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FINAL REPORT:

Keystone Business Park Precinct Structure Plan

Technical Background Report: Flora and Fauna

ON BEHALF OF:

Capella Pacific

c/o David Lock Associates

August 2008

Ecology Partners Pty Ltd

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- Burke Renouf (Environment and Natural Resources Unit, City of Greater Geelong) for biodiversity management plan information; and,
- Landholders within the study area for general site information.

The following staff from Ecology Partners Pty Ltd were involved in the project:
Craig Billows, Andrew Hill and Zed Senbergs

SUMMARY

Introduction

Ecology Partners Pty Ltd was engaged by David Lock Associates, on behalf of Capella Pacific, to undertake a background study and prepare a technical report for the proposed Keystone Business Park Precinct Structure Plan (KBPPSP). This plan, will direct future land use and potential development for this area.

Methods

Biological databases maintained by the Department of Sustainability and Environment (DSE) were reviewed, including the Flora Information System (FIS) and Atlas of Victorian Wildlife (AVW). The presence of Ecological Vegetation Classes (EVCs) within the study area was reviewed using DSE's biodiversity interactive maps, while information referring to matters protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) was also obtained from the Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA) Protected Matters Search Tool.

A flora and fauna survey and fauna habitat assessment was undertaken to obtain information on terrestrial flora and fauna values, within the study area and immediate surrounds on 7 July 2008. Fauna surveys included diurnal and nocturnal surveys, including bird surveys, active searches at ground level and spotlight searches.

Results

Flora

A total of 64 taxa of plants (15 indigenous, 49 exotics) were recorded in the study area during the present assessment (Appendix 2.1). Planted trees and shrubs were not recorded unless they were seen to be naturally spreading within the study area.

The literature review and site assessment indicates that the site would have originally supported several Ecological Vegetation Classes (EVC), such as Floodplain Riparian Woodland (56), Plains Grassland (132), and Cane Grass – Lignum Halophytic Herbland (898). However, the study area has been extensively cleared and disturbed, and currently supports predominantly introduced vegetation with no vegetation assigned an EVC classification.

The majority of the vegetation within the study area is highly modified (very low quality), comprising introduced flora species (i.e. mostly pasture grasses and weeds) and areas of planted Australian natives of unknown provenance and other introduced planted species. However, there are scattered and isolated indigenous flora species in several locations, such as along Sparrowvale Road, and the low-lying area in the south east of the study area, but the majority of the vegetation at these sites is introduced.

Fauna

The study area currently supports habitat for a range of native fauna species. During the present assessment 45 terrestrial fauna species were detected, comprising five mammals (one native, four introduced), 37 birds (31 native, six introduced) and three frogs (all native)(Appendix 3.1). All of these species are common throughout the local area.

Overall value of fauna habitat within the study area is low to moderate. Vegetation and physical landscape features such as grasslands and/or woodlands have been highly modified since European settlement and currently provide very little important habitat for native fauna.

Ecological significance

Based on the field survey results no flora and fauna species of national or state conservation significance were recorded within the study area. The majority of the study area is devoid of remnant native vegetation and is considered to be of negligible significance for flora and fauna. There are scattered and isolated examples of some common indigenous flora species, such as wattles, which vary from local to regional conservation significance. Similarly, some of the fauna habitats, such as the mature plantations and farm dams, are also likely to be of local significance, due to the resources they provide in such a modified environment.

Legislative Implications

Currently a referral to the Australian Government Environment Minister is considered unnecessary as no nationally threatened species were recorded within the study area. However, the Growling Grass Frog has been recorded in the local area and it is a highly mobile species and therefore it is recommended that prior to farm dams being disturbed (which may occur in years to come), targeted surveys should be undertaken.

Based on the current survey no flora and fauna species listed under the FFG Act 1988 were recorded within the study area, and no critical habitat for any FFG listed fauna species is located within the study area. However, the Growling Grass Frog may need to be considered in the future, as it is a highly mobile species and it has been recorded in the local area in the past. A permit from DSE is required in order to 'take' listed flora species from public land, such as road reserves, and the Golden Wattle and Black Wattle were recorded in the study area.

A permit from the City of Greater Geelong is likely to be required for the removal of any native vegetation, and an informal approach to Net Gain is also likely to be required if native vegetation is cleared.

Opportunities and Constraints

Based on the field assessment, there are a number of opportunities and constraints in regards to the placement of these tanks, and these are discussed further in Section 6.

Further Assessment/survey

The Growling Grass Frog has been recorded in the local area and it is a highly mobile species and therefore it is recommended that prior to any farm dams being disturbed (which may occur in years to come), targeted surveys should be undertaken and if recorded a conservation management plan for the frog developed.

1 INTRODUCTION

1.1 Background

Ecology Partners Pty Ltd was engaged by David Lock Associates, on behalf of Capella Pacific, to undertake a background study and prepare a technical report for the proposed Keystone Business Park Precinct Structure Plan (KBPPSP). This plan, will direct future land use and potential development for this area.

Ecology Partners Pty Ltd, as a member of the consultant team, provided direction to the KBPPSP through identifying key ecological values within and adjacent to the study area, associated constraints for development and subsequent land use and determination of future opportunities for the area, based on a site assessment, review of previous flora and fauna investigations and other relevant databases, maps and search tools.

The specific area of focus of this background report is to identify and discuss the key ecological values present within the KBPPSP, together with providing information in relation to the opportunities and ecological constraints associated with the future planning requirements of the study area.

1.2 Scope of Assessment

Specifically, the objectives of the assessment were to provide:

- Review the existing flora & fauna assessment / recommendations included in the Armstrong Creek Urban Growth Plan Background Report (CoGG 2006);
- Liaise with key stakeholders, such as Council and the Department of Sustainability and Environment (DSE), where appropriate;
- Conduct a detailed site inspection and document the existing flora and fauna values on the site;
- Assessment of quality of vegetation, using the habitat hectare methodology, where appropriate;
- Provide recommendations about any further investigations required, such as targeted flora and fauna surveys;
- Make recommendations to be included in a Native Vegetation Precinct Management Plan, and,
- Make recommendations regarding the management of any habitat to be retained.

1.3 Study Area

The study area is located approximately five kilometres southeast of the Geelong CBD, at Marshall (Figure 1). The extent of the study area is approximately 130 hectares and is situated immediately east of Barwon Heads Road and is bound in the north and east by low-lying floodplains of the Barwon River (Figure 1).

Apart from a few scattered remnants, artificial dams and drainage lines, the entire study area is highly modified, comprising introduced pasture grasses and weeds, and planted strips of vegetation.

According to DSE's Biodiversity Interactive Map (www.dse.vic.gov.au) the study area is within the Otway Plain Bioregion. The majority of the Otway Plain Bioregion extends from the Bellarine Peninsula in the east to Warrnambool in the west.

The study area is located within the region under the management of the Corangamite Catchment Management Authority, within the Barwon River Basin Catchment (http://www.ccma.vic.gov.au/).

2 METHODS

2.1 Nomenclature

Common and scientific names of vascular plants follow the Flora Information System (FIS) 2007 version of DSE, and the Census of Vascular Plants of Victoria (Walsh and Stajsic 2007). Vegetation community names follow the DSE Ecological Vegetation Classes (EVC) Benchmarks (www.dse.vic.gov.au).

Terrestrial fauna (e.g. mammals, birds, reptiles, amphibians) follow the Atlas of Victorian Wildlife (AVW) of DSE. Common names are used throughout the body of the report. Corresponding scientific names are listed in Appendices A3.1 and A3.2.

2.2 Literature Review

Information from the FIS and EVC Benchmarks for the study area, and other relevant literature, such as CVRFASC (2000), Oates and Taranto (2001), Cogg (2006), Ecology Australia (2006) and the City of Greater Geelong Biodiversity Database were reviewed. Several maps, databases, web-based search tools and documents have provided the basis for a background assessment of the study area.

Previous consultant reports that address the flora and fauna values of land within, and in the vicinity of, the study area were used to supplement information obtained from the field investigations carried out as part of this study. These reports have been reviewed within the context of the study area and associated proposed land use changes.

2.3 Database Searches

The FIS (2007) and AVW (2007), biological databases maintained by DSE, were reviewed to obtain a list of species previously recorded within 10 kilometres of the study area. The presence of EVCs within the study area was reviewed using DSE's Biodiversity Interactive Map (www.dse.vic.gov.au).

Information referring to matters (listed taxa, ecological communities, Ramsar wetlands, etc.) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) was obtained via the Department of the Environment, Water, Heritage and the Arts (DEWHA) Protected Matters Search Tool: http://www.environment.gov.au/erin/ert/epbc/index.html.

2.4 Vegetation Assessment

A site assessment was undertaken to obtain information on terrestrial flora values, within the study area and immediate surrounds on 7 July 2008. The entire site was visually assessed, with all vascular plants recorded, significant records mapped and the overall condition of

vegetation noted. Remnant vegetation in the local area was also reviewed to assist in determining the original vegetation within the study area.

EVCs within the subject land were determined by reference to DSE pre-1750 and extant EVC mapping and their published descriptions (www.dse.vic.gov.au, CVRFASC 2000, Oates and Taranto 2001). The significance assessment criteria of taxa and vegetation communities are presented in Appendix 1.

2.5 Net Gain Analysis

A Net Gain assessment (i.e. habitat hectare and tree assessments only) was conducted, where appropriate, during the botanical surveys on 7 July 2008 in areas of remnant native vegetation to assess the avoid and minimise steps, and to quantify any potential vegetation losses in accordance with the State Government's Native Vegetation Management Framework (NRE 2002 – the 'Framework'). Where appropriate, habitat hectare and tree assessments were undertaken in 'remnant patches' and for 'scattered trees' as defined by the recently revised DSE guidelines (DSE 2006a). These methodologies are described in more detail below.

2.5.1 Habitat hectare methodology

Victoria's Native Vegetation Management Framework uses the habitat hectare measure to assist with quantifying Net Gain outcomes for native vegetation. Methodology on habitat scoring and habitat hectares is described in the Vegetation Quality Assessment Manual (DSE 2004, DSE Website). The habitat hectare is a unit of measurement, which combines both quality (relative to a published Benchmark) and quantity (of a single vegetation (EVC) type) for a habitat zone.

According to published DSE guidelines, three categories of native vegetation are recognised (DSE 2006a – pg.10). The three categories are 'remnant patches', 'scattered trees' and 'degraded treeless vegetation'. Habitat hectare assessments are only undertaken in areas of vegetation that are considered 'remnant patches', this is where the canopy cover is at least 20% and/or where understorey weed cover as a proportion of the total understorey cover is generally less than 75% (i.e. at least 25% indigenous understorey cover). These new thresholds have been proposed in place of the threshold of 10% indigenous vegetation cover, which was previously used as a trigger for conducting a habitat hectare assessment (NRE 2002). Scattered trees consist of canopy species and are defined as groups of trees where the canopy cover is less than 20% and weed cover as a proportion of the total understorey cover is 75% or greater. Degraded treeless vegetation is all other native vegetation that does not meet the thresholds for a remnant patch or scattered trees. Where losses are permitted, the definition of conservation significance and offset objectives are guided by the Framework (Appendices 3 and 4, Tables 5 and 6 of the Framework) and the Regional Native Vegetation Plan (CCMA 2005).

The habitat score is calculated using ten components: large trees, tree canopy cover, understorey, weediness, recruitment, organic litter, logs, patch size, neighbourhood context and distance to core area. Each component is listed on the Vegetation Quality Field Assessment Sheet (DSE Website). An assessor then scores the site according to the conditions and landscape context.

It is assumed that extensive intact vegetation would have a theoretical habitat score of 100, but typically the scores vary between 10 and 90. The habitat scores are usually expressed on a scale of zero to 1.

The habitat hectare value of a habitat zone is calculated by multiplying the habitat score by the actual area in hectares. For example, 1 hectare of vegetation with a habitat score of 50 contains 0.5 habitat hectares.

Qualitative and quantitative data were collected for the relevant vegetation 'site condition' components during the field assessment. A count of large trees was undertaken by simply walking through and counting the number of trees at or above the defined diameter threshold. Canopy cover was estimated by averaging projective foliage cover across the habitat zone and by referring to aerial photography of the zone. Weed cover was given an overall cover estimate for each stratum where weeds were present (generally shrub and ground layers). Understorey condition was determined by collating a species list, based on incidental observations (no quadrat data was collected), and then apportioning each indigenous species to a life-form and cover category. Recruitment was gauged through observation of woody species regeneration, and organic litter cover and type were simply estimated. Log score was determined by conducting a full count (in linear meters) of total logs, large logs and cut stumps.

2.5.2 Tree Assessment

The Framework recognises that old trees are important environmental assets and these can be found in habitat zones, or as relicts of vegetation that formerly occupied a site (i.e. scattered trees). The Framework includes minimum protection/replacement ratios for trees that are to be removed as part of permitted clearing, based on Diameters at Breast Height over bark (DBH). Ratios apply to large old trees in 'habitat zones' and to scattered very large (>150% of Large Old Tree DBH), large and medium (>75% of Large Old Tree DBH) old trees where the canopy is below 20% and weeds occupy more than 75% of understorey cover. Scattered other trees (i.e. not medium, large or very large) are also considered to be environmental assets, and any permitted clearance requires offset ratios in accordance with the regional vegetation plan or determined through negotiation with the responsible authorities.

2.5.2.1 Trees within Habitat Zones

In relation to habitat zones that contain large old trees, the Framework states:

> *For each large old tree removed as part of permitted clearing a certain number of other large old trees have to be protected and a certain number recruited* (NRE 2002).

During this assessment only large trees, if present, were counted, identified, measured and mapped within habitat zones.

2.5.2.2 Scattered Trees

In relation to scattered old trees (for parcels of land greater than 4 hectares with less than 8 scattered old trees/hectare, or for parcels of land less than 4 hectares with any number of scattered old trees/hectare) the Framework states:

> *For each medium or large old tree removed as part of permitted clearing an appropriate number of new trees must be recruited. The number of new trees that must be recruited will be specified in regional Native Vegetation Plans and may be graded according to conservation significance….However where it better suits their circumstances, landholders may use the 'protect other trees and ensure supplementary recruitment' approach to meet this criteria* (NRE 2002).

The regional native vegetation plan also provides guidance on recruitment targets for scattered trees losses (CCMA 2005).

2.6 Terrestrial Fauna Survey

A site assessment was undertaken by an experienced ecologist on 7 July 2008 during cool and showery conditions to obtain information on terrestrial fauna values within the study area and its immediate surrounds. Diurnal (daytime) and nocturnal (night-time) searches were employed as part of the assessment.

Binoculars were used to scan the area for birds, whilst listening for calls and searching for other signs, such as nests, remains of dead animals, droppings and footprints. An active search of logs, rocks and human-derived debris (e.g. corrugated roofing material, fence posts) was conducted to locate ground dwelling species such as small mammals, reptiles and frogs. Habitat features within the study area, such as trees and shrubs (plantations and remnant), dams and drains were also noted.

A 30 Watt, 12 volt, hand-held spotlight was used during the nocturnal fauna survey within areas likely to support nocturnal species. Calls from nocturnally active species were identified and noted.

An inventory of all fauna species recorded during the survey, and a description of habitats and their overall quality was also documented.

2.7 Assessment Qualifications and Limitations

Terrestrial flora and fauna data collected during the field surveys, and information obtained from relevant sources (e.g. biological databases) were reviewed and considered sufficient to provide an accurate assessment of the ecological values within the study area, to determine the likelihood of significant taxa and communities occurring with the study area, and to determine key opportunities and constraints from any proposed development.

The objectives of the assessment were to document terrestrial flora and fauna species and communities within the study area, and to identify key opportunities and constraints for any proposed development. However, an assessment of the interaction of species over a longer survey period was beyond the scope of this study. The short duration of the survey meant that migratory, transitory or uncommon fauna species might have been missed.

The middle of winter is the not the optimal time to undertake ecological surveys, and a small number of additional flora and fauna species are likely to have been recorded if the survey was undertaken over a longer duration, and during different seasons.

Further, ecological values located outside of the study area (mapped on Figure 2) were obtained from previous reports and incidental records, and this information should not be considered accurate until ground-truthing has been undertaken.

3 RESULTS

3.1 Flora

Present assessment

A total of 64 taxa of plants (15 indigenous, 49 exotics) were recorded in the study area during the present assessment (Appendix 2.1). Planted trees and shrubs were not recorded unless they were seen to be naturally spreading within the study area.

Database searches and other information

Additional flora species have been recorded from within the local area, and as potentially occurring, or their habitats as potentially occurring within the study area (i.e. 10 kilometre radius of the study area) (FIS and EPBC Act Protected Matters Search Tool). A number of the more common indigenous species are likely to occur within the remnant vegetation within the study area.

The significant flora derived from respective Commonwealth and State databases are listed in Appendix 2.2.

3.2 Ecological Vegetation Class

The literature review and site assessment indicates that the site would have originally supported several Ecological Vegetation Classes (EVC), such as Floodplain Riparian Woodland (56), Plains Grassland (132), and Cane Grass – Lignum Halophytic Herbland (898). However, the study area has been extensively cleared and disturbed, and currently supports predominantly introduced vegetation with no vegetation assigned an EVC classification (Figure 2). It should be noted, that there are several locations where scattered and isolated common indigenous flora species are present, but these areas are dominated by introduced flora species (see Figure 2 for locations).

Vegetation condition

The majority of the vegetation within the study area is highly modified (very low quality), comprising introduced flora species (i.e. mostly pasture grasses and weeds) and areas of planted Australian natives of unknown provenance and other introduced planted species. Species present within areas dominated by introduced flora include, Prairie Grass *Bromus cartharticus*, Soursob *Oxalis pes-caprae*, Galena *Galena pubescens*, Ribwort *Plantago lanceolata*, Buck's-horn Plantain *Plantago coronopus*, Toowoomba Canary-grass *Phalaris aquatica*, Couch *Cynodon dactylon*, Annual Meadow-grass *Poa annua*, Cocksfoot *Dactylis glomerata*, rye grass *Lolium* spp. and Kikuyu *Pennisetum clandestinum*.

There are scattered and isolated indigenous flora species, such as Hedge Wattle *Acacia paradoxa*, Australian Salt-grass *Distichlis distichophylla* and wallaby grasses *Austrodanthonia* spp. in several locations, such as along Sparrowvale Road, two private properties, and the low-lying area in the south east of the study area, but the majority of the vegetation at these sites is introduced (see Figure 2 for locations of isolated indigenous flora species).

3.3 Significant Flora Species and Communities

No flora species of either national or state conservation significance were recorded within the study area during the present assessment. Significant flora species documented as occurring within the local area (i.e. 10 kilometres surrounding the study area) are listed in Appendix 2.2 (see Figure 4 for locations).

3.3.1 National

Two nationally significant flora species (Large-fruit Fireweed *Senecio macrocarpus* and Swamp Everlasting *Xerochrysum palustre*) have previously been recorded from within the local area. However, six flora species not previously documented within the local area, but habitat for these species is identified as potentially occurring within a 10 kilometre radius of the study area (EPBC Act protected matters search tool), are listed in Appendix 2.2. Owing to the highly modified nature of the study area there is no habitat for any flora species of national conservation significance within the study area.

3.3.2 State

No state significant flora species were recorded within the study area during the present assessment. There have been 23 state significant flora species previously recorded from the local area (Appendix 2.2.). Based on the survey findings and overall site conditions (i.e. highly modified), it is unlikely that any state significant flora species would occur within the study area.

3.3.3 Regional and local

Five regionally significant flora species have been recorded within the study area. All other indigenous species are considered to be of local significance, due to the depletion of native vegetation in the local area.

3.3.4 Significant communities

There are no vegetation communities listed as threatened under the EPBC Act or FFG Act within the study area, or with a bioregional conservation status.

3.4 Terrestrial Fauna

Present assessment

The study area currently supports habitat for a range of native fauna species. During the present assessment 45 terrestrial fauna species were detected, comprising five mammals (one native, four introduced), 37 birds (31 native, six introduced) and three frogs (all native) (Appendix 3.1). All of these species are common throughout the local area.

Database searches

Terrestrial fauna species derived from respective Commonwealth and State databases as occurring, or having the potential to occur, within the study area are provided in Appendices 3.1 and 3.2.

There has been a high level of terrestrial fauna survey undertaken, with 1347 fauna surveys or incidental records of individual species within a 10 kilometre radius of the study area (AVW). From these data there have been a total of 305 individual species documented, with a high number of bird records and moderate numbers of species recorded for other fauna groups (i.e. mammals, reptiles, frogs) (AVW). Several of these species (primarily waterbirds and common open country birds) are likely to use habitats within the study area. Many of the previously recorded species are primarily marine birds (e.g. albatrosses and petrels) and are unlikely to be found within the study area. The AVW also includes previous records of marine mammals which will not be considered within the context of this investigation.

Thirty four nationally significant fauna species have been identified as potentially occurring, or their habitats as potentially occurring, within 10 kilometres of the study area (EPBC Act Protected Matters Search Tool). Several of these species are primarily marine birds (e.g. albatrosses and petrels) and are unlikely to be found within the study area. Other marine species (e.g. whales and sharks) are also listed. These listed marine species have not been included within Appendix 3.2 unless previously recorded within the AVW.

3.5 Fauna Habitats

The study area currently supports several habitat types,which are mapped on Figure 3, including:

- Scattered remnant native shrubs;
- Non-indigenous tree plantations and gardens;
- Farm dams;
- Drainage lines; and,
- Open grasslands and cultivated fields.

The overall value of fauna habitat within the study area is low to moderate. Vegetation and physical landscape features such as grasslands and/or woodlands have been highly modified since European settlement and currently provides very little important habitat for native fauna.

Scattered remnant native shrubs

Isolated and scattered native shrubs occur in low numbers as remnants or naturally regenerated vegetation, located for example within a small section of the Sparrowvale Road road reserve. The understorey associated with these scattered shrubs is predominantly weedy, often comprising woody weeds such as African Boxthorn or introduced pasture grasses. These areas exhibit little in the way of habitat features, but may include a very low cover of fallen branches and a low level of leaf litter.

This habitat type within the study area contributes to less than one percent of the area and is generally of low quality. However, at times it will support a range of common native fauna species, such as Australian Magpie, Australian Raven and Willie Wagtail.

The abovementioned species, as well as most of those recorded during the field assessment, have adapted well to modified habitat conditions. These areas also support introduced species including the Common Myna and Common Starling. Isolated and scattered shrubs provide foraging, roosting and nesting sites for these and other species.

Non-indigenous tree plantations and gardens

Areas of planted trees and shrubs mainly occur on private property within gardens or as shelter belts within paddocks. These areas provide low to moderate quality habitat for a range of fauna groups. They provide a foraging resource for birds (e.g. nectar for New Holland Honeyeater, White-plumed Honeyeater), whilst also providing shelter for common native fauna where a shrub layer occurs (e.g. Southern Brown Tree Frog, Superb Fairy Wren). Mature Pine, Cypress and Eucalypt trees not indigenous to the local area occur within mature plantations, throughout the study area, and these are generally located along road reserves. Pine trees provide a foraging resource for birds (e.g. pine cones for cockatoos), whilst also providing dispersal habitat for other native fauna. In addition, these trees provide perching, roosting and nesting sites for raptors and other bird species (e.g. Australian Raven and Australian Magpie) that may utilise adjacent open grasslands and nearby riparian wetland habitats for foraging.

Farm dams

Several farm dams occur throughout the study area, either as a source of drinking water for livestock or for irrigation of market gardens. This habitat type mainly supports a range of wetland bird (e.g. Purple Swamp Hen, White-faced Heron) and frog species (e.g. Spotted Marsh Frog and Southern Brown Tree Frog). Several of the smaller dams were dry during the current field assessment. Small patches of aquatic and semi-aquatic vegetation (e.g. Common

Spike Sedge, Cumbungi) occur within some of these dams. Discarded building materials and other debris (e.g. corrugated roofing, timber and sheet metal) often provide additional artificial habitat, adjacent to some of these dams. These provide refuge sites for frogs and potentially for reptiles. A large irrigation basin at the northern end of the study area provides the largest area of open water within the precinct, offering suitable foraging habitat for waterfowl (e.g. Pacific Black Duck and Chestnut Teal). These habitat areas are considered to be of low to moderate quality.

Drainage lines

Three main artificial drainage lines occur within the study area. One at the eastern end of Tannery Road adjacent to a mature Cypress plantation, which was dry during the present survey and exhibited low quality habitat. The second, near the northeast boundary of the study area was flowing steadily after recent rain, which receives stormwater from land adjacent to the study area. This drain exhibits low to moderate quality habitat, comprising areas of emergent introduced vegetation. It supports a colony of frog species, including Spotted Marsh Frog, Southern Brown Tree Frog and Common Froglet. Waders (e.g. egrets and herons) and waterfowl may occasionally use this drain as a foraging resource. The third was observed in the south of the study area, and exhibited low quality habitat. This is an artificial shallow-drainage line, which is dominated introduced flora species and scattered rushes.

Open grasslands and cultivated fields

The study area is dominated by highly modified grasslands (mainly exotic pasture grasses) and cultivated fields (market gardens). Habitat quality for these areas is considered low. However they provide important foraging sites for many common birds which utilise treeless areas, including raptors, and species such as Australian Magpie, Magpie Lark, Australian White Ibis and Masked Lapwing.

3.6 Significant fauna

No nationally significant fauna species were recorded during the present survey.

Fourteen nationally significant fauna species have previously recorded from the local area (AVW) (Appendix 3.2) (see Figure 5 for locations).

Six additional terrestrial species and one freshwater species (not previously documented on the AVW), or habitat for these species, are identified as potentially occurring within a 10 kilometre radius of the study area (EPBC Act Protected Matters Search Tool) (Appendix 3.2).

Nationally listed fauna species include:

- Seven terrestrial mammals: Smoky Mouse, Long-nosed Potoroo, Southern Bent-wing Bat, Southern Brown Bandicoot, Eastern Barred Bandicoot, Grey-headed Flying Fox and Spot-tailed Quoll;
- Three wetland-dependent bird species: Australasian Bitten and Australian Painted Snipe and Orange-bellied Parrot;
- Two woodland/forest dependent bird species: Regent Honeyeater, Swift Parrot;
- One frog species: Growling Grass Frog;
- Five fish species: Australian Grayling, Dwarf Galaxias and Yarra Pygmy Perch; and,
- One invertebrate: Golden Sun Moth.

One nationally significant species, Growling Grass Frog, which has previously been recorded within close proximity (less than 3 kilometres) of the study area, may also utilise suitable habitat (e.g. farm dams) within the study area, and this species is discussed below.

Growling Grass Frog ***Litoria raniformis***

The Growling Grass Frog is commonly known by several other names; Warty Bell Frog, Southern Bell Frog, Warty Swamp Frog and Green and Golden Frog. The species is listed as endangered in Victoria (DSE 2007) and vulnerable nationally (Tyler 1997). It is also listed as a threatened taxon under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act). A draft Flora and Fauna Guarantee Action Statement (Robertson 2003) and a draft National Recovery Plan have been development for the species.

Although formally widely distributed across southern eastern Australia, including Tasmania (Littlejohn 1963, 1982; Hero et al. 1991), the species has declined markedly across much of its former range. This has been most evident over the past two decades and in many areas, particularly in south and central Victoria, populations have experienced apparent declines and local extinctions (AVW; Mahoney 1999; Organ pers. obs.).

This species is largely associated with permanent or semi-permanent still or slow flowing waterbodies (i.e. streams, lagoons, farm dams and old quarry sites) (Hero *et al.* 1991; Barker *et al.* 1995; Cogger 1996; Ashworth 1998). Frogs can also utilise temporarily inundated waterbodies for breeding purposes providing they contain water over the breeding season (Organ 2003).

Although the Growling Grass Frog was not detected during the survey, one previous record (AVW) is within approximately three kilometres from the study area. There is a fair possibility that this species may inhabit for short periods or occasionally visit parts of the study area as there is suitable habitat (principally farm dams) to support this species within the

study area, the species is highly mobile, and the study area is adjacent to the a significant riparian corridor, the Barwon River.

Other nationally threatened species

The likely occurrence or use of habitats in the study area by other nationally significant fauna is provided in Appendix 3.2. There is no important or limiting habitat for any of these species within the study area.

3.6.1 State

No state significant fauna species were recorded during the fieldwork conducted as part of this investigation. An additional 33 state significant fauna species have previously been documented from within 10 kilometres of the study area on the AVW (Appendix 3.2) (see Figure 5 for locations).

A small number of these species (principally waterbirds such as Great Egret, Australian Shoveler and Hardhead) may utilise aquatic habitats within the study area on occasion. However, overall there is no important or limiting habitat for any of these species, or any other species of state conservation significance, within the study area. The likelihood of these species occurring in the study area is provided in Appendix 3.2.

3.6.2 Regional and local

No regionally significant fauna species were recorded during the present assessment. Eighteen regionally significant fauna have been previously recorded from the local area (Appendix 3.2). Species such as Whiskered Tern, Nankeen Night Heron and Latham's Snipe may utilise habitats within the study area on occasion. All other native fauna (primarily common open country birds) are of local significance, as they are not listed as rare or threatened at a national, state or regional level.

4 ECOLOGICAL SIGNIFICANCE OF STUDY AREA

The majority of the study area is devoid of remnant native vegetation and is considered to be of negligible significance for flora and fauna. There are scattered and isolated examples of some common indigenous flora species, such as wattles (see Appendix 2.1) (see Figure 2 for locations), which vary from local to regional conservation significance. Similarly, some of the fauna habitats, such as the mature plantations and farm dams, are also likely to be of local significance, due to the resources they provide in such a modified environment.

Based on the survey results the reasons for conservation significance within the study area are as follows:

- Remnant and isolated indigenous flora species, within a highly modified landscape;
- Presence of remnant populations of at least five plant species of regional conservation significance;
- While not detected during the survey the study area provides potential habitat (farm dams) for the nationally significant Growling Grass Frog. This species has previously been recorded approximately three kilometres from the study area (AVW); and,
- Presence of some habitats, such as mature plantations, which can provide habitat for a diversity of fauna species.

4.1 Previous Assessments and Adjacent Areas

The study area is part of larger area known as the Armstrong Creek Urban Growth Development Area, and background/technical reports have been prepared for this larger area (CoGG 2006, Ecology Australia 2006). These reports did not identify any areas of ecological value within the current study area, however, it was noted that there are areas of ecological value immediately adjacent to the study area. The Barwon River corridor, including flood prone areas, immediately adjacent to the northern and eastern boundaries of the study area, is mapped as containing remnant native vegetation (Ecology Australia 2006). Further, a small section of the road reserve of Brearleys Lane, just outside of the study area was identified as having medium conservation significance (Ecology Australia 2006) (see Figure 2).

Based on the current assessment, the Barwon River corridor supports extensive areas of native vegetation and commensurately higher quality fauna habitat. These areas consist of riparian and aquatic habitats associated with the Barwon River. Riparian areas comprise several wetland habitats, including Tall Marsh, Lignum Swamp and Saltmarsh. This riparian zone provides potentially high quality habitat for fauna which utilise the Barwon River for foraging, nesting and shelter. These areas are likely to support a wide range of native species from all fauna groups (mammals, birds, frogs, reptiles and fish).

In addition, two remnant River Red Gums *Eucalyptus camaldulensis*, were noted adjacent to the southern boundary of the study area, within the road reserve of Reserve Road.

The City of Greater Geelong (CoGG) database, which contains the Biodiversity Management Plans, lists a site of conservation significance adjacent to the northern and eastern boundaries of the study area. The site (Number 1000368) documents the extent of the now 'highly degraded' Floodplain Riparian Woodland within the Barwon River corridor (B. Renouf, City of Greater Geelong, pers. comm.).

One DSE biosite, Goat Island on the Barwon River (Site 1332), is also located adjacent to the northern boundary of the study area. This site is listed as being of local significance (DSE 2005b).

5 IMPLICATIONS OF THE FINDINGS

5.1 Legislative and Policy Implications

This section identifies biodiversity policy and legislation relevant to the proposed development, principally:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Cwth);
- *Flora and Fauna Guarantee Act 1988* (FFG Act) (Vic);
- *Fisheries Act 1995* (Vic);
- *Planning and Environment Act 1987* (Vic);
- *Catchment and Land Protection Act 1994* (CALP Act) (Vic);
- Victoria's Biodiversity Strategy 1997;
- Corangamite Native Vegetation Plan (2005);
- City of Greater Geelong Planning Scheme; and,
- Victoria's *Native Vegetation Management Framework – A Framework of Action* (Net Gain Policy).

5.1.1 *Environment Protection and Biodiversity Conservation Act 1999*

The EPBC Act establishes a Commonwealth process for assessment of proposed actions that are likely to have a significant impact on matters of national environmental significance, or on Commonwealth land. An action (i.e. project, development, undertaking, activity, or series of activities), unless otherwise exempt, requires approval from the Australian Government Environment Minister if they are likely to have an impact on any matters of national environmental significance. A referral under the EPBC Act is required if a proposed action is likely to have a 'significant impact' on any of the following matters of national conservation significance:

- World Heritage properties
- National heritage places
- Ramsar wetlands of international significance
- Threatened species and ecological communities
- Migratory and marine species
- Commonwealth marine area
- Nuclear actions (including uranium mining)

5.1.1.1 Matters of national environmental significance

Ramsar wetlands of international significance

The EPBC Act Protected Matters Search Tool (http://www.environment.gov.au/erin/ert/epbc/imap/map.html) lists two wetlands of international significance, Western District Lakes and Port Phillip Bay (Western Shoreline) and Bellarine, as occurring either in the vicinity, or in the catchment of the study area. The study area is situated approximately 2.5 kilometres west of Reedy Lake, a component wetland of the Port Phillip Bay (Western Shoreline) and Bellarine Ramsar wetlands. The Western District Lakes is situated approximately 40 kilometres (Lake Murdeduke being the closest to Geelong) west of the study area. The Western District Lakes Ramsar Wetlands are most unlikely to be affected by any activities within the study area, due to their remoteness, upstream position within the catchment and as they are mostly isolated from the Barwon River catchment within their own confined drainage basins.

Future activities within the study area should consider potential impacts to downstream Ramsar wetland sites (Reedy Lake and Lake Connewarre), particularly with respect to potential changes in the quality and quantity of water runoff from the study area via the Barwon River.

Listed flora and fauna species, and ecological communities

An action requires approval from the Australian Government Environment Minister if it will, or if it is likely to, have a significant impact on an endangered or critically endangered species, or on an 'important population' or critical habitat of a listed vulnerable species.

Flora – No species listed under the EPBC Act were recorded during the present assessment. However, eight species or some of the species habitat is predicted to occur within a 10 kilometre radius of the study area (EPBC Act Protected Matters Search Tool) or they have been identified from the FIS. None of these species are likely to occur within the study area (Appendix 2.2).

Fauna – Although not recorded during the current survey, one fauna species (Growling Grass Frog) listed as vulnerable under the EPBC Act may occupy habitats within, or in the vicinity of the study area (Appendix 3.2). Growling Grass Frog may be resident within the study area and, if so, may utilise the open water and vegetated fringes of farm dams on either a temporary or permanent basis. Targeted surveys for this species during the early part of its active breeding season (i.e. late November to mid December) may provide further information on its status within the study area. This species was not recorded during the current assessment, but as this species is highly mobile it is recommended that prior to farm dams being disturbed (which may occur in years to come), targeted surveys should be undertaken.

Communities – The remnant native vegetation within the study area is not part of a listed ecological community under the EPBC Act.

Listed migratory and marine species

Migratory and marine species recorded during the present survey, or that have been recorded within the local area are listed in Appendix 3.1. A number of migratory and marine species (e.g. Latham's Snipe, Great Egret) are may utilise habitats within the study area at certain times of the year. However, the study area is unlikely to provide habitat for an ecologically significant proportion of any of these species.

Commonwealth marine area and nuclear actions

The study area is not within a marine area, nor is the proposed works related to nuclear actions.

Implications for any proposed development

Based on the current assessment, a referral to the Australian Government Environment Minister is currently considered unnecessary as no nationally threatened species were recorded within the study area. However, the Growling Grass Frog has been recorded in the local area and it is a highly mobile species and therefore it is recommended that prior to farm dams being disturbed (which may occur in years to come), targeted surveys should be undertaken.

5.1.2 *Flora and Fauna Guarantee Act 1988*

The primary legislation for the protection of flora and fauna in Victoria is the FFG Act. The Act builds on broader national and international policy in the conservation of biodiversity.

The broad objectives of the FFG Act are to; 1) ensure native flora and fauna survive, flourish and maintain in situ evolutionary potential, 2) manage threatening processes, 3) encourage the conserving of flora and fauna through cooperative community endeavours, and 4) establish a regulatory structure for the conservation of flora and fauna in Victoria.

The Act contains protection procedures such as the listing of threatened species and/or communities of flora and fauna, and the preparation of action statements to protect the long-term viability of these values.

Flora – Nine flora species listed as threatened under the FFG Act are predicted to occur within a 10 kilometre radius of the study area (EPBC Act Protected Matters Search Tool) or have been identified from the FIS (Appendix 2.2). Owing to the highly modified nature of the study area there is no habitat for any of these species within the study area.

Vegetation Communities – No vegetation communities listed on the FFG Act were recorded within the study area.

Fauna – Thirty seven fauna species listed as threatened under the FFG Act have previously been recorded from within the local area (i.e. within a 10 kilometre radius of the study area) (Appendix 3.2). Six additional FFG Act listed species (six terrestrial, one freshwater) not documented on the AVW may also occur within the local area (EPBC Act Protected Matters Search Tool). There is no suitable habitat for most of these species within the study area. However, several may visit the study area on occasion. Further targeted surveys may provide more information on the use of the study area by FFG-listed species (such as the Growling Grass Frog), which have been previously recorded within a few kilometres of the study area and which rely on similar habitats to that which occurs on site.

Threatening processes – A number of potentially threatening processes that may have an impact generally on flora and fauna values are listed under Schedule 3 of the FFG Act 1988, and relevant recommendations should be considered.

The following processes in relation to future works associated with land development being undertaken within the study area may include:

- Increase in sediment input into Victorian rivers and streams due to human activities;
- Input of toxic substances into Victorian rivers and streams; and
- The invasion of native vegetation by environmental weeds.

Implications for any proposed development

Based on the current survey no flora and fauna species listed under the FFG Act 1988 were recorded within the study area, and no critical habitat for any FFG listed fauna species is located within the study area (Appendices 2.1 and 3.1). However, the Growling Grass Frog may need to be considered in the future, as it is a highly mobile species and it has been recorded in the local area in the past.

However, a permit from DSE is required in order to 'take' listed flora species, species that are members of listed communities (not the case for this project) or protected flora on public land, such as road reserves, and to clear or disturb protected flora species within the study area including *Acacia* species (except Blackwood *Acacia melanoxylon*), any of the Asteraceae (Daisies) (e.g. Golden Wattle *Acacia pycnantha*, which was recorded in the study area), and all orchids and all ferns.

5.1.3 *Planning and Environment Act 1987*

All planning schemes contain native vegetation provisions at Clause 52.17. A planning permit is required under the *Planning and Environment Act 1987* to remove, destroy or lop native vegetation on a site of more than 0.4 hectares (not habitat hectares), unless:

- The application is exempt under the schedule to Clause 52.17
- A Native Vegetation Precinct Plan applies.

Planning schemes may contain other provisions in relation to the removal of native vegetation.

Recent changes to the planning provisions (DSE 2006b) have altered the criteria for when DSE is the mandatory referral authority. A permit must be referred to DSE if there is one or more of the following:

Scattered Trees (may include trees from patches of vegetation)

- Greater than 15 trees with a diameter less than 40 centimetres at 1.3 metres above ground.
- Greater than 5 trees with a diameter more than 40 centimetres at 1.3 metres above ground.

Areas of vegetation (may include trees)

- Greater than 0.5 hectares of vegetation in an Ecological Vegetation Class with Bioregional Conservation Status of Endangered, Vulnerable or Rare.
- Greater than 1 hectare of vegetation in an Ecological Vegetation Class with Bioregional Conservation Status of Depleted or Least Concern.

Other circumstances

- On Crown land managed by the responsible authority.
- Where a property vegetation plan applies to the site.

Implications for any proposed development

A planning permit from the City of Greater Geelong is required to remove, destroy or lop any vegetation, including isolated indigenous grass tussocks, as part of any proposed works.

5.1.4 *Catchment and Land Protection Act 1994*

The CALP Act contains provisions relating to catchment planning, land management, noxious weeds and pest animals.

This Act also provides a legislative framework for the management of private and public land and sets out the responsibilities of land managers, stating that they must take all reasonable steps to:

- Avoid causing or contributing to land degradation which causes or may cause damage to land of another land owner;

- Protect water resources;
- Conserve soil;
- Eradicate regionally prohibited weeds;
- Prevent the growth and spread of regionally controlled weeds; and
- Prevent the spread of, and as far as possible eradicate, established pest animals

Essentially the Act establishes a framework for the integrated management and protection of catchments, and provides a framework for the integrated and coordinated management, which aims to ensure that the quality of the State's land and water resources and their associated plant and animal life are maintained and enhanced.

Implications for any proposed development

While not directly associated with the proposed works, the client is responsible to control any infestation of noxious weeds, which may become established after the works have been completed. As such, noxious weeds should be appropriately controlled in areas of native vegetation to minimise their spread and overall impact on ecological values.

5.1.5 Victoria's Biodiversity Strategy

The Victorian Government endorses this strategy titled 'Victoria's Biodiversity – Directions in Management (NRE 1997) and represents a benchmark for biodiversity conservation and management throughout the state.

The Biodiversity Strategy encourages Victorians to better understand and appreciate flora and fauna and ecosystems throughout the state, and to take an active part in conservation and management to ensure biodiversity is managed in an ecologically sound and sustainable manner.

5.1.6 Corangamite Native Vegetation Plan

The Corangamite Native Vegetation Plan (CCMA 2005) is a guide for local government in assessing planning applications for vegetation removal and determining permit conditions (Net Gain requirements) to ensure that ecological values across the region are not compromised.

The Plan provides information on biodiversity values across the Region and gives guidance to local municipalities on how clearing applications should be assessed. The document also outlines actions to ensure there is more strategic and coordinated approach to address ongoing degradation in quantity and quality of native vegetation throughout south western Victoria.

The recommendations above, made in the *Native Vegetation Plan*, should be taken into consideration in the planning phase of the proposed rezoning and development.

Implications for any proposed development

The planning for the proposed construction should address the key recommendations outlined under the Corangamite Native Vegetation Plan (CCMA 2005).

Vegetation within the study area can be evaluated using the guidelines for conservation significance assessment and application of the Net Gain approach to regional outcomes and local responses (CCMA 2005). Management actions pertinent to the proposed development would need to be consistent with the management priorities provided in the Corangamite Native Vegetation Plan, and these actions would need to be articulated in a detailed environmental management plan.

5.1.7 City of Greater Geelong

Currently no overlays under the City of Greater Geelong Planning Scheme cover the study area, and the site is currently a mix of Industrial Zone and Farm Zone.

Implications for any proposed development

A planning permit is required to remove, destroy or lop any vegetation as part of any proposed development.

5.1.8 The Native Vegetation Framework

Since 1989, most proposals to clear native vegetation have required a planning permit from the local Council (Responsible Authority), under the native vegetation provisions of Clause 52.17 of the Victoria Planning Provisions ('VPPs'). In 2002, the Victorian Government released *Victoria's Native Vegetation Management – A Framework for Action* (NRE 2002) ('the Framework'), which establishes a "strategic direction for the protection, enhancement and revegetation of native vegetation across the State".

Amendment (VC19) to Victoria's Planning Provisions introduced the Framework in July 2003 as an incorporated document for all Victorian Planning Schemes. Clauses 11 and 15.09 in the State Planning Policy Framework provide the framework for considering native vegetation issues in the planning system.

These clauses require planning and responsible authorities to have regard to the Framework, which establishes the strategic direction for the protection, enhancement and revegetation of native vegetation across Victoria.

Net Gain

The Framework states that the primary goal is to achieve:

"a reversal, across the entire landscape, of the long-term decline in the extent and quality of native vegetation, leading to a Net Gain" (NRE 2002).

Net Gain is the overall outcome where native vegetation and habitat gains are greater than the losses and where losses are avoided, where possible.

Applying Net Gain – The Three Step Approach

When Net Gain is considered for potential impacts on native vegetation within all planning schemes, the Framework has defined a three-step approach for applying Net Gain to protection and clearance decisions. The three-step approach is:

1. To avoid adverse impacts, particularly through vegetation clearance.
2. If impacts cannot be avoided, to minimise impacts through appropriate consideration in planning processes and expert input to project design or management.
3. Identify appropriate offset options.

The three-step approach to Net Gain is the first consideration for all planning permit applications and planning scheme amendments, with emphasis placed on the first two steps of avoidance and minimisation. Only after these two steps have been taken should offsets (actions undertaken to achieve commensurate gains) be considered (NRE 2002).

Implications for any proposed development

If native vegetation or indigenous species are proposed to be cleared, then the Net Gain policy must be considered. No patches of remnant vegetation (including fauna habitat) or scattered trees, as defined by DSE (2006a) are present within the study area, and therefore a formal assessment under the Net Gain policy, as defined by Victoria's *Native Vegetation Management Framework* (the Framework) (NRE 2002), is currently not required to be considered, as part of any development. However, there are scattered and isolated indigenous remnants (see Figure 2 for locations), and the Framework states that gains are to be commensurate with losses, and therefore an informal strategy under the Net Gain policy is required if any of the scattered indigenous grassy remnants or scattered shrubs were to be cleared. In this instance the offset could be to ensure that landscape/revegetation works as part of any development, particularly along the interface of the study area and the Barwon River corridor, use indigenous flora species.

6 OPPORTUNITIES AND CONSTRAINTS

Future land use and development within the study area is unlikely to be significantly constrained by the various biodiversity related policies, legislations, regional strategic management plans and local planning schemes, as the majority of the study area is devoid of native vegetation and quality fauna habitats, and is of negligible ecological significance. However, there are scattered ecological values remaining on site (see Section 4) and given the proximity of the site to the significant Barwon River corridor, any development should be undertaken with respect to these values.

6.1 Opportunities

The relatively low ecological significance of the study area, due to a lack of remnant native vegetation and low to moderate quality fauna habitat values (as determined by this study), provides a suitable rationale for the location of a Business Park within the study area, without unduly further compromising the ecological values of the area.

Based on this premise, opportunities exist to protect and enhance existing native vegetation and fauna habitat within and adjacent to the study area. In order to achieve this, the following should be considered:

- As documented in the State Government's Net Gain policy, where remnant vegetation cannot be retained within the study area, it could be offset with revegetation/landscape works (as the native vegetation within the study area is not part of a remnant patch and scattered remnant trees are not present), using indigenous species;

- Habitat buffer zones, wetlands and/or corridors should be provided within the study area to enhance areas of ecological value, and should be designed to provide habitat features for a suite of indigenous species, such as frogs and birds. These features should be particularly located along the Barwon River frontage to enhance and widen this significant corridor and to enhance water quality within the Barwon River and downstream wetlands (including Ramsar wetlands);

- Additional areas could be utilised as habitat corridors, eg. within the power easement, particularly where any remnants are currently located;

- The habitat buffers and corridors can also be designed as the basis for biodiversity corridors that link other habitats within the local area. These could be established along existing or planned major drainage lines within the site and at other strategic locations, such as areas adjacent to the Barwon River and along the southern boundary of the study area (Refer Armstrong Creek Urban Growth Plan- Framework Plan);

- Where possible, encourage ongoing recruitment of remnant native vegetation (trees, shrubs and groundcovers);

- Allow for public access along biodiversity corridors to maintain community awareness, but ensuring that there are some restricted areas;

- Incorporate local indigenous species into nature strips, gardens and stormwater drainage and treatment facilities to reflect local environment/landscape and augment adjacent natural areas (e.g. Barwon River);

- Incorporate Water Sensitive Urban Design (WSUD) into future developments within the study area and investigate the use of alternative stormwater drainage schemes that minimise changes to natural infiltration rates of water into soils; and,

- Incorporate constructed wetlands and establish adequate vegetated buffer strips adjacent to the Barwon River corridor to treat stormwater and overland runoff from the study area before it enters the river, and to provide suitable habitat for fauna species, such as frogs.

6.2 Constraints

The majority of the study area has been modified from its original condition, with widespread clearance of remnant native vegetation. However, there are still habitat features and remnant vegetation (albeit of low quality) located throughout the study area. Any loss of ecological values should be viewed in the context of the overall ongoing loss, fragmentation, and deterioration in the quality of remnant vegetation and fauna habitat throughout the Geelong Region and in particular the Armstrong Creek Urban Growth Area.

The study area's close proximity to intact, high quality vegetation and fauna habitat (Barwon River corridor) will require consideration during any land development, planning, design, construction and post-construction occupation and use within the study area.

Potential constraints relating to the effects of future development and use of land within and adjacent to the study area on ecological values have been identified, and include;

- The close proximity of the Barwon River and environs to the study area, which will require that any future development and associated infrastructure is directed away from areas supporting moderate to high ecological values;

- The close proximity of the two River Red Gums and the medium conservation significance vegetation within Brearleys Lane;

- The loss of fauna habitat from the study area, particularly farm dams and scattered mature plantations;

- Low-lying land containing scattered indigenous flora species within the study area, west of Brearleys Lane, and adjoining remnant vegetation adjacent to the study area;

- During and after development, there is likely to be a change in anthropogenic disturbances, such as noise, vibrations, traffic, lighting, etc., and therefore these will require careful planing and consideration;

- Potential increase in pest plant and animal invasions; and,

- Changes to surface runoff and contaminants associated with land use changes, which will require WSUD principles to be considered.

7 CONCLUSION

The majority of the vegetation within the study area is highly modified (very low quality), comprising introduced flora species (i.e. mostly pasture grasses and weeds) and areas of planted Australian natives of unknown provenance and other introduced planted species. However, there are scattered and isolated indigenous flora species in several locations, such as along Sparrowvale Road, and the low-lying area in the south east of the study area, but the majority of the vegetation at these sites is introduced.

The overall value of fauna habitat within the study area is low to moderate. Vegetation and physical landscape features such as grasslands and/or woodlands have been highly modified since European settlement and currently provides very little important habitat for native fauna.

Based on the field survey results no flora and fauna species of national or state conservation significance were recorded within the study area. The majority of the study area is devoid of remnant native vegetation and is considered to be of negligible significance for flora and fauna. There are scattered and isolated examples of some common indigenous flora species, such as wallaby grasses, which vary from local to regional conservation significance. Similarly, some of the fauna habitats, such as the mature plantations and farm dams, are also likely to be of local significance, due to the resources they provide in such a modified environment.

Currently a referral to the Australian Government Environment Minister is considered unnecessary as no nationally threatened species were recorded within the study area. However, the Growling Grass Frog has been recorded in the local area and it is a highly mobile species and therefore it is recommended that prior to farm dams being disturbed (which may occur in years to come), targeted surveys should be undertaken.

Based on the current survey no flora and fauna species listed under the FFG Act 1988 were recorded within the study area, and no critical habitat for any FFG listed fauna species is located within the study area. However, the Growling Grass Frog may need to be considered in the future, as it is a highly mobile species and it has been recorded in the local area in the past. A permit from DSE is required in order to 'take' listed flora species from public land, such as road reserves, and the Golden Wattle and Black Wattle were recorded in the study area.

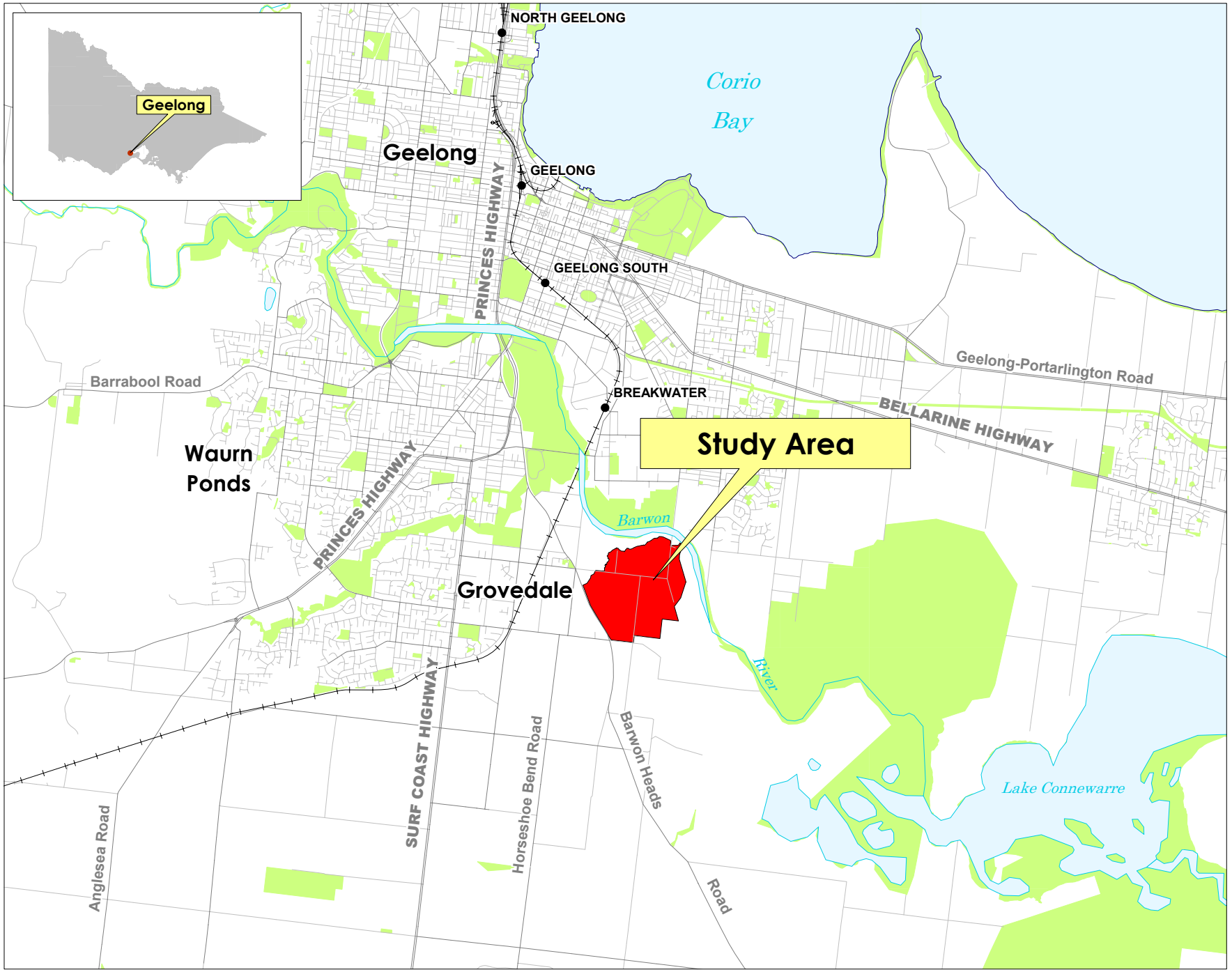
A permit from the City of Greater Geelong is likely to be required for the removal of any native vegetation, and an informal approach to Net Gain is also likely to be required if native vegetation is cleared.

Further Assessment/survey

The Growling Grass Frog has been recorded in the local area and it is a highly mobile species and therefore it is recommended that prior to any farm dams being disturbed (which may

occur in years to come), targeted surveys should be undertaken and if recorded a conservation management plan for the frog developed.

FIGURES



Study area

N

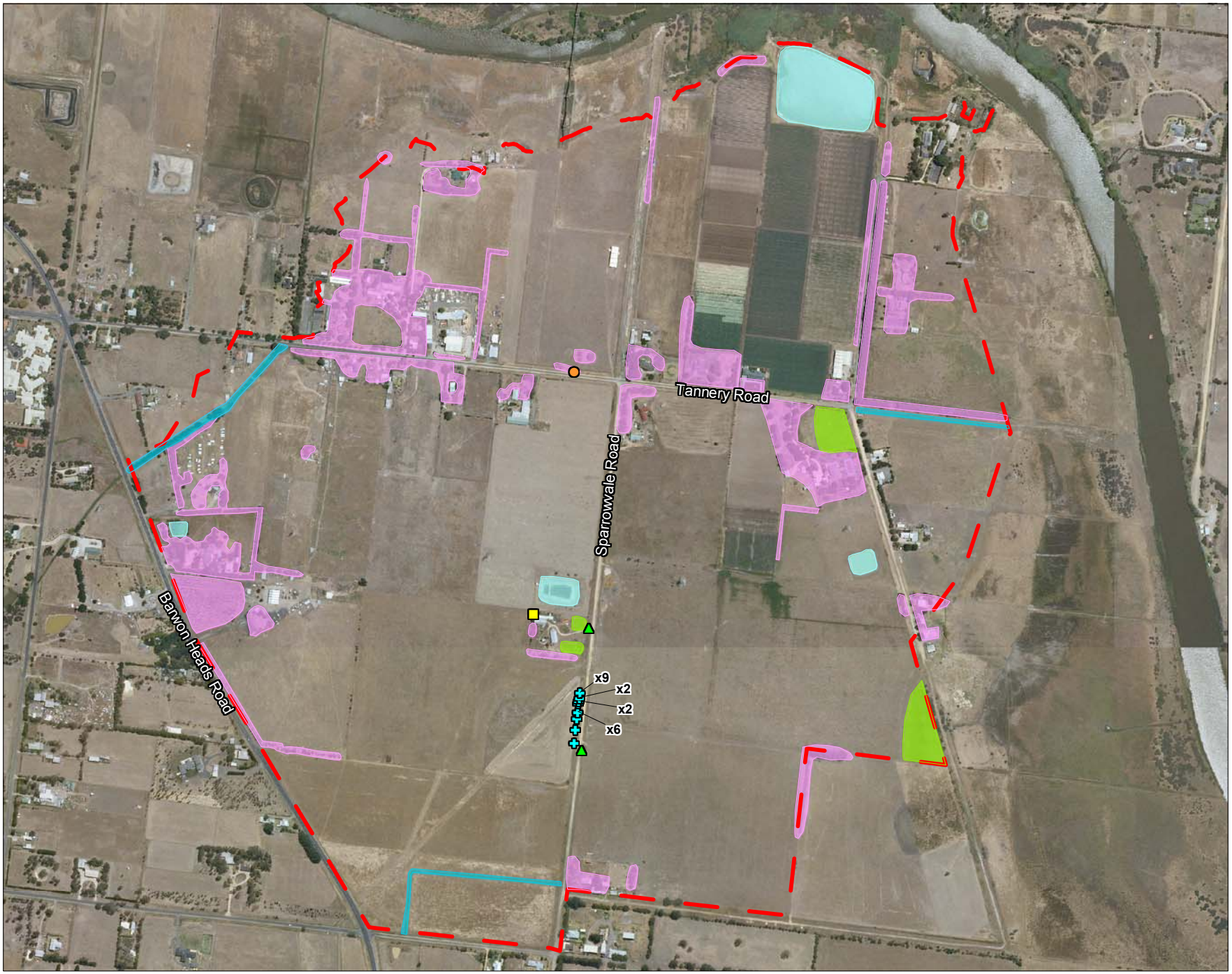
0 1 2

Kilometres

Figure 1
Location of the study area

ecologypartners

EP Map Num: 984 Fig 1
Issue Date: 14/7/2008



Black Wattle
Blackwood
Golden Wattle
Hedge Wattle
Drain (Artificial)
Dams
Non-indigenous tree plantations & gardens
Areas of scattered and isolated common indigenous flora species, but mostly introduced flora species are present, and therefore these areas do not meet DSE thresholds for native vegetation
Study area

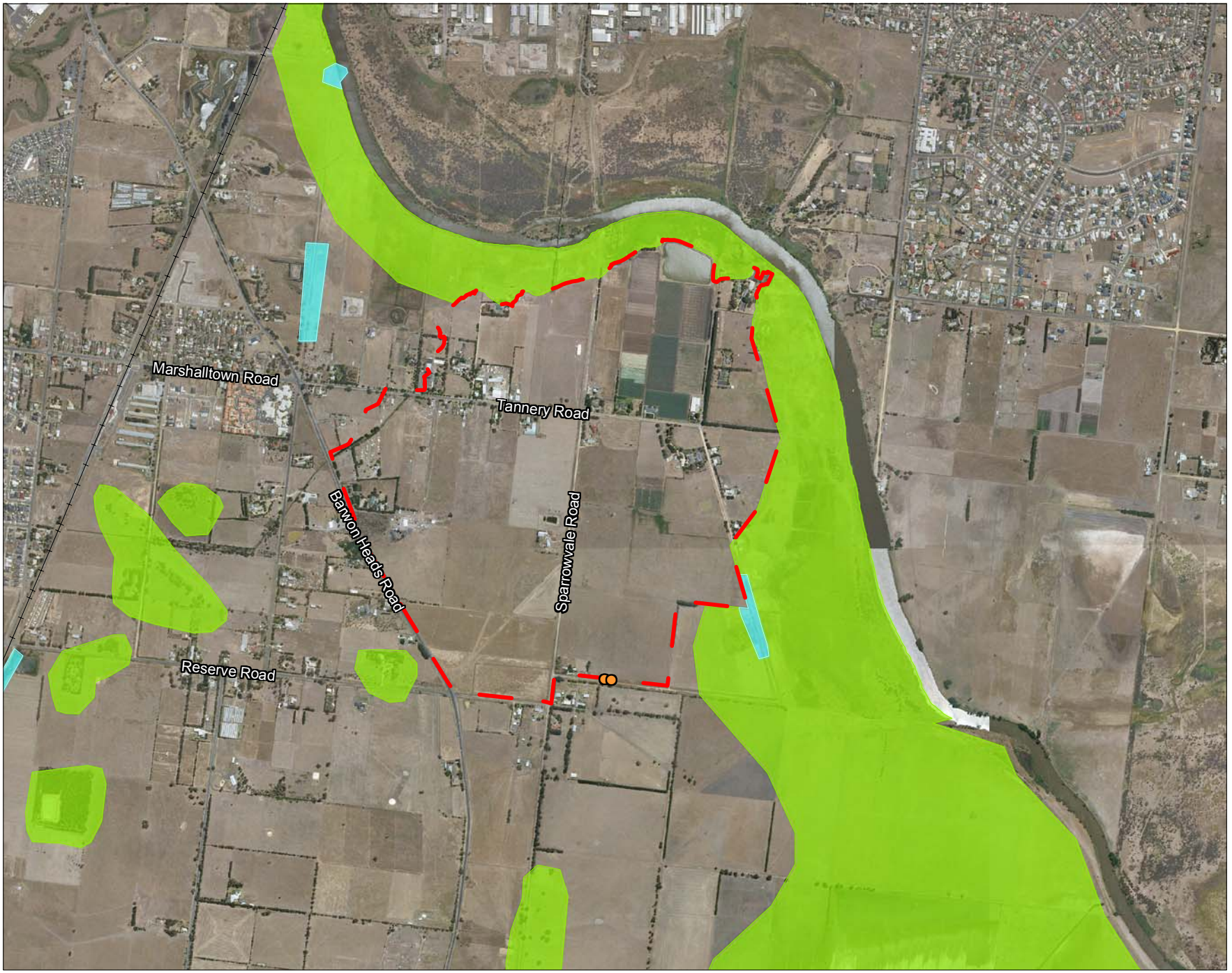
N

0 100 200
Metres

Figure 2
Ecological values within the study area

ecologypartners

EP Map Num: 984 Fig 2
Issue Date: 20/8/2008



River Red-gums

Remnant vegetation

Roadside vegetation

Study area

Note:
Ecological values located outside of the study area were obtained from previous reports and incidental records, and this information should not be considered accurate until ground-truthing has been undertaken

N

0 250 500
Metres

Figure 3
Ecological values adjacent to the study area

ecologypartners

EP Map Num: 984 Fig 3
Issue Date: 20/8/2008

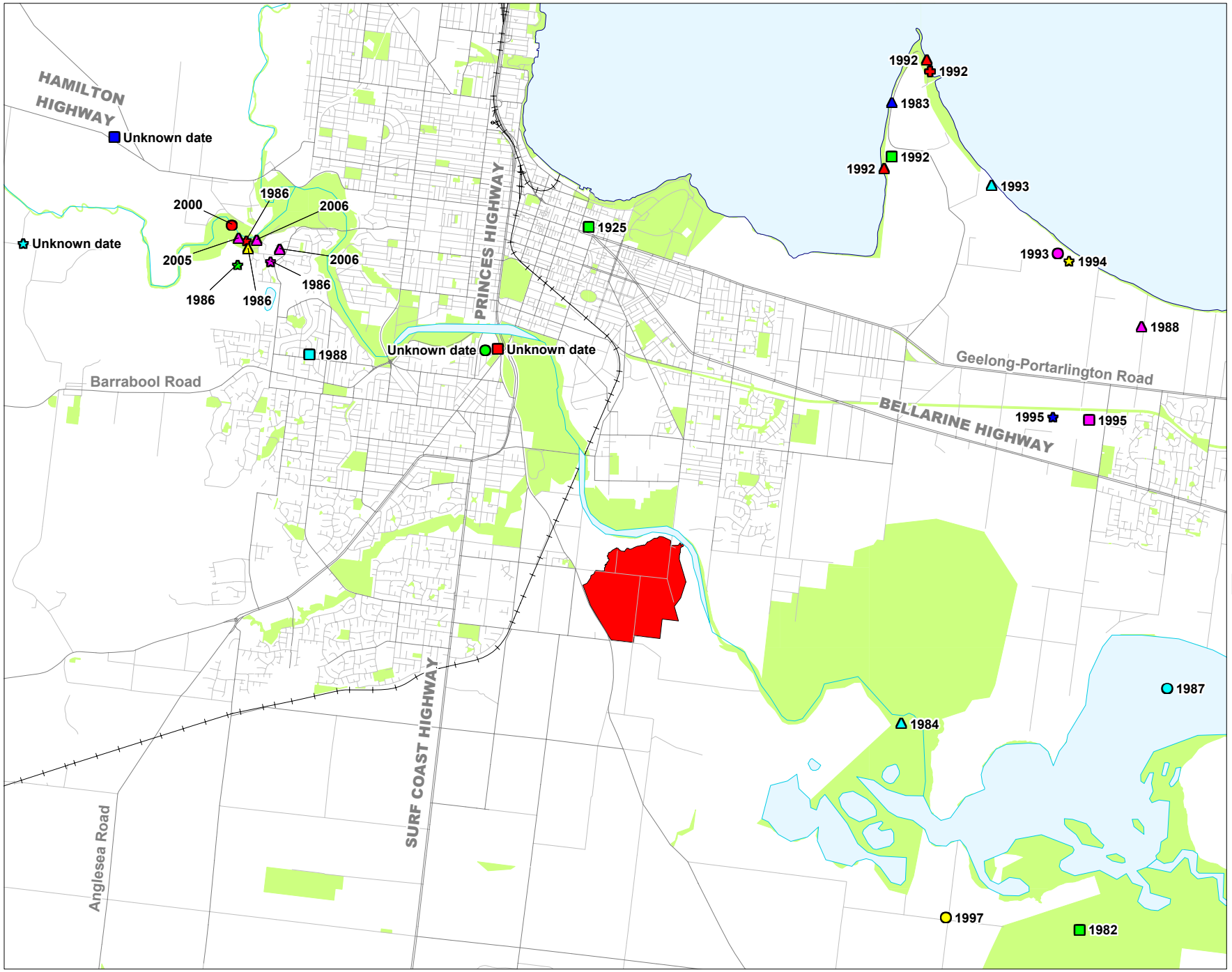


Figure 4
Significant flora species recorded within the local area

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EP Map Num: 984 Fig 4
Issue Date: 20/8/2008

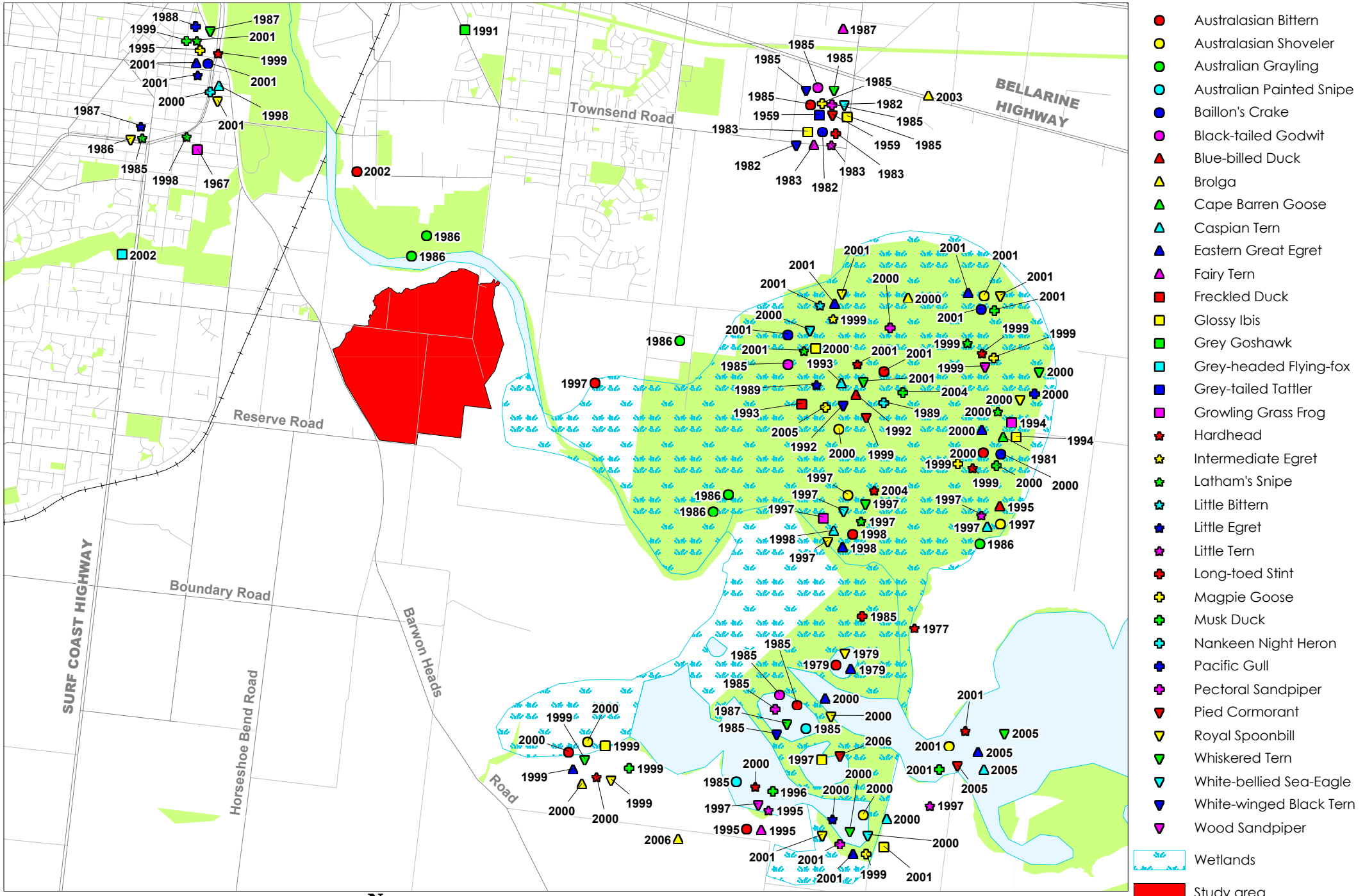

Figure 5
Significant fauna species recorded within the local area

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EP Map Num: 984 Fig 5, Issue Date: 20/8/2008

APPENDICES

Appendix 1 – Significance Assessment

Criteria used by Ecology Partners Pty. Ltd. to define conservation significance, vegetation condition and habitat quality is provided below.

A1.1. Rare or Threatened Categories for listed Victorian taxa

Table A1.1. *Rare or Threatened categories for listed Victorian taxa.*

Rare or Threatened Categories
CONSERVATION STATUS IN AUSTRALIA **(Based on the EPBC Act 1999, Briggs and Leigh 1996*)**
EX - Extinct: Extinct is when there is no reasonable doubt that the last individual of the species has died.
CR - Critically Endangered: A species is critically endangered when it is facing an extremely high risk of extinction in the wild in the immediate future.
EN - Endangered: A species is endangered when it is not critically endangered but is facing a very high risk of extinction in the wild in the near future.
VU - Vulnerable: A species is vulnerable when it is not critically endangered or endangered but is facing a high risk of extinction in the wild in the medium-term future.
R* - Rare: A species is rare but overall is not currently considered critically endangered, endangered or vulnerable.
K* - Poorly Known: A species is suspected, but not definitely known, to belong to any of the categories extinct, critically endangered, endangered, vulnerable or rare.
CONSERVATION STATUS IN VICTORIA **(Based on DSE 2005, DSE 2007, FIS)**
x - Presumed Extinct in Victoria: not recorded from Victoria during the past 50 years despite field searches specifically for the plant, or, alternatively, intensive field searches (since 1950) at all previously known sites have failed to record the plant.
e - Endangered in Victoria: at risk of disappearing from the wild state if present land use and other causal factors continue to operate.
v - Vulnerable in Victoria: not presently endangered but likely to become so soon due to continued depletion; occurring mainly on sites likely to experience changes in land-use which would threaten the survival of the plant in the wild; or, taxa whose total population is so small that the likelihood of recovery from disturbance, including localised natural events such as drought, fire or landslip, is doubtful.
r - Rare in Victoria: rare but not considered otherwise threatened - there are relatively few known populations or the taxon is restricted to a relatively small area.
k - Poorly Known in Victoria: poorly known and suspected, but not definitely known, to belong to one of the above categories (x, e, v or r) within Victoria. At present, accurate distribution information is inadequate.

A1.2. Defining Ecological Significance

Table A1.2. Defining Ecological Significance.

Criteria for defining Ecological Significance	
NATIONAL SIGNIFICANCE	
Flora	National conservation status is based on the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) list of taxa considered threatened in Australia (i.e. extinct, critically endangered, endangered, vulnerable).
	Flora listed as rare in Australia in *Rare or Threatened Australian Plants* (Briggs and Leigh 1996).
Fauna	National conservation status is based on the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) list of taxa considered threatened in Australia (i.e. extinct, critically endangered, endangered, vulnerable).
	Fauna listed as extinct, critically endangered, endangered, vulnerable, Rare or Lower Risk (near threatened, conservation dependent or least concern) under National Action Plans for terrestrial taxon prepared for the Department of Environment and Water Resources: threatened marsupials and monotremes (Maxwell *et al.* 1996), rodents (Lee 1995), bats (Duncan *et al.* 1999), birds (Garnett and Crowley 2000), reptiles (Cogger *et al.* 1993), and amphibians (Tyler 1997).
	Species that have not been included on the EBPC Act but listed as significance according to the *IUCN 2006 Red List of Threatened Species* (IUCN 2006).
Communities	Vegetation communities considered critically endangered, endangered or vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* and considering vegetation condition.
STATE SIGNIFICANCE	
Flora	Threatened taxa listed under the provisions of the *Flora and Fauna Guarantee Act 1988*.
	Flora listed as extinct, endangered, vulnerable or rare in Victoria in the DSE Flora Information System (most recent Version).
	Flora listed in the State Government's *Advisory List of Rare or Threatened Plants in Victoria*, 2005 (DSE 2005).
	Flora listed as poorly known in Australia in *Rare or Threatened Australian Plants* (Briggs and Leigh 1996).
Fauna	Threatened taxon listed under Schedule 2 of the *Flora and Fauna Guarantee Act 1988*.
	Fauna listed as extinct, critically endangered, endangered and vulnerable on the State Government's *Advisory List of Threatened Vertebrate Fauna in Victoria - 2007* (DSE 2007).

Criteria for defining Ecological Significance	
	Listed as Data Deficient or Insufficiently Known under National Action Plans for terrestrial species prepared for the Department of Environment and Water Resources: threatened marsupials and monotremes (Maxwell *et al.* 1996), rodents (Lee 1995), bats (Duncan *et al.* 1999), birds (Garnett and Crowley 2000), reptiles (Cogger *et al.* 1993), and amphibians (Tyler 1997).
Communities	Ecological communities listed as threatened under the *Flora and Fauna Guarantee Act 1988*.
	Ecological vegetation class listed as threatened (i.e. endangered, vulnerable) or rare in a Native Vegetation Plan for a particular Bioregion (DSE Website) and considering vegetation condition.
REGIONAL SIGNIFICANCE	
Flora	Flora considered rare in any regional native vegetation plan for a particular Bioregion.
	Flora considered rare by the author for a particular Bioregion.
Fauna	Fauna with a disjunct distribution, or a small number of documented recorded or naturally rare in the particular Bioregion in which the study area is located.
	A particular taxon that is has an unusual ecological or biogeographical occurrence or listed as Lower Risk – Near Threatened, Data Deficient or Insufficiently Known on the State Government's Advisory List of *Threatened Vertebrate Fauna in Victoria* - 2007 (DSE 2007).
Communities	Ecological vegetation class listed as depleted or least concern in a Native Vegetation Plan for a particular Bioregion (DSE Website) and considering vegetation condition.
	Ecological vegetation class considered rare by the author for a particular Bioregion.
LOCAL SIGNIFICANCE	
Local significance is defined as flora, fauna and ecological communities indigenous to a particular area, which are not considered rare or threatened on a national, state or regional level.	

A1.3 Defining Site Significance

The following geographical areas apply to the overall level of significance with respect to the current survey.

National: Australia

State: Victoria

Regional: Otway Plain Bioregion

Local: Within 10 kilometres surrounding the study area

Table A1.3. Defining Site Significance.

Criteria for defining Site Significance
NATIONAL SIGNIFICANCE
A site is of National significance if: - it regularly supports, or has a high probability of regularly supporting individuals of a taxon listed as 'Critically Endangered' or 'Endangered' under the *Environment Protection and Biodiversity Conservation Act 1999* and/or under National Action Plans for terrestrial taxon prepared for the Department of Environment and Water Resources. - it regularly supports, or has a high probability of supporting, an 'important population' as defined under the *Environment Protection and Biodiversity Conservation Act 1999* of one or more nationally 'vulnerable' flora and fauna taxon. - it is known to support, or has a high probability of supporting taxon listed as 'Vulnerable' under National Action Plans. - it is known to regularly support a large proportion (i.e. greater than 1%) of a population of a taxon listed as 'Conservation Dependent' under the *Environment Protection and Biodiversity Conservation Act 1999* and/or listed as Rare or Lower Risk (near threatened, conservation dependent or least concern) under National Action Plans. - it contains an area, or part thereof designated as 'critical habitat' under the *Environment Protection and Biodiversity Conservation Act 1999,* or if the site is listed under the Register of National Estate compiled by the Australian Heritage Commission. - it is a site which forms part of, or connected to a larger area(s) of remnant native vegetation or habitat of national conservation significance such as most National Park, and/or a Ramsar Wetland(s).
STATE SIGNIFICANCE
A site is of State significance if: - it occasionally supports taxon listed as 'Critically Endangered' or 'Endangered' under the *Environment Protection and Biodiversity Conservation Act 1999* and/or under National Action Plans. - it regularly supports, or has a high probability of regularly supporting (i.e. high habitat quality) taxon listed as 'Vulnerable', 'Near threatened', 'Data Deficient' or 'Insufficiently Known' in Victoria (DSE 2005, 2007), or species listed as 'Data Deficient' or 'Insufficiently Known' under National Action Plans. - it contains an area, or part thereof designated as 'critical habitat' under the *Flora and Fauna Guarantee Act 1988*. - it supports, or likely to support a high proportion of any Victorian flora and fauna taxa. - it contains high quality, intact vegetation/habitat supporting a high species richness and diversity in a particular Bioregion. - it is a site which forms part of, or connected to a larger area(s) of remnant native vegetation or habitat of state conservation significance such as most State Parks and/or Flora and Fauna Reserves.

Criteria for defining Site Significance
REGIONAL SIGNIFICANCE
A site is of Regional significance if: - it regularly supports, or has a high probability of regularly supporting regionally significant fauna as defined in Table 1.2. - is contains a large population (i.e. greater than 1%) of flora considered rare in any regional native vegetation plan for a particular Bioregion. - it supports a fauna population with a disjunct distribution, or a particular taxon that has an unusual ecological or biogeographical occurrence. - it is a site which forms part of, or connected to a larger area(s) of remnant native vegetation or habitat of regional conservation significance such as most Regional Parks and/or Flora and Fauna Reserves.
LOCAL SIGNIFICANCE
Most sites are considered to be of at least local significant for conservation, and in general a site of local significance can be defined as: - an area which supports indigenous flora species and/or a remnant Ecological Vegetation Class, and habitats used by locally significant fauna species. - an area which currently acts, or has the potential to act as a wildlife corridor linking other areas of higher conservation significance and facilitating fauna movement throughout the landscape.

A1.4. Defining Vegetation Condition

Table A1.4. Defining Vegetation Condition.

Criteria for defining Vegetation Condition
Good condition - Vegetation dominated by a diversity of indigenous species, with defined structures (where appropriate), such as canopy layer, shrub layer, and ground cover, with little or few introduced species present.
Moderate condition - Vegetation dominated by a diversity of indigenous species, but is lacking some structures, such as canopy layer, shrub layer or ground cover, and/or there is a greater level of introduced flora species present.
Poor condition - Vegetation dominated by introduced species, but supports low levels of indigenous species present, in the canopy, shrub layer or ground cover.

A1.5. Defining Habitat Quality

Several factors are taken into account when determining the value of habitat. Habitat quality varies on both spatial and temporal scales, with the habitat value varying depending upon a particular fauna species.

Table A1.5. *Defining Habitat Quality.*

Criteria for defining Habitat Quality
HIGH QUALITY
High degree of intactness (i.e. floristically and structurally diverse), containing several important habitat features such as ground debris (logs, rocks, vegetation), mature hollow-bearing trees, and a dense understorey component.
High species richness and diversity (i.e. represented by a large number of species from a range of fauna groups).
High level of foraging and breeding activity, with the site regularly used by native fauna for refuge and cover.
Habitat that has experienced, or is experiencing low levels of disturbance and/or threatening processes (i.e. weed invasion, introduced animals, soil erosion, salinity).
High contribution to a wildlife corridor, and/or connected to a larger area(s) of high quality habitat.
Provides known, or likely habitat for one or more rare or threatened species listed under the EPBC Act, FFG Act, or species considered rare or threatened according to DSE 2007.
MODERATE QUALITY
Moderate degree of intactness, containing one or more important habitat features such as ground debris (logs, rocks, vegetation), mature hollow-bearing trees, and a dense understorey component.
Moderate species richness and diversity - represented by a moderate number of species from a range of fauna groups.
Moderate levels of foraging and breeding activity, with the site used by native fauna for refuge and cover.
Habitat that has experienced, or is experiencing moderate levels of disturbance and/or threatening processes.
Moderate contribution to a wildlife corridor, or is connected to area(s) of moderate quality habitat.
Provides potential habitat for a small number of threatened species listed under the EPBC Act, FFG Act, or species considered rare or threatened according to DSE 2007.
LOW QUALITY
Low degree of intactness, containing few important habitat features such as ground debris (logs, rocks, vegetation), mature hollow-bearing trees, and a dense understorey component.
Low species richness and diversity (i.e. represented by a small number of species from a range of fauna groups).
Low levels of foraging and breeding activity, with the site used by native fauna for refuge and cover.
Habitat that has experienced, or is experiencing high levels of disturbance and/or threatening processes.
Unlikely to form part of a wildlife corridor, and is not connected to another area(s) of habitat.
Unlikely to provide habitat for rare or threatened species listed under the EPBC Act, FFG Act, or considered rare or threatened according to DSE 2007.

Appendix 2.1 – Flora survey results

Table A2.1. Flora recorded during the present survey (7 July 2008) from the study area.

Species in bold are considered to be of Regional conservation significance

Scientific Name	Common Name
Indigenous Species	
Acacia mearnsii	Black Wattle
Acacia melanoxylon	Blackwood
Acacia paradoxa	Hedge Wattle
Acacia pycnantha	**Golden Wattle**
Austrodanthonia racemosa var. *racemosa*	Slender Wallaby-grass
Austrodanthonia spp	Wallaby-grass
Calocephalus lacteus	**Milky Beauty-heads**
Carex tereticaulis	**Poong'ort**
Distichlis distichophylla	**Australian Salt-grass**
Einadia nutans	Nodding Saltbush
Eleocharis acuta	**Small Spike-sedge**
Juncus spp.	Rush
Muehlenbeckia florulenta	**Tangled Lignum**
Phragmites australis	Common Reed
Typha spp.	Bulrush
Introduced Species	
Agrostis capillaris	Brown-top Bent
Aloe spp.	Aloe
Arctotheca calendula	Cape Weed
Asparagus asparagoides	Bridal Creeper
Beta vulgaris subsp. maritima	Wild Beet
Brassica fruticulosa	Twiggy Turnip
Bromus catharticus	Prairie Grass
Chamaecytisus palmensis	Tree Lucerne
Chenopodium album	Fat Hen
Chenopodium murale	Sowbane
Cirsium vulgare	Spear Thistle
Cyperus eragrostis	Drain Flat-sedge
Dactylis glomerata	Cocksfoot
Ehrharta erecta var. *erecta*	Panic Veldt-grass
Erodium spp.	Heron's Bill
Galenia pubescens var. *pubescens*	Galenia
Galium aparine	Cleavers
Genista monspessulana	Montpellier Broom
Helminthotheca echioides	Ox-tongue
Holcus lanatus	Yorkshire Fog
Hordeum marinum	Sea Barley-grass
Lepidium africanum	Common Peppercress
Lolium rigidum	Wimmera Rye-grass
Lophopyrum ponticum	Tall Wheat-grass

Lycium ferocissimum	African Box-thorn
Malva parviflora	Small-flower Mallow
Marrubium vulgare	Horehound
Medicago polymorpha	Burr Medic
Nassella neesiana	Chilean Needle-grass
Nassella trichotoma	Serrated Tussock
Oxalis pes-caprae	Soursob
Paspalum dilatatum	Paspalum
Pennisetum clandestinum	Kikuyu
Phalaris aquatica	Toowoomba Canary-grass
#Pittosporum undulatum	Sweet Pittosporum
Plantago coronopus	Buck's-horn Plantain
Plantago lanceolata	Ribwort
Poa annua	Annual Meadow-grass
Romulea rosea	Onion Grass
Rubus anglocandicans	Blackberry
Rumex crispus	Curled Dock
Solanum nigrum sensu Willis (1972)	Black Nightshade
Sonchus oleraceus	Common Sow-thistle
Sporobolus africanus	Rat-tail Grass
Stenotaphrum secundatum	Buffalo Grass
Trifolium campestre var. *campestre*	Hop Clover
Ulex europaeus	Gorse
Ulmus spp.	Elm
Vicia sativa	Common Vetch

Appendix 2.2 – Flora database results

Table A2.2. *Significant flora within 10 kilometres of the study area.*

Source: Flora Information System

Sources used to determine species status:
EPBC *Environment Protection and biodiversity Conservation Act 1999* (Commonwealth)
DSE Advisory List of Threatened Flora in Victoria (DSE 2005a)
FFG *Flora and Fauna Guarantee Act 1988* (Victoria)

National status of species is designated by:
EX Extinct
CR Critically Endangered
EN Endangered
VU Vulnerable
K Poorly Known
* EPBC Act Protected Matters Search Tool.

State status of species is designated by:
e Endangered
v Vulnerable
FIS Record
r Rare
k Poorly Known
L Listed on FFG Act

Likelihood of occurrence in study area
1 Known occurrence
2 Possible occurrence
3 Low likelihood
4 Unlikely
5 No suitable habitat

Scientific Name	Common Name	Number of records	EPBC Act 1999	DSE 2007	FFG Act 1988	Likelihood of occurrence
NATIONALLY SIGNIFICANT						
#Carex tasmanica	Curly Sedge	-	VU	v	L	5
#Glycine latrobeana	Clover Glycine	-	VU	v	L	5
#Pimelea spinescens subsp. *spinescens*	Spiny Rice-flower	-	CE	v	L	5
# Prasophyllum frenchii	Maroon Leek-orchid	-	EN	e	L	5
#Senecio macrocarpus	Large-headed Fireweed	1	VU	e	L	5
#Thelymitra epipactoides	Metallic Sun-orchid	-	EN	e	L	5
#Thelymitra matthewsii	Spiral Sun-orchid	-	VU	v	L	5
#Xerochrysum palustre	Swamp Everlasting	1	VU	v	L	5
STATE SIGNIFICANT						
Acacia cupularis	Cup Wattle	1	-	r	-	5
Acacia uncifolia	Coast Wirilda	1	-	r	-	5
Adriana quadripartita	Coast Bitter-bush	3	-	v	-	5
Atriplex paludosa subsp. *paludosa*	Marsh Saltbush	4	-	r	-	5
Austrofestuca littoralis	Coast Fescue	1	-	r	-	5
Bartramia nothostricta	Apple Moss	1	-	k	-	5
Callitriche palustris	Swamp Water-starwort	1	-	k	-	5
Cardamine tenuifolia	Slender Bitter-cress	1	-	k	-	5
Eucalyptus leucoxylon subsp. *bellarinensis*	Bellarine Yellow-gum	1		e	L	5
Eucalyptus leucoxylon subsp. *connata*	Melbourne Yellow-gum	1	-	v	-	5
Helichrysum aff. rutidolepis (Lowland Swamps)	Pale Swamp Everlasting	1		v	-	5
Heterozostera tasmanica	Tasman Grass-wrack	1	-	r	-	5
Juncus revolutus	Creeping Rush	2	-	r	-	5

Scientific Name	Common Name	Number of records	EPBC Act 1999	DSE 2007	FFG Act 1988	Likelihood of occurrence
Lawrencia spicata	Salt Lawrencia	1	-	r	-	5
Malva preissiana s.s. (white-flowered coastal form)	Coast Hollyhock	1	-	v	-	5
Nicotiana maritima	Coast Tobacco	1	-	e	-	5
Pleurosorus subglandulosus	Glandular Blanket-fern	1	-	k	-	5
Rhagodia parabolica	Fragrant Saltbush	12	-	r	-	5
Salsola tragus subsp. *pontica*	Coast Saltwort	2	-	r	-	5
Senecio cunninghamii var. cunninghamii	Branching Groundsel	1	-	r	-	5
Thelymitra circumsepta	Naked Sun-orchid	1	-	v	-	5
Triodia bunicola	Southern Porcupine Grass	1	-	k	-	5
Tripogon loliiformis	Rye Beetle-grass	1	-	r	-	5

Source: Flora Information System (DSE), EPBC Protected Matters Search Tool (DEHWA)

Appendix 3.1 – Fauna survey results

Table A3.1. Fauna recorded during the present survey (*7 July 2008*), and previously recorded within 10 kilometres of the study area.

Type of Record:
H – Heard
S – Seen
T – Trapped or Handheld
I – Incidental (identified from feathers, bones or scats, etc)

* Introduced species

Mi Migratory (EPBC Act)
Ma Marine (EPBC Act)

Common Name	Scientific Name	Last Documented Record (AVW)	Total # of Documented Records (AVW)	Hollow Use	Mi/Ma	Present survey
		MAMMALS				
Platypus	*Ornithorhynchus anatinus*	2002	3	-	-	-
Short-beaked Echidna	*Tachyglossus aculeatus*	1998	3	-	-	-
Eastern Barred Bandicoot	*Perameles gunnii*	-	1	-	-	-
Common Brushtail Possum	*Trichosurus vulpecula*	1998	4	Total	-	S
Common Ringtail Possum	*Pseudocheirus peregrinus*	2002	7	Partial	-	-
Koala	*Phascolarctos cinereus*	1987	7	-	-	-
Black Wallaby	*Wallabia bicolor*	-	1	-	-	-
Eastern Grey Kangaroo	*Macropus giganteus*	1998	2	-	-	-
Grey-headed Flying-fox	*Pteropus poliocephalus*	2002	3	-	-	-
White-striped Freetail Bat	*Tadarida australis*	-	1	Total	-	-
Lesser Long-eared Bat	*Nyctophilus geoffroyi*	1981	1	Total	-	-
Gould's Wattled Bat	*Chalinolobus gouldii*	1986	2	-	-	-
Southern Forest Bat	*Vespadelus regulus*	-	1	Total	-	-
Swamp Rat	*Rattus lutreolus*	2002	3	-	-	-
Water Rat	*Hydromys chrysogaster*	2002	7	-	Ma	-
* Black Rat	*Rattus rattus*	-	1	-	-	-
* Brown Rat	*Rattus norvegicus*	-	2	-	-	-
* House Mouse	*Mus musculus*	2002	3	-	-	S

Common Name	Scientific Name	Last Documented Record (AVW)	Total # of Documented Records (AVW)	Hollow Use	Mi/Ma	Present survey
* European Rabbit	*Oryctolagus cuniculus*	2005	4	-	-	S
* European Hare	*Lepus europeaus*	2005	2	-	-	S
* Red Fox	*Vulpes vulpes*	2005	8	-	-	S
* Cat	*Felis catus*	1976	1	-	-	-
Australian Fur Seal	*Arctocephalus pusillus*	1997	1	-	Ma	-
Southern Elephant Seal	*Mirounga leonina*	2005	13	-	Ma	-
Leopard Seal	*Hydrurga leptonyx*	1990	2	-	Ma	-
Humpback Whale	*Megaptera novaeangliae*	2000	2	-	Mi	-
Killer Whale	*Orcinus orca*	1984	1	-	Mi	-
Bottlenose Dolphin	*Tursiops truncatus*	1991	5	-	-	-
	BIRDS					
Stubble Quail	*Coturnix pectoralis*	2004	7	-	Ma	-
Brown Quail	*Coturnix ypsilophora*	-	3	-	-	-
Common Bronzewing	*Phaps chalcoptera*	2000	4	-	-	-
Brush Bronzewing	*Phaps elegans*	1972	1	-	-	-
Crested Pigeon	*Ocyphaps lophotes*	1999	1	-	-	S
Lewin's Rail	*Lewinia pectoralis*	1998	4	-	-	-
Buff-banded Rail	*Gallirallus philippensis*	2004	9	-	-	-
Australian Spotted Crake	*Porzana fluminea*	2001	23	-	-	-
Baillon's Crake	*Porzana pusilla*	2001	21	-	Ma	-
Spotless Crake	*Porzana tabuensis*	2001	14	-	Ma	-
Black-tailed Native-hen	*Gallinula ventralis*	2005	4	-	-	-
Dusky Moorhen	*Gallinula tenebrosa*	2002	167	-	-	-
Purple Swamphen	*Porphyrio porphyrio*	2005	189	-	Ma	S
Eurasian Coot	*Fulica atra*	2004	176	-	-	S
Great Crested Grebe	*Podiceps cristatus*	2001	25	-	-	-
Australasian Grebe	*Tachybaptus novaehollandiae*	2001	86	-	-	-
Hoary-headed Grebe	*Poliocephalus poliocephalus*	2005	90	-	-	-
White-faced Storm-Petrel	*Pelagodroma marina*	1983	1	-	Ma	-
Wandering Albatross	*Diomedea exulans*	1959	1	-	Mi/Ma	-
Great Cormorant	*Phalacrocorax carbo*	2005	77	-	-	-

Common Name	Scientific Name	Last Documented Record (AVW)	Total # of Documented Records (AVW)	Hollow Use	Mi/Ma	Present survey
Little Black Cormorant	*Phalacrocorax sulcirostris*	2005	95	-	-	S
Black-faced Cormorant	*Phalacrocorax fuscescens*	1967	1	-	Ma	-
Pied Cormorant	*Phalacrocorax varius*	2006	39	-	-	-
Little Pied Cormorant	*Microcarbo melanoleucos*	2005	142	-	-	-
Darter	*Anhinga novaehollandiae*	2001	11	-	-	S
Australian Pelican	*Pelecanus conspicillatus*	2006	159	-	Ma	-
White-winged Black Tern	*Chlidonias leucopterus*	1992	7	-	Mi/Ma	-
Whiskered Tern	*Chlidonias hybridus*	2005	44	-	Ma	-
Gull-billed Tern	*Gelochelidon nilotica*	1999	10	-	Ma	-
Caspian Tern	*Hydroprogne caspia*	2005	43	-	Mi/Ma	-
Crested Tern	*Thalaseus bergii*	2005	18	-	Ma	-
Little Tern	*Sternula albifrons*	1997	14	-	Mi/Ma	-
Fairy Tern	*Sternula nereis*	2000	26	-	Ma	-
Silver Gull	*Chroicocephalus novaehollandiae*	2006	337	-	Ma	-
Pacific Gull	*Larus pacificus pacificus*	2005	26	-	Ma	-
Pied Oystercatcher	*Haematopus longirostris*	2001	22	-	-	-
Red-kneed Dotterel	*Erythrogonys cinctus*	2005	33	-	-	-
Masked Lapwing	*Vanellus miles*	2005	284	-	-	S
Banded Lapwing	*Vanellus tricolor*	1969	14	-	-	-
Pacific Golden Plover	*Pluvialis fulva*	2001	7	-	Mi/Ma	-
Double-banded Plover	*Charadrius bicinctus*	2001	15	-	Mi/Ma	-
Red-capped Plover	*Charadrius ruficapillus*	2001	46	-	Ma	-
Black-fronted Dotterel	*Elseyornis melanops*	2005	42	-	-	-
Black-winged Stilt	*Himantopus himantopus*	2004	78	-	Ma	-
Banded Stilt	*Cladorhynchus leucocephalus*	2001	22	-	-	-
Red-necked Avocet	*Recurvirostra novaehollandiae*	2001	25	-	Ma	-
Eastern Curlew	*Numenius madagascariensis*	2001	37	-	Mi/Ma	-
Black-tailed Godwit	*Limosa limosa*	2004	8	-	Mi/Ma	-
Bar-tailed Godwit	*Limosa lapponica*	2001	5	-	Mi/Ma	-
Wood Sandpiper	*Tringa glareola*	1999	2	-	Mi/Ma	-
Grey-tailed Tattler	*Heteroscelus brevipes*	1959	1	-	Mi/Ma	-

Common Name	Scientific Name	Last Documented Record (AVW)	Total # of Documented Records (AVW)	Hollow Use	Mi/Ma	Present survey
Common Sandpiper	*Actitis hypoleucos*	1995	3	-	Mi/Ma	-
Common Greenshank	*Tringa nebularia*	2001	74	-	Mi/Ma	-
Marsh Sandpiper	*Tringa stagnatilis*	2001	33	-	Mi/Ma	-
Terek Sandpiper	*Xenus cinereus*	1998	2	-	Mi/Ma	-
Curlew Sandpiper	*Calidris ferruginea*	2006	59	-	Mi/Ma	-
Red-necked Stint	*Calidris ruficollis*	2002	61	-	Mi/Ma	-
Sharp-tailed Sandpiper	*Calidris acuminata*	2002	63	-	Mi/Ma	-
Red Knot	*Calidris canutus*	2001	6	-	Mi/Ma	-
Great Knot	*Calidris tenuirostris*	2001	3	-	Mi/Ma	-
Broad-billed Sandpiper	*Limicola falcinellus*	1992	1	-	Mi/Ma	-
Latham's Snipe	*Gallinago hardwickii*	2004	81	-	Mi/Ma	-
Australian Painted Snipe	*Rostratula australis*	1985	3	-	Mi/Ma	-
Australian Pratincole	*Stiltia isabella*	1985	1		Ma	-
Brolga	*Grus rubicunda*	2006	12	-	-	-
Glossy Ibis	*Plegadis falcinellus*	2004	24	-	Mi/Ma	-
Australian White Ibis	*Threskiornis molucca*	2006	217	-	Ma	S
Straw-necked Ibis	*Threskiornis spinicollis*	2005	128	-	Ma	-
Royal Spoonbill	*Platalea regia*	2001	125	-	-	-
Yellow-billed Spoonbill	*Platalea flavipes*	2005	54	-	-	-
Little Egret	*Egretta garzetta*	2005	41	-	Ma	-
Intermediate Egret	*Ardea intermedia*	2001	12	-	Ma	-
Eastern Great Egret	*Ardea modesta*	2005	109	-	Mi/Ma	-
White-faced Heron	*Egretta novaehollandiae*	2005	182	-	-	-
White-necked Heron	*Ardea pacifica*	2001	15	-	-	-
Nankeen Night Heron	*Nycticorax caledonicus*	2001	32	-	Ma	-
Little Bittern	*Ixobrychus minutus*	2001	1	-	-	-
Australasian Bittern	*Botaurus poiciloptilus*	2004	34	-	-	-
Cape Barren Goose	*Cereopsis novaehollandiae*	1981	2	-	Ma	-
Magpie Goose	*Anseranas semipalmata*	2005	30	-	Ma	-
Australian Wood Duck	*Chenonetta jubata*	2001	6	Total	-	-
Black Swan	*Cygnus atratus*	2005	290	-	-	S

Common Name	Scientific Name	Last Documented Record (AVW)	Total # of Documented Records (AVW)	Hollow Use	Mi/Ma	Present survey
Australian Shelduck	*Tadorna tadornoides*	2006	141	Total	-	-
Pacific Black Duck	*Anas superciliosa*	2006	283	-	-	S
Chestnut Teal	*Anas castanea*	2006	129	Total	-	S
Grey Teal	*Anas gracilis*	2006	166	Total	-	-
Australasian Shoveler	*Anas rhynchotis*	2004	61	-	-	-
Pink-eared Duck	*Malacorhynchus membranaceus*	1996	12	Partial	-	-
Freckled Duck	*Stictonetta naevosa*	1993	5	-	-	-
Hardhead	*Aythya australis*	2004	61	-	-	-
Blue-billed Duck	*Oxyura australis*	1995	8	-	-	-
Musk Duck	*Biziura lobata*	2004	31	-	Ma	-
Spotted Harrier	*Circus assimilis*	1997	1	-		-
Swamp Harrier	*Circus approximans*	2005	105	-	Ma	-
Grey Goshawk	*Accipiter novaehollandiae*	2004	13	-	-	-
Brown Goshawk	*Accipiter fasciatus*	2001	37	-	Ma	-
Collared Sparrowhawk	*Accipiter cirrhocephalus*	2001	6	-	-	-
Wedge-tailed Eagle	*Aquila audax*	2006	6	-	-	-
Little Eagle	*Hieraaetus morphnoides*	2005	22	-	-	-
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	2002	8	-	Mi/Ma	-
Whistling Kite	*Haliastur sphenurus*	2005	49	-	Ma	S
Black Kite	*Milvus migrans*	2003	2	-	-	S
Black-shouldered Kite	*Elanus axillaris*	2002	55	-	-	-
Australian Hobby	*Falco longipennis*	2001	62	-	-	-
Peregrine Falcon	*Falco peregrinus*	2001	9	Partial	-	-
Black Falcon	*Falco subniger*	1991	2	-	-	-
Brown Falcon	*Falco berigora*	2005	40	-	-	-
Nankeen Kestrel	*Falco cenchroides*	2005	29	Partial	Ma	-
Southern Boobook	*Ninox novaeseelandiae*	2001	3	Total	Ma	-
Barking Owl	*Ninox connivens*	1993	1	Total	-	-
Pacific Barn Owl	*Tyto javanica*	2003	3	Partial	-	-
Rainbow Lorikeet	*Trichoglossus haematodus*	2001	151	Total	-	S
Scaly-breasted Lorikeet	*Trichoglossus chlorolepidotus*	2001	7	Total	-	-

Common Name	Scientific Name	Last Documented Record (AVW)	Total # of Documented Records (AVW)	Hollow Use	Mi/Ma	Present survey
Musk Lorikeet	*Glossopsitta concinna*	2002	64	Total	-	S
Purple-crowned Lorikeet	*Glossopsitta porphyrocephala*	2002	100	Total	-	-
Little Lorikeet	*Glossopsitta pusilla*	2001	50	Total	-	-
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	2001	52	Total	-	-
Gang-gang Cockatoo	*Callocephalon fimbriatum*	2001	87	Total	-	S
Sulphur-crested Cockatoo	*Cacatua galerita*	2001	130	Total	-	-
Major Mitchell's Cockatoo	*Lophocroa leadbeateri*	1999	1	Total	-	-
Long-billed Corella	*Cacatua tenuirostris*	1999	2	Total	-	-
Galah	*Eolophus roseicapilla*	2001	129	Total	-	-
Cockatiel	*Nymphicus hollandicus*	1998	2	Total	-	-
Australian King-Parrot	*Alisterus scapularis*	1998	1	Total	-	-
Crimson Rosella	*Platycercus elegans elegans*	2001	87	Total	-	S
Eastern Rosella	*Platycercus eximius*	2001	72	Total	-	S
Red-rumped Parrot	*Psephotus haematonotus*	2002	54	Total	-	-
Orange-bellied Parrot	*Neophema chrysogaster*	2001	68	-	Mi/Ma	-
Blue-winged Parrot	*Neophema chrysostoma*	2001	23	Partial	Ma	-
Swift Parrot	*Lathamus discolor*	2000	22	Total	Ma	-
Ground Parrot	*Pezoporus wallicus*	1909	1	-	-	-
Tawny Frogmouth	*Podargus strigoides*	2000	2	-	-	-
Azure Kingfisher	*Alcedo azurea*	1999	1	-	-	-
Laughing Kookaburra	*Dacelo novaeguineae*	2000	22	Total	-	-
Sacred Kingfisher	*Todiramphus sanctus*	1999	1	Partial	Ma	-
White-throated Needletail	*Hirundapus caudacutus*	2000	2	-	Mi/Ma	-
Fork-tailed Swift	*Apus pacificus*	2000	5	-	Mi/Ma	-
Pallid Cuckoo	*Cuculus pallidus*	2000	9	-	Ma	-
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	2002	17	-	Ma	-
Horsfield's Bronze-Cuckoo	*Chrysococcyx basalis*	2001	30	-	Ma	-
Shining Bronze-Cuckoo	*Chrysococcyx lucidus*	2001	8	-	Ma	-
Welcome Swallow	*Hirundo neoxena*	2005	322	Partial	Ma	-
Tree Martin	*Hirundo nigricans*	2005	5	Total	Ma	-
Fairy Martin	*Hirundo ariel*	2001	9	Partial	-	-

Common Name	Scientific Name	Last Documented Record (AVW)	Total # of Documented Records (AVW)	Hollow Use	Mi/Ma	Present survey
Grey Fantail	*Rhipidura albiscarpa*	2001	57	-	-	S
Rufous Fantail	*Rhipidura rufifrons*	2001	1	-	Mi/Ma	-
Willie Wagtail	*Rhipidura leucophrys*	2005	256	-	-	S
Jacky Winter	*Microeca fascinans*	1999	1	-	-	-
Scarlet Robin	*Petroica boodang*	2001	3	-	-	-
Flame Robin	*Petroica phoenicea*	2004	6	-	Ma	S
Pink Robin	*Petroica rodinogaster*	2001	15	-	Ma	-
Rose Robin	*Petroica rosea*	1999	4	-	-	-
Eastern Yellow Robin	*Eopsaltria australis*	2000	2	-	-	-
Golden Whistler	*Pachycephala pectoralis*	2001	35	-	-	-
Rufous Whistler	*Pachycephala rufiventris*	2001	3	-	-	-
Grey Shrike-thrush	*Colluricincla harmonica*	2002	20	Partial	-	-
Magpie-lark	*Grallina cyanoleuca*	2005	359	-	Ma	S
Crested Shrike-tit	*Falcunculus frontatus*	2001	13	-	-	-
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	2001	41	-	Ma	-
White-bellied Cuckoo-shrike	*Coracina papuensis*	1999	1	-	Ma	-
White-winged Triller	*Lalage sueurii*	2000	1	-	-	-
White-fronted Chat	*Epthianura albifrons*	2004	118	-	-	S
Western Gerygone	*Gerygone fusca*	1998	1	-	-	-
Weebill	*Smicrornis brevirostris*	1998	3	-	-	-
Striated Thornbill	*Acanthiza lineata*	2000	13	-	-	-
Yellow Thornbill	*Acanthiza nana*	2001	25	-	-	-
Brown Thornbill	*Acanthiza pusilla*	2001	26	-	-	-
Buff-rumped Thornbill	*Acanthiza reguloides*	1999	1	-	-	-
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	2005	117	-	-	S
White-browed Scrubwren	*Sericornis frontalis*	2005	47	-	-	-
Striated Fieldwren	*Calamanthus fuliginosus*	2004	33	-	-	-
Brown Songlark	*Cincloramphus cruralis*	1999	2	-	-	-
Little Grassbird	*Megalurus gramineus*	2002	123	-	-	-
Clamorous Reed Warbler	*Acrocephalus stentoreus*	2001	98	-	Mi/Ma	-
Golden-headed Cisticola	*Cisticola exilis*	2005	105	-	-	-

Common Name	Scientific Name	Last Documented Record (AVW)	Total # of Documented Records (AVW)	Hollow Use	Mi/Ma	Present survey
Southern Emu-wren	*Stipiturus malachurus*	1999	1	-	-	-
Superb Fairy-wren	*Malurus cyaneus*	2005	180	-	-	S
Masked Woodswallow	*Artamus personatus*	1999	2	-	-	-
White-browed Woodswallow	*Artamus superciliosus*	1999	8	-	-	-
Dusky Woodswallow	*Artamus cyanopterus*	2001	6	Partial	-	-
Mistletoebird	*Dicaeum hirundinaceum*	2001	11	-	-	-
Spotted Pardalote	*Pardalotus punctatus*	2002	102	-	-	-
Silvereye	*Zosterops lateralis*	2002	155	-	Ma	-
White-naped Honeyeater	*Melithreptus lunatus*	2001	16	-	-	-
Eastern Spinebill	*Acanthorhynchus tenuirostris*	2001	52	-	-	-
Regent Honeyeater	*Anthochaera phrygia*	1993	1	-	Mi	-
Yellow-faced Honeyeater	*Lichenostomus chrysops*	2001	23	-	-	-
White-eared Honeyeater	*Lichenostomus leucotis*	2000	2	-	-	-
White-plumed Honeyeater	*Lichenostomus penicillatus*	2005	163	-	-	S
Crescent Honeyeater	*Phylidonyris pyrrhoptera*	2000	5	-	-	-
New Holland Honeyeater	*Phylidonyris novaehollandiae*	2005	261	-	-	S
Noisy Miner	*Manorina melanocephala*	2005	47	-	-	S
Little Wattlebird	*Anthochaera chrysoptera*	2000	1	-	-	-
Red Wattlebird	*Anthochaera carunculata*	2005	314	-	-	S
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*	2001	13	-	-	-
Australasian Pipit	*Anthus novaeseelandiae*	2001	25	-	Ma	-
Horsfield's Bushlark	*Mirafra javanica*	2000	4	-	-	-
Zebra Finch	*Taeniopygia guttata*	2000	1	Partial	-	-
Red-browed Finch	*Neochmia temporalis*	2002	31	-	-	-
Pied Currawong	*Strepera graculina*	2001	113	-	-	-
Grey Currawong	*Strepera versicolor*	2001	39	-	-	-
Grey Butcherbird	*Cracticus torquatus*	2001	95	-	-	S
Australian Magpie	*Gymnorhina tibicen*	2005	372	-	-	S
Bassian Thrush	*Zoothera lunulata*	1972	1	-	-	-
Lesser Yellowlegs	*Tringa flavipes*	1986	3	-	-	-
Little Ringed Plover	*Charadrius dubius*	1987	1	-	Mi/Ma	-

Common Name	Scientific Name	Last Documented Record (AVW)	Total # of Documented Records (AVW)	Hollow Use	Mi/Ma	Present survey
Baird's Sandpiper	*Calidris bairdii*	1986	1	-	Mi/Ma	-
Australian Raven	*Corvus coronoides*	2001	4	-	-	S
Red-necked Phalarope	*Phalaropus lobatus*	2002	1	-	Mi/Ma	-
Ruff	*Philomachus pugnax*	1995	2	-	Mi/Ma	-
Common Tern	*Sterna hirundo*	1996	2	-	Mi/Ma	-
Little Raven	*Corvus mellori*	2005	291	-	Ma	-
Long-toed Stint	*Calidris subminuta*	1986	3	-	Mi/Ma	-
Striated Pardalote	*Pardalotus striatus*	2001	22	Partial	-	-
Cattle Egret	*Ardea ibis*	2001	43	-	Mi/Ma	-
Pectoral Sandpiper	*Calidris melanotos*	2001	11	-	Mi/Ma	-
Kelp Gull	*Larus dominicanus*	1979	1	-	Ma	-
* Domestic Goose	*Anser anser (domestic)*	1997	1	-	-	-
* Rock Dove	*Columba livia*	2005	51	-	-	-
* Northern Mallard	*Anas platyrhynchos*	2001	16	-	-	-
* Spotted Turtle-Dove	*Streptopelia chinensis*	2005	272	-	-	S
* Common Blackbird	*Turdus merula*	2002	289	-	-	S
* Song Thrush	*Turdus philomelos*	2001	71	-	-	-
* European Skylark	*Alauda arvensis*	2005	93	-	-	-
* Eurasian Tree Sparrow	*Passer montanus*	2001	7	-	-	-
* House Sparrow	*Passer domesticus*	2005	276	-	-	S
* European Goldfinch	*Carduelis carduelis*	2005	239	-	-	S
* European Greenfinch	*Carduelis chloris*	2002	157	-	-	-
* Common Myna	*Acridotheres tristis*	2002	188	Partial	-	S
* Common Starling	*Sturnus vulgaris*	2005	320	Partial	-	S
	FISH					
Pouched Lamprey	*Geotria australis*	1986	1	-	-	-
Short-finned Eel	*Anguilla australis*	1999	22	-	-	-
Sandy Sprat	*Hyperlophus vittatus*	1995	1	-	-	-
Australian Smelt	*Retropinna semoni*	1999	20	-	-	-
Australian Grayling	*Prototroctes maraena*	1987	36	-	-	-
Broad-finned Galaxias	*Galaxias brevipinnis*	1995	6	-	-	-

Common Name	Scientific Name	Last Documented Record (AVW)	Total # of Documented Records (AVW)	Hollow Use	Mi/Ma	Present survey
Common Galaxias	*Galaxias maculatus*	1999	29	-	-	-
Spotted Galaxias	*Galaxias truttaceus*	1999	19	-	-	-
Small-mouthed Hardyhead	*Atherinosoma microstoma*	1987	3	-	-	-
Murray Cod	*Maccullochella peelii peelii*	1873	1	-	-	-
Macquarie Perch	*Macquaria australasica*	1873	1	-	-	-
Yarra Pigmy Perch	*Nannoperca obscura*	1991	4	-	-	-
Southern Pigmy Perch	*Nannoperca australis*	1991	3	-	-	-
Yelloweye Mullet	*Aldrichetta forsteri*	1995	2	-	-	-
Tupong	*Pseudaphritis urvillii*	1999	11	-	-	-
Bridled Goby	*Arenigobius bifrenatus*	1987	1	-	-	-
Lagoon Goby	*Tasmanogobius lasti*	1987	1	-	-	-
Flat-headed Gudgeon	*Philypnodon grandiceps*	1999	11	-	-	-
Sand Trevally	*Pseudocaranx wrighti*	1995	1	-	-	-
* Brown Trout	*Salmo trutta*	1999	8	-	-	-
* Eastern Gambusia	*Gambusia holbrooki*	1999	4	-	-	-
* Goldfish	*Carassius auratus*	1999	5	-	-	-
* Common Carp	*Cyprinus carpio*	1999	5	-	-	-
* Redfin Perch	*Perca fluviatilis*	1987	4	-	-	-
* Tench	*Tinca tinca*	1996	5	-	-	-
	REPTILES					
Marbled Gecko	*Christinus marmoratus*	1994	1	-	-	-
Tree Dragon	*Amphibolurus muricatus*	1961	1	-	-	-
Large Striped Skink	*Ctenotus robustus*	1995	1	-	-	-
Cunningham's Skink	*Egernia cunninghami*	1961	1	-	-	-
White's Skink	*Egernia whitii (group)*	1987	1	-	-	-
Garden Skink	*Lampropholis guichenoti*	1994	1	-	-	-
Metallic Skink	*Niveoscincus metallicus*	1987	1	-	-	-
Common Blue-tongued Lizard	*Tiliqua scincoides*	1967	2	-	-	-
Eastern Three-lined Skink	*Bassiana duperreyi*	1991	5	-	-	-
Southern Water Skink	*Eulamprus tympanum tympanum*	1999	2	-	-	-
Lowland Copperhead	*Austrelaps superbus*	1999	3	-	-	-

Common Name	Scientific Name	Last Documented Record (AVW)	Total # of Documented Records (AVW)	Hollow Use	Mi/Ma	Present survey
Tussock Skink	*Pseudemoia pagenstecheri*	1987	1	-	-	-
FROGS						
Southern Bullfrog	*Limnodynastes dumerilii*	1994	1	-	-	-
Striped Marsh Frog	*Limnodynastes peronii*	1996	3	-	-	-
Spotted Marsh Frog	*Limnodynastes tasmaniensis*	2001	7	-	-	S
Common Froglet	*Crinia signifera*	2005	21	-	-	H
Southern Brown Tree Frog	*Litoria ewingii*	1998	8	-	-	H
Growling Grass Frog	*Litoria raniformis*	1997	9	-	-	-
INVERTEBRATES						
Altona Skipper	*Hesperilla flavescens flavescens*	1947	3	-	-	-
Southern Victorian Spiny Cray	*Euastacus yarraensis*	1942	1	-	-	-
Otway Burrowing Cray	*Engaeus fultoni*	1942	1	-	-	-
Granular Burrowing Cray	*Engaeus cunicularius*	1982	1	-	-	-

Source: DSE Atlas of Victorian Wildlife (AVW 2007)

Appendix 3.2 – Fauna database results

Table A3.2. *Significant fauna within 10 kilometres of the study area.*

Sources used to determine species status:

EPBC *Environment Protection and biodiversity Conservation Act 1999* (Commonwealth)

DSE Advisory List of Threatened Vertebrate Fauna in Victoria (DSE 2007)

FFG *Flora and Fauna Guarantee Act 1988* (Victoria)

National Action Plan for mammals and monotremes (Maxwell *et al.* 1996), bats (Duncan *et al.* 1999), rodents (Lee 1995), birds (Garnett and Crowley 2000), reptiles (Cogger *et. al.* 1993), and amphibians (Tyler 1997).

Species status:

EX Extinct
RX Regionally extinct
CR Critically endangered
EN Endangered
VU Vulnerable
RA Rare
NT Near threatened
CD Conservation dependent
DD Data deficient (insufficiently or poorly known)
LR Least concern (lower risk)

L Listed as threatened under FFG Act
I Invalid or ineligible for listing under the FFG Act

Protected Matters Search Tool (DEWHA)

Use of the study area:

1 Known resident
2 Possible resident
3 Frequent visitor
4 Occasional visitor
5 Rare visitor
6 Vagrant visitor
7 Unlikely/no suitable habitat

Common Name	Scientific Name	Last documented record	Total # of records	EPBC Act	DSE (2007)	FFG ACT	National Action Plan	Likely use of study area
NATIONAL SIGNIFICANCE								
# Grey-headed Flying-fox	*Pteropus poliocephalus*	2002	3	VU	VU	L	VU	6
# Spot-tailed Quoll (SE mainland population)	*Dasyurus maculatus maculatus*	-	-	EN	EN	L	VU	7

Common Name	Scientific Name	Last documented record	Total # of records	EPBC Act	DSE (2007)	FFG ACT	National Action Plan	Likely use of study area
# Smoky Mouse	*Pseudomys fumeus*	-	-	EN	CR	L	RA	7
# Long-nosed Potoroo	*Potorous tridactylus tridactylus*	-	-	VU	VU	L	VU	7
# Southern Bent-wing Bat	*Miniopterus schreibersii bassanii*	-	-	CE	EN	L	LR	7
# Southern Brown Bandicoot	*Isoodon obesulus obesulus*	-	-	EN	-	-	NT	7
Eastern Barred Bandicoot	*Perameles gunnii*	-	1	EN	CR	L	CR	7
# Humpback Whale	*Megaptera novaeangliae*	2000	2	VU	VU	L	VU	7
Southern Elephant Seal	*Mirounga leonina*	2005	13	VU	-	-	VU	7
Wandering Albatross	*Diomedea exulans*	1959	1	VU	EN	L	VU	7
# Australian Painted Snipe	*Rostratula australis*	1985	3	VU	CR	L	VU	6
Australasian Bittern	*Botaurus poiciloptilus*	2004	34	-	EN	L	VU	5
# Regent Honeyeater	*Anthochaera phrygia*	1993	1	EN	CR	L	EN	7
# Orange-bellied Parrot	*Neophema chrysogaster*	2001	68	CE	CR	L	CR	7
# Swift Parrot	*Lathamus discolor*	2000	22	EN	EN	L	EN	5
# Growling Grass Frog	*Litoria raniformis*	1997	9	VU	EN	L	VU	2/4
# Australian Grayling	*Prototroctes maraena*	1987	36	VU	VU	L	VU	7
# Dwarf Galaxias	*Galaxiella pusilla*	-	-	VU	VU	L	VU	7
# Yarra Pigmy Perch	*Nannoperca obscura*	1991	4	VU	NT	L	VU	7
Murray Cod	*Maccullochella peelii peelii*	1873	1	VU	EN	L	-	7
Macquarie Perch	*Macquaria australasica*	1873	1	EN	EN	L	DD	7
# Golden Sun Moth	*Synemon plana*	-	-	CE	-	-	-	7
		STATE SIGNIFICANCE						
Baillon's Crake	*Porzana pusilla*	2001	21	-	VU	L	-	5
Black-tailed Godwit	*Limosa limosa*	2004	8	-	VU	-	-	6
Wood Sandpiper	*Tringa glareola*	1999	2	-	VU	-	-	6
Grey-tailed Tattler	*Heteroscelus brevipes*	1959	1	-	CR	L	-	6
Common Sandpiper	*Actitis hypoleucos*	1995	3	-	VU	-	-	6
Terek Sandpiper	*Xenus cinereus*	1998	2	-	EN	L	-	6
Great Knot	*Calidris tenuirostris*	2001	3	-	EN	L	-	6

Common Name	Scientific Name	Last documented record	Total # of records	EPBC Act	DSE (2007)	FFG ACT	National Action Plan	Likely use of study area
Brolga	*Grus rubicunda*	2006	12	-	VU	L	-	5
Royal Spoonbill	*Platalea regia*	2001	125	-	VU	-	-	4
Intermediate Egret	*Ardea intermedia*	2001	12	-	CR	L	-	5
Australasian Shoveler	*Anas rhynchotis*	2004	61	-	VU	-	-	5
Caspian Tern	*Hydroprogne caspia*	2005	43	-	NT	L	-	7
Little Tern	*Sternula albifrons*	1997	14	-	VU	L	-	7
Fairy Tern	*Sternula nereis*	2000	26	-	EN	L	-	7
Little Egret	*Egretta garzetta*	2005	41	-	EN	L	-	5
Eastern Great Egret	*Ardea modesta*	2005	109	-	VU	L	-	4
Little Bittern	*Ixobrychus minutus*	2001	1	-	EN	L	-	5
Grey Goshawk	*Accipiter novaehollandiae*	2004	13	-	VU	L	-	6
Freckled Duck	*Stictonetta naevosa*	1993	5	-	EN	L	-	5
Magpie Goose	*Anseranas semipalmata*	2005	30	-	NT	L	-	5
Hardhead	*Aythya australis*	2004	61	-	VU	-	-	4
Blue-billed Duck	*Oxyura australis*	1995	8	-	EN	L	-	4
Musk Duck	*Biziura lobata*	2004	31	-	VU	-	-	4
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	2002	8	-	VU	L	-	7
Gull-billed Tern	*Gelochelidon nilotica*	1999	10	-	EN	L	-	5
Black Falcon	*Falco subniger*	1991	2	-	VU	-	-	4
Barking Owl	*Ninox connivens*	1993	1	-	EN	L	-	7
White-faced Storm-Petrel	*Pelagodroma marina*	1983	1	-	VU	-	-	7
Major Mitchell's Cockatoo	*Lophocroa leadbeateri*	1999	1	-	VU	L	-	7
Lewin's Rail	*Lewinia pectoralis*	1998	4	-	VU	L	NT	5
Ground Parrot	*Pezoporus wallicus*	1909	1	-	EN	L	VU	7
Altona Skipper	*Hesperilla flavescens flavescens*	1947	3	-	-	L	-	7
REGIONAL SIGNIFICANCE								
Brown Quail	*Coturnix ypsilophora*	1995	3	-	NT	-	-	5
Common Diving-Petrel	*Pelecanoides urinatrix*	2001	5	-	NT	-	-	7
Black-faced Cormorant	*Phalacrocorax fuscescens*	1967	1	-	NT	-	-	7

Common Name	Scientific Name	Last documented record	Total # of records	EPBC Act	DSE (2007)	FFG ACT	National Action Plan	Likely use of study area
Pied Cormorant	*Phalacrocorax varius*	2006	39	-	NT	-	-	5
White-winged Black Tern	*Chlidonias leucopterus*	1992	7	-	NT	-	-	7
White-fronted Tern	*Sterna striata*	2000	3	-	NT	-	-	7
Pacific Gull	*Larus pacificus pacificus*	2005	26	-	NT	-	-	6
Sooty Oystercatcher	*Haematopus fuliginosus*	1992	2	-	NT	-	-	7
Grey Plover	*Pluvialis squatarola*	1860	1	-	NT	-	-	7
Pacific Golden Plover	*Pluvialis fulva*	2001	7	-	NT	-	-	7
Eastern Curlew	*Numenius madagascariensis*	2001	37	-	NT	-	-	7
Red Knot	*Calidris canutus*	2001	6	-	NT	-	-	6
Latham's Snipe	*Gallinago hardwickii*	2004	81	-	NT	-	-	5
Glossy Ibis	*Plegadis falcinellus*	2004	24	-	NT	-	-	5
Cape Barren Goose	*Cereopsis novaehollandiae*	1981	2	-	NT	-	-	6
Spotted Harrier	*Circus assimilis*	1997	1	-	NT	-	-	5
Azure Kingfisher	*Alcedo azurea*	1999	1	-	NT	-	-	5
Black-eared Cuckoo	*Chrysococcyx osculans*	2001	2	-	NT	-	-	5
Long-toed Stint	*Calidris subminuta*	1986	3	-	NT	-	-	6
Pectoral Sandpiper	*Calidris melanotos*	2001	11	-	NT	-	-	6
Glossy Grass Skink	*Pseudemoia rawlinsoni*	1994	1	-	NT	-	-	7
Australian Pratincole	*Stiltia isabella*	1985	1		NT	-	-	6
Whiskered Tern	*Chlidonias hybridus*	2005	44	-	NT	-	-	4
Nankeen Night Heron	*Nycticorax caledonicus*	2001	32	-	NT	-	-	5

Source: DSE Atlas of Victorian Wildlife (AVW 2007); DEWHA Protected Matters Search Tool (http://www.environment.gov.au/erin/ert/epbc/index.html); and Museum of Victoria Butterfly Database (http://flyaqis.mov.vic.gov.au/cgi-bin/texhtml?form=bio_nvicbio);

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