mormopterus norfolkensis***	**East Coast Freetail-bat (V)**			✓
	Mormopterus sp.1	Little Freetail-bat			
	Mormopterus sp.2	Eastern Freetail-bat			✓
	Nyctinomus australis	Whit-striped Freetail-bat			✓
	Tadarida australis	White-striped Freetail-bat			
Vespertilionidae (Vespertilionid Bats)	***Miniopterus australis***	**Little Bentwing-bat (V)**			✓
	Miniopterus schreibersii	**Common Bentwing-bat (V)**			
	Nyctophilus geoffroyi	Lesser Long-eared Bat		✓	✓
	Nyctophilus gouldii	Gould's Long-eared Bat		✓	✓
	Chalinolobus dwyeri	**Large-eared Pied Bat (V, V*)**			
	Chalinolobus gouldii	Gould's Wattled Bat			✓
	Chalinolobus morio	Chocolate Wattled Bat		✓	✓
	Falsistrellus tasmaniensis	**Eastern Falsistrelle (V)**			
	Myotis adversus	**Large-footed Myotis (V)**			
	Scoteanax rueppellii	**Greater Broad-nosed Bat (V)**			
	Scotorepens greyii	Little Broad-nosed Bat			
	Scotorepens orion	Eastern Broad-nosed Bat			✓
	Vespadelus darlingtoni	Large Forest Bat			
	Vespadelus regulus	Southern Forest Bat			
	Vespadelus pumilus	Eastern Forest Bat		✓	

Family Name	Scientific Name	Common Name	RPS	PB	CT
	Vespadelus regulus	Southern Forest Bat			✓
	Vespadelus vulturnus	Little Forest Bat		✓	✓
Muridae (Murids)	*Hydromys chrysogaster*	Water Rat			
	Melomys burtoni	Grassland Melomys		✓	✓
	**Mus musculus*	House Mouse			✓
	Pseudomys novaehollandiae	New Holland Mouse			
	Pseudomys gracilicaudatus	Eastern Chestnut Mouse		✓	
	Rattus fuscipes	Bush Rat		✓	✓
	Rattus lutreolus	Swamp Rat		✓	✓
	**Rattus norvegicus*	Brown Rat			
	**Rattus rattus*	Black Rat		✓	✓
Canidae (Dogs)	**Canis familiaris*	Dog			✓
	Canis familiaris dingo	Dingo		✓	
	**Vulpes vulpes*	Red Fox		✓	
Felidae (Cats)	**Felis catus*	Feral Cat			✓
Leporidae (Rabbit and Hare)	**Oryctolagus cuniculus*	European Rabbit		✓	✓
	**Lepus capensis*	Brown Hare			✓
Equidae (Horse and Donkey)	**Equus caballus*	Horse		✓	
Suidae (Pigs)	**Sus scrofa*	Pig			

Family Name	Scientific Name	Common Name	RPS	PB	CT
Bovidae (Horned Ruminants)	**Bos taurus*	Cow	✓		✓
	**Capra hircus*	Goat			
Cervidae (Deer)	**Cervus timorensis*	Rusa Deer			

KNOWN AND EXPECTED REPTILE LIST

Appendix Key: ✓ = Species Detected
(E) = Species listed under NSW TSC Act 1995 as Endangered.
(V) = Species listed under NSW TSC Act 1995 as Vulnerable.
(V*) = Species listed under the Commonwealth EPBC Act 1999 as Vulnerable
(E*) = Species listed under the Commonwealth EPBC Act 1999 as Endangered
(M*) = Species listed under the Commonwealth EPBC Act as Migratory
Species indicated in **BOLD** font are those threatened species known from within 10km of study area (Atlas of NSW Wildlife data 2005)

Data Source: **1** = Species recorded during this survey **(RPS HSO, 2008)**
2 = Species recorded previously on adjacent lands **(PPK, 1998)**
3 = Species recorded previously on adjacent lands **(Conacher Travers, 1998)**
4 = Species recorded previously on adjacent lands **(GECon, 1998)**

Detection code: Only use for FF Inventories **o** = observed
s = secondary indication (eg. scats, scratches etc)

Family Name	Scientific Name	Common Name	RPS	PB	CT
Cheloniidae (Turtles)	***Chelonis mydas***	**Green Turtle (V, V*, M*)**			
Chelidae (Tortoises)	*Chelodina longicollis*	Long-necked Tortoise			✓
Agamidae (Dragons)	*Amphibolurus muricatus*	Jacky Lizard		✓	✓
	Amphibolurus nobbi	Nobbi			
	Physignathus lesuerii	Eastern Water Dragon		✓	
	Pogona barbata	Eastern Bearded Dragon		✓	
Pygopodidae (Legless Lizards)	*Lialis burtonis*	Burton's Snake Lizard			
	Pygopus lepidopus	Common Scaly-foot			
	Delma plebeia	Leaden Delma			
Gekkonidae (Geckoes)	*Diplodactylus vittatus*	Wood Gecko			
	Phyllurus platurus	Southern Leaf-tailed Gecko			
	Oedura lesueurii	Lesueur's Velvet Gecko			
	Underwoodisaurus milii	Thick-tailed Gecko			
Varanidae	*Varanus gouldii*	Gould's Monitor			

Family Name	Scientific Name	Common Name	RPS	PB	CT
(Monitors)					
	Varanus varius	Lace Monitor		✓	✓
Scincidae (Skinks)	*Carlia tetradactyla*				
	Cryptoblepharus virgatus				
	Ctenotus taeniolatus	Copper-tailed Skink			
	Ctenotus robustus	Striped Skink		✓	
	Ctenotus virgatus	Wall Lizard		✓	
	Cyclodomorphus casuarinae	She-oak Skink			
	Egernia cunninghamii	Cunningham's Skink			
	Egernia major	Land Mullet			✓
	Egernia modesta				
	Egernia striolata	Tree-crevice Skink			
	Egernia saxatilis	Black Rock Skink			
	Egernia whitii	White's Skink			
	Eulamprus quoyii	Eastern Water Skink			✓
	Eulamprus tenuis				
	Lampropholis delicata	Grass Skink	✓	✓	
	Lampropholis guichenoti	Garden Skink		✓	✓
	Lygisaurus foliorum	Tree-base Litter-skink			
	Morethia boulengeri	South-eastern Morethia			
	Pseudomoia platynota	Red-throated Skink			
	Saiphos equalis			✓	
	Saproscincus mustelinus	Weasel Skink			
	Tiliqua scincoides	Eastern Blue-tongued Lizard		✓	✓
Typhlopidae	*Ramphotyphlops bituberculatus*	Prong-snouted Blind Snake			

Family Name	Scientific Name	Common Name	RPS	PB	CT
(Blind Snakes)					
	Ramphotyphlops weidii	Brown-snouted Blind Snake			
	Ramphotyphlops nigrescens	Black Blind Snake			
Boidae (Pythons)	*Morelia spilota*	Diamond Python	✓	✓	
Colubridae (Tree Snakes)	*Boiga irregularis*	Brown Tree Snake			
	Dendralaphis punctulata	Green Tree Snake		✓	✓
Elapidae (Venomous Snakes)	*Furina diadema*	Red-naped Snake			
	Acanthopis antarcticus	Death Adder			
	Cacophis krefftii	Dwarf Crowned Snake			
	Cacophis squamulosus	Golden Crowned Snake			
	Demansia psammophis	Yellow-faced Whip Snake			
	Furina diadema	Red-naped Snake			
	Notechis scutatus	Eastern Tiger Snake			
	Pseudonaja textilis	Eastern Brown Snake		✓	
	Rhinoplocephalus nigrescens	Eastern Small-eyed Snake			
	Vermicella annulata	Bandy Bandy			
	Hemiaspis signata	Black-bellied Swamp Snake		✓	
	Pseudechis porphyriacus	Red-bellied Black Snake	✓	✓	✓

KNOWN AND EXPECTED FROG LIST

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(E) = Species listed under NSW TSC Act 1995 as Endangered.
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Detection code: Only use for FF Inventorys **o** = observed
h = heard call

Family Name	Scientific Name	Common Name	RPS	PB	CT
Hylidae (Tree Frogs)	***Litoria aurea***	**Green and Golden Bell Frog (E, V*)**			
	Litoria caerulea	Green Tree Frog			✓
	Litoria chloris	Red-eyed Green Tree Frog			
	Litoria dentata	Bleating Tree Frog			✓
	Litoria fallax	Eastern Dwarf Tree Frog	✓	✓	✓
	Litoria gracilenta	Dainty Tree Frog			✓
	Liotria jervisiensis	Heath Frog			
	Litoria latopalmata	Broad-palmed Frog		✓	
	Litoria lesueuri	Lesueur's Frog			
	Litoris nasuta	Rocket Frog		✓	✓
	Litoria peronii	Peron's Tree Frog	✓	✓	✓
	Litoria phyllochroa	Green Leaf Tree Frog			
	Litoria tyleri	Tyler's Tree Frog		✓	✓
	Litoria verreauxii	Verreaux's Frog			✓
Myobatrachidae (Ground Frogs)	*Adelotus brevis*	Tusked Frog			
	Crinia signifera	Common Eastern Froglet	✓	✓	✓

Family Name	Scientific Name	Common Name	RPS	PB	CT
	Crinia tinnula	**Wallum Froglet (V)**	✓	✓	✓
	Limnodynastes dumerilli	Eastern Banjo Frog			✓
	Limnodynastes ornatus	Ornate Burrowing Frog			
	Limnodynastes peronii	Striped Marsh Frog		✓	✓
	Limnodynastes tasmaniensis	Spotted Grass Frog			✓
	Mixophyes fasciolatus	Great Barred Frog			
	Paracrinia haswelli	Haswell's Frog		✓	✓
	Pseudophryne coriacea	Red-backed Toadlet		✓	
	Pseudophryne bibronii	Brown Toadlet			
	Uperoleia fusca	Dusky Toadlet			✓
	Uperoleia laevigata	Smooth Toadlet		✓	

APPENDIX 3

Letter from Royal Botanical Gardens Sydney

ROYAL BOTANIC GARDENS SYDNEY

Mr Shaun CORRY
Harpers Somers O'Sullivan
PO Box 428
Hamilton, NSW 2303
AUSTRALIA

Inquiry No: 14066
Botanical.Is@rbgsyd.nsw.gov.au
Fax No: (02) 9251 1952
Ph No: (02) 9231 8111
Date: 4 September 2008

Dear Mr CORRY,

In reply to your inquiry of 04-Sep-08 the following information is supplied:

RE: Specimen collected from Tea Gardens (your ref: 24737:SC:AT)

This does conform with *Grevillea parviflora* subsp. *parviflora*. This would probably be the most northerly occurrence recorded to date. Det. R.O. Makinson 4/09/08.
This specimen has been retained for the Herbarium. Could you please provide an accurate locality and also habit data as soon as possible.

An invoice for $33.00 (incl. GST) will be forwarded to you separately by our finance section to cover cost of identification.

Thank you for your inquiry.

Yours sincerely

Barbara Wiecek
Identification Botanist
Botanical Information Service

APPENDIX 4

Personnel Qualifications

RPS HARPER SOMERS O'SULLIVAN

Curriculum Vitae

Name: Toby Lambert

Office: RPS Harper Somers O'Sullivan

Position in Company: Senior Ecologist

Qualifications / Memberships:
Bachelor of Environmental Science
Ecological Consultants Association of NSW
NSW Driver's Licence (Class C)
OH&S Induction Training (Green Card)
NPWS Scientific Investigation Licence
NSW Animal Ethics Research Authority

Areas of Expertise:

- Environmental and ecological impact assessment reporting
- Flora, fauna and habitat survey methodology design and management
- Detailed understanding of threatened species legislation and issues
- Terrestrial fauna surveys
- Renewable energy assessment
- Bushland and vegetation management
- Complex holistic project management
- Local, State and Commonwealth project co-ordination
- Dispute resolution and mediation

Experience Includes:

Toby has over twelve years experience in undertaking and managing a diverse array of ecological and environmental surveys and assessments. Toby has produced ecological and environmental documentation for private and public projects ranging in complexity. These include a number of wind farms throughout Australia and New Zealand, coal mines and a range of infrastructure projects within the Hunter region. Toby has also managed ecological masterplanning for residential projects in Sydney, the Central Coast and the Hunter. Toby is also currently the project manager for the environmental component of the development of the Hunter Economic Zone industrial estate at Kurri Kurri, the largest industrial estate in NSW.

Toby's fields of special competence are Environmental Impact Assessment and mediation, flora, fauna and habitat survey method, design and identification, detailed understanding of legislation and threatened species issues, terrestrial fauna surveys and project management.

RPS HARPER SOMERS O'SULLIVAN

Curriculum Vitae

Name: Sam Bishop

Office: RPS Harper Somers O'Sullivan

Position in Company: Ecologist

Qualifications / Memberships: B. Env. Sc. (EAM)

Member of the Fire Protection Association Australia (FPA)
Society of Frogs & Reptiles (SOFAR)
Hunter Bird Observers Club (HBOC)
NSW Driver's Licence (Class C)
OH&S Induction Training (Green Card)
NPWS Scientific Investigation Licence
NSW Animal Ethics Research Authority

Areas of Expertise:

- Conducting Field Surveys for Flora, Fauna and Habitat Identification.
- Flora identification and targeted threatened flora species searches
- Geographical Information Systems project design and mapping
- Report Preparation including Threatened Species Assessment, Endangered Ecological Communities assessment, and Vegetation Management Plans
- Detailed understanding of environmental legislation and threatened flora species issues
- Bushfire Threat Assessment & Management reporting
- Bushfire Risk Management Plans
- Fuel Management Plans
- Tree Clearance Supervision and Fauna Handling
- Nestbox Installation & Maintenance

Experience Includes:

July 2006 – Current Ecologist
RPS Harper Somers O'Sullivan, Broadmeadow, NSW

February 2005 - July 2006 Ecologist
Wildthing Environmental Consultants, Wallsend, NSW

RPS HARPER SOMERS O'SULLIVAN

Curriculum Vitae

Name: Deborah Landenberger

Office: RPS Harper Somers O'Sullivan

Position in Company: Ecologist/ Botanist

Qualifications / Memberships: B. Sc (Hons)

Australian Plant Society
Australian Ecological Society
Australasian Native Orchid Society
NSW Driver's Licence (Class C)
OH&S Induction Training (Green Card)
NPWS Scientific Investigation Licence
NSW Animal Ethics Research Authority

Areas of Expertise:

- Expert Botanist
  - Flora identification and habitat assessment
  - Targeted threatened flora surveys
  - Delineation and mapping of vegetation communities
  - Endangered Ecological Community (EEC) assessment
- Project Management and quote preparation
- Fauna habitat identification
- Experience with GPS/GIS for project design and mapping
- Environmental reporting and assessment
- Detailed understanding of environmental legislation

Experience Includes:

June 2006 – Current	Ecologist/ Botanist RPS Harper Somers O'Sullivan, Broadmeadow, NSW
Mar 2005 – Jun 2006	Botanist Conacher Travers, Gosford, NSW
Dec 2004 – Mar 2005	Research Assistant/Casual Demonstrator University of Newcastle, Newcastle, NSW

RPS HARPER SOMERS O'SULLIVAN

Curriculum Vitae

Name: Shaun Corry

Office: RPS Harper Somers O'Sullivan

Position in Company: Ecologist

Qualifications / Memberships: Dip Conservation and Land Mgt

NSW Driver's Licence (Class C)
Waterways Authority Boating Licence

Areas of Expertise:

- Geographical Information Systems project design and mapping
- Conducting Field Surveys for Flora, Fauna and Habitat Identification.
- Report Preparation including Fauna & Flora Assessments

Experience Includes:

January 2008 – Current Ecologist
RPS Harper Somers O'Sullivan, Broadmeadow, NSW