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FINAL REPORT:

Officer Precinct Structure Plan: Targeted Significant Flora and Fauna Surveys, Officer, Victoria

PREPARED FOR:

Cardinia Shire Council on behalf of the Growth Areas Authority

April 2009

Ecology Partners Pty Ltd

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***Cover Photos*:** Swamp Scrub (main), Matted Flax-lily (inset left) and Growling Grass Frog (inset right) (Ecology Partners Pty. Ltd.)

The following Ecology Partners Pty. Ltd. staff completed the site surveys and contributed to the report: Jenna Forbes, Andrew Taylor, Kailash Willis, Ian Wheatland, Matt Hatton, Cameron Amos, Aaron Organ and Zed Senbergs

SUMMARY

Introduction

Ecology Partners Pty. Ltd. was commissioned by Cardinia Shire Council on behalf of the Growth Areas Authority to undertake targeted surveys for significant flora and fauna species currently listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), *Flora and Fauna Guarantee Act 1988* (FFG Act) and the Department of Sustainability and Environment's (DSE) Threatened Species Advisory List in Officer, Victoria.

Targeted surveys were undertaken for significant flora species including Matted Flax-lily *Dianella amoena*, Green Scentbark *Eucalyptus fulgens*, Swamp Everlasting *Xerochrysum palustre*, River Swamp Wallaby-grass *Amphibromus fluitans*, Veined Spear-grass *Austrostipa rudis* subsp. *australis*, Arching Flax-lily *Dianella* sp. aff *longifolia* and Maroon Leek-orchid *Prasophyllum frenchii*.

In addition, surveys were undertaken for significant fauna species, including Southern Brown Bandicoot *Isoodon obesulus obesulus*, Swamp Skink *Egernia coventryi,* Glossy Grass Skink *Pseudemoia rawlinson,* Growling Grass Frog *Litoria raniformis*, Southern Toadlet *Pseudophryne semimarmorata,* Dwarf Galaxias *Galaxias pusilla,* and Australian Grayling *Prototoctes maraena.*

These surveys address DSE and Cardinia Shire Council's survey requirements as part of the Officer Precinct Structure Planning process and also for the preparation of an EPBC Act referral to The Department of the Environment, Water, Heritage and the Arts (DEWHA) as part of the future development of the precinct.

Methods

Flora

Previous records for all targeted flora species within the study area, and beyond, were obtained and reviewed from the Flora Information System (FIS), a biological database maintained by DSE. Targeted surveys for the national and state significant flora species were undertaken during March and early April of 2009. Areas of potentially suitable habitat were searched on foot in an effort to detect the targeted species, or any other species of conservation significance. Any locations of observed target species were documented, and are provided in a figure later in the report.

Fauna

Previous records for all significant fauna species within the study area were obtained and reviewed from the Atlas of Victorian Wildlife (AVW), a biological database maintained by DSE. Species previously recorded either within a 10 kilometre radius of the study area, include Growling Grass Frog, Southern Brown Bandicoot, Swamp Skink, Southern Toadlet, Dwarf Galaxias and Australian Grayling. However, Glossy Grass Skink has not previously been recorded within a 10 kilometre radius of the study area, although potential habitat for the species does exist within the study area. Targeted surveys were undertaken by an experienced zoologist, to ascertain the likelihood of occurrence for these species within the precinct.

Southern Brown Bandicoot

Previous records of the Southern Brown Bandicoot within the local area were obtained and reviewed (AVW). Given the lack of suitable habitat within the precinct detailed targeted survey techniques such as trapping were not undertaken as part of the current surveys. However, active searching for the distinctive conical shaped diggings of the species, and also for nests/shelter sites was undertaken by an experienced zoologist to identify any incidental evidence to identify the status of the Southern Brown Bandicoot within the study area (Section 2.5).

Swamp Skink

Previous habitat assessments conducted throughout the Officer region by Ecology Partners Pty. Ltd. (2008a) identified several sites as potentially containing suitable habitat, or adjacent habitat for Swamp Skink. Habitat attributes noted for suitable habitat included low lying areas (e.g. areas supporting Swamp Scrub and dense understorey vegetation) within the precinct. Active searching and trapping techniques were used to identify the presence of this species within the precinct.

Glossy Grass Skink

Potentially suitable habitat (albeit low quality) for the species occurred within the precinct and targeted surveys coincided with those carried out for Swamp Skink within suitable habitat types (i.e. Plains/Swampy Woodland EVC 651 and Swamp Scrub EVC 53) in addition to roadside areas comprising dense vegetation and/or drainage lines.

Growling Grass Frog

Previous amphibian data recorded from the local area was obtained and reviewed (AVW), in addition to previous reports and current studies being undertaken within the area by Ecology Partners Pty. Ltd. (2006).

Within the present study 21 dams were surveyed in addition to those previously assessed by Ecology Partners Pty Ltd. using techniques such as active searching and spotlighting to determine the status and distribution of this species within the precinct.

Southern Toadlet

Personnel experienced in surveying for amphibians, including Southern Toadlet, conducted both diurnal and nocturnal surveys within the study area on 26 of March 2009, and 2 April 2009 respectively. Ephemeral drainage lines and depressions were carefully searched for using 30 watt 12 volt hand-held spotlights, while the advertisement call of male Southern Toadlet was imitated to elicit a response from any adult males residing within the study area. Suitable refuge sites such as logs, rocks and other ground debris were lifted opportunistically to locate inactive frogs.

Dwarf Galaxias

Dwarf Galaxias occur within waterways with dense instream vegetation, fringing and overhanging vegetation and are found in both wetland systems, creeks and streams. There is a known population of Dwarf Galaxias within the Cardinia catchment and floodplain including known populations occurring within the Cardinia Retarding Basin. Dwarf Galaxias were surveyed for using a backpack electrofisher, bait traps and dip nets within waterways. Bait traps were set within microhabitats, whilst dip netting was conducted through the same microhabitats targeted through bait trapping. Identified microhabitats included macrophyte beds, trailing bank vegetation and overhanging banks.

Australian Grayling

There are three records of Australian Grayling occurring within the Officer region, within Cardinia Creek two in 1983 and there is anecdotal evidence of an individual caught in 2003. Australian Grayling occur within large waterways, generally with clear flowing waterways with large substrate present. Surveys for Australian Grayling were conducted concurrently with Dwarf Galaxias surveys, despite there being a low likelihood of the species occurring within the area due to the lack of suitable habitat (i.e. poor water quality, and low flows).

Results

Targeted flora surveys

One individual Matted Flax-lily plant, and several Green Scentbarks were recorded within study area. Veined Spear-grass was confirmed in locations where they had been recorded previously. Other target species were difficult or unable to be identified in the field due to the surveys being conducted outside the flowering period.

However, given the lack of high quality habitat for several significant flora species (e.g. orchids) it is considered that there is a low likelihood of occurrence with the precinct.

Targeted fauna surveys

Despite targeted surveys for several significant fauna species there was no evidence of these species within the precinct. However, the study area is considered to be of national significance for the Growling Grass Frog as it supports a meta-population of this species (i.e. throughout the south eastern portion of the study area south of the Princes Highway).

Potential Impacts and Mitigation

Detailed information relating to potential impacts on nationally significant species within the study area and mitigation measures is provided in Section 3.

Further Requirements and Recommendations

The EPBC Act-listed Matted Flax-lily was detected within the study area in areas of poor to moderate quality Swamp Scrub habitat. In addition, Growling Grass Frog has previously been recorded within the study area. As such, an EPBC Act referral to the Commonwealth Environment Minister is required as part of the proposed development.

In situ conservation and protection of Matted Flax-lily habitat within the study area should be undertaken. Salvage and translocation measures of Matted Flax-lily prior to any site disturbance should only be undertaken in accordance with a Conservation Management Plan which would need to be approved by relevant authorities (i.e. DEWHA and DSE).

Individual Matted Flax-lily plants may be translocated into retained conservation reserves within the study area, and these areas would need to be managed appropriately in the long-term to ensure that populations persist in these areas in the future.

1 INTRODUCTION

1.1 Background

Ecology Partners Pty. Ltd. was commissioned by Cardinia Shire Council on behalf of the Growth Areas Authority (GAA) to undertake targeted surveys for significant flora and fauna species currently listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), *Flora and Fauna Guarantee Act 1988* (FFG Act) and the Department of Sustainability and Environment's (DSE) Threatened Species Advisory List in Officer, Victoria.

Targeted surveys were undertaken for significant flora species including Matted Flax-lily *Dianella amoena*, Green Scentbark *Eucalyptus fulgens*, Swamp Everlasting *Xerochrysum palustre*, River Swamp Wallaby-grass *Amphibromus fluitans*, Veined Spear-grass *Austrostipa rudis* subsp. *australis*, Arching Flax-lily *Dianella* sp. aff *longifolia* and Maroon Leek-orchid *Prasophyllum frenchii*.

In addition, surveys were undertaken for significant fauna species, including Southern Brown Bandicoot *Isoodon obesulus obesulus,* Swamp Skink *Egernia coventryi,* Glossy Grass Skink *Pseudemoia rawlinson,* Growling Grass Frog *Litoria raniformis*, Southern Toadlet *Pseudophryne semimarmorata,* Dwarf Galaxias *Galaxias pusilla,* and Australian Grayling *Prototoctes maraena.*

The targeted surveys were undertaken to identify any areas within the study area which currently support these species, and to provide information in relation to potential impacts and mitigation measures associated with the proposed development of the study area.

These surveys address DSEs and Cardinia Shire Council's survey requirements as part of the Officer Precinct Structure Planning process and also for the preparation of an EPBC Act referral to The Department of the Environment, Water, Heritage and the Arts (DEWHA) as part of the future development of the precinct.

1.2 Flora Species of Conservation Significance

1.2.1 Matted Flax-lily *Dianella amoena*

EPBC Act Conservation Status: Endangered

DSE 2007 Conservation Status: Endangered

Species Description

Matted Flax-lily is a tufted perennial lily which can form loose 'mats' up to five metres wide or grow individually (Carr and Horsfall 1995; DSE 2004b).

The leaves are grey-green in colour, narrow and linear approximately 40 centimetres in length (relatively small for a Dianella spp.) and taper to point. Ranging between 4-12 millimetres in width, leaves are broadly V-shaped to flat and the margins of leaf blades, sheaths and midribs exhibit distinguishing small, irregularly-spaced teeth (Carr and Horsfall 1995; DSE 2004b; FIS 2007).

Flowering occurs from October to April with flower stems reaching between 20 to 90 centimetres long. The flowers are large, star-shaped, nodding and sweetly fragrant with petals that are pale to deep blue violet and bend backwards towards the stem.

Each flower has six stamens with bright orange strumae before the anther; the anther is lime yellow. The species can be summer deciduous depending on conditions and will die back to a tuberous rootstock (Gray and Knight 2001).

Habitat

Plants typically occur in grasslands, grassy woodlands and in grassy wetlands in Victoria and Tasmania (Gray and Knight 2001; Carter 2005). Grasses typically dominate the understorey layer (Carr and Horsfall 1995), including native species such as Kangaroo Grass *Themeda triandra*, Weeping Grass *Microlaena stipoides* var. *stipoides*, Common Wheat Grass *Elymus scaber* var. *scaber*, Common Tussock-Grass *Poa labillardierei*, and Stiped Wallaby-grass *Austrodanthonia racemosa* var. *racemosa.* In grassy woodlands, a variety of eucalypt species dominate, with Blackwood *Acacia melanoxylon* a common understorey at many sites (Carter 2005).

The Matted Flax-lily is a plant of well-drained to seasonally waterlogged fertile sandy loams to heavy cracking clays, most Victorian populations have been recorded from within volcanic geology (Carr and Horsfall 1995).

Populations are clearly fragments of much larger populations that have persisted in highly degraded vegetation, with most known populations recorded within extremely weedy and grossly degraded vegetation on occasion with a known a history of stock grazing and regular mowing (Carr and Horsfall 1995).

Distribution

The current known distribution of Matted Flax-lily extends from Stawell in western Victoria to Sale in East Gippsland, with a further disjunct population in the north-east of Victorian around Benambra (FIS 2007). However, the plant is thought to be extinct in Tasmania (DSE 2006).

Threats

As Matted Flax-lily populations commonly occur within highly degraded, semi-urban grassland areas threats to the survival of the species are similar to threats faced by other rare or threatened grassland flora species associated with native grassland communities.

Typical threats listed in the *Draft Recovery Plan* for the species (Carter 2005) include:

- Weed invasion;
- Reservation status;
- Vegetation clearance for urban development;
- Small population size;
- Inappropriate roadside/railway maintenance; and,
- Inappropriate biomass reduction/fire regimes.

1.2.2 Green Scentbark *Eucalyptus fulgens*

DSE 2007 Conservation Status: Rare

Species Description

Green Scentbark is a spreading tree which grows to 20 metres tall. Its leaves are a dark glossy green, which grow to 18 centimetres long and 1.8 centimetres wide. Buds occur in clusters of seven, and fruiting capsules take a hemispherical, cup-like shape. Flowering period is in autumn, with pale flowers. The trunk is covered with fissured, brittle bark, which covers all but the smallest branches. The bark is aromatic when handled, producing a distinct eucalyptus scent (FIS 2007, Costermans 2000).

Habitat

During this survey, it has been noted that the tree is more likely to occur at the bottom of a slope where ground moisture is greater, than on a hill or incline.

Distribution

The current known distribution of Green Scentbark is confined to south east Victoria, with populations existing from Healesville to the Latrobe Valley (Walsh and Entwisle 2003). There are 18 previously documented records of Green Scentbark within a 10 kilometre radius of Officer (FIS 2007).

Threats

Possible threats include damage to the root zone by livestock such as horses and cattle, and damage to limbs from urban development.

1.2.3 Swamp Everlasting *Xerochrysum palustre*

EPBC Act Conservation Status: Vulnerable

FFG Act Listed

DSE 2007 Conservation Status: Vulnerable

Species Description

The Swamp Everlasting is a perennial herb with a flowering stem which grows to one metre tall (FIS 2009). Leaves grow from three to 10 centimetres long and have hairs on the margins. Flowering season ranges from November to March, flowers consisting of a tight button of yellow florets surrounded by bright yellow papery bracts one to 2.5 centimetres long, forming a flower up to five centimetres across.

Habitat

The Swamp Everlasting inhabits lowland swamps, wetlands and black cracking clay soils.

Distribution

Distribution of the Swamp Everlasting in Victoria is restricted to the southern areas of high rainfall, from Portland in the west, to Bairnsdale in the east.

Threats

The Swamp Everlasting was once widespread across Victoria, however due to removal of native vegetation throughout its distribution it is now listed as rare by the DSE. The biggest threat to remnant populations is the further habitat depletion across the state.

1.2.4 River Swamp Wallaby-grass *Amphibromus fluitans*

EPBC Act Conservation Status: Vulnerable

Species Description

River Swamp Wallaby-grass is a perennial aquatic grass with stoloniferous (sprawling), tufted stems to 1.2 metres long. Leaves are smooth and flat, and the inflorescence is open and often drooping, with five to twelve flowers per spikelet.

Habitat

The grass is confined to swamps and waterbodies, and is commonly found growing around farm dams, or seasonally swampy ground.

Distribution

River Swamp Wallaby-grass is more common in the northern half of Victoria along watercourses such as the Murray River, but is rare in southern Victoria, confined to areas around Moe in Gippsland and the eastern suburbs of Melbourne. River Swamp Wallaby-grass has not been recorded previously within the Officer area, however it has been found in nearby Cranbourne.

Threats

Loss of habitat is the primary threat to populations of River Swamp Wallaby-grass.

1.2.5 Veined Spear-grass *Austrostipa rudis subsp. australis*

EPBC Act Conservation Status: Vulnerable

Species Description

Veined Spear-grass is a tufted grass which grows to 1.3 metres tall. Leaves are usually rough, sometimes with small hairs. Inflorescences are open panicles to 50 centimetres long. Flowering period is typically from November to January.

Habitat

Austrostipa rudis sub sp. *australis* prefers sandy soils in areas of cool climate and moderate altitudes (Walsh and Entwisle 1994), and has been recorded in open-forest environments.

Distribution

The current known distribution of Veined Spear-grass is across southern Victoria, from Nelson in the west to Mallacoota in the east. It is regarded as uncommon by Walsh and Entwisle (1994). There are five previous records listed on the FIS of Veined Spear-grass in the Officer area, and more were recorded by Biosis Research Pty Ltd (2006).

Veined Spear-grass is known to occur along Stephens Road and Rix Road reserves, and areas of Plains Grassland within the precinct. It is likely to exist along similar stretches of open canopy vegetation.

Threats

Like many grassland species, Veined Spear-grass is under threat from ongoing loss of habitat throughout the state.

1.2.6 Arching Flax-lily *Dianella sp. aff. longifolia (Benambra)*

DSE 2007 Conservation Status: Vulnerable

Species Description

Arching Flax-lily forms tufts to 40 centimetres wide and 1.3 metres tall. Leaves are straight with red or white bases, are 2.5 centimetres wide, and are more of a grey-green than the bright green leaves of Pale Flax-lily *Dianella longifolia*. Flowers are pale green or white to pale blue, with flowering season occurring from November through to December.

Habitat

Arching Flax-lily prefers rocky outcrops in open forests, and is found at higher altitudes than other variations of Pale Flax-lily.

Distribution

The current known distribution of this species may well underestimate its spread across the state, which is currently thought to be north of Melbourne and the districts surrounding Omeo and Benambra. A more accurate description of this species' distribution will become available as the species becomes better known. Several Arching Flax-lily specimens have previously been recorded in the precinct, on Rix Road, McMullen Road, and along the railway line (FIS).

Threats

Lack of species description and knowledge could make it more susceptible to habitat and population loss.

1.2.7 Maroon Leek Orchid *Prasophyllum frenchii*

DSE 2007 Conservation Status: Vulnerable

Species Description

The Maroon Leek-orchid emerges annually from an underground tuber, and is pollinated by nectivorous insects. Leaves are generally solitary or located at the base of the plant to 20 centimetres long (Walsh and Entwisle 1994). Flowering season lasts

from October to November, and plants have robust flowering stems to 60 centimetres tall, and occasionally to one metre.

Flowers are green with maroon markings, or entirely maroon, and are fragrant, variable in colour, and can be in a loose or dense spike arrangement. Numbers of flowers range between 20 and 60 per plant (FIS 2009).

Habitat

Maroon Leek-orchid prefers coastal or near-coastal swamps, usually not located more than 10 kilometres inland from these areas.

Distribution

The currently known distribution is restricted to southern Victoria, and ranges from the Victorian-South Australian border, to Bairnsdale in the east. One specimen of Maroon Leek-orchid has been previously recorded within Officer, along Browns Road. It is possible that there are other specimens present further along this road, or road reserves with similar vegetation such as Officer South Road or the railway line.

Threats

Threats to populations of the Maroon Leek-orchid include loss of habitat, associated with disturbances such as weed invasion, soil disturbance, vegetation clearance, urban development, and grazing by stock or introduced pests such as rabbits

1.3 Fauna Species of Conservation Significance

1.3.1 Growling Grass Frog *Litoria raniformis*

EPBC Act Conservation Status: Vulnerable

FFG Act Conservation Status: Listed

DSE 2007 Conservation Status: Endangered

National Action Plan *Conservation Status*: Vulnerable

Plate 1, Growling Grass Frog (Ecology Partners Pty. Ltd.)

The Growling Grass Frog is listed as endangered in Victoria (DSE 2003) and vulnerable nationally (Tyler 1997) (Plate 1). It is also listed as a threatened taxon under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and the Victorian *Flora and Fauna Guarantee Act 1988*. A draft Flora and Fauna Guarantee Action Statement (Robertson 2003) and a draft National Recovery Plan have been developed for the species. Overall the species is of national conservation significance.

Although formally widely distributed across south 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 2007; Mahony 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 use temporarily inundated waterbodies for breeding purposes providing they contain water over the breeding season (Organ 2003).

Based on previous investigations there is a strong correlation between the presence of the species and key habitat attributes at a given waterbody. For example, the species is typically associated with waterbodies supporting extensive cover of emergent, submerged and floating vegetation (Robertson *et al.* 2002; Organ 2004; Organ 2005). Emergent vegetation provides basking sites for frogs and protection from predators, while floating vegetation provides suitable calling stages for adult males, and breeding and oviposition sites.

Terrestrial vegetation (e.g. grass and sedges), rocks and other ground debris around a wetland perimeter also provide foraging, dispersal and over-wintering sites for frogs. Waterbodies supporting the above mentioned habitat characteristics and which are located within at least 500 metres of each other are more likely to support a population of Growling Grass Frog, compared with isolated sites lacking important habitat features.

Indeed, recent studies have revealed that the spatial orientation of waterbodies across the landscape is one of the most important habitat determinants influencing the presence of the species at a given site (Robertson *et al.* 2002; Heard *et al.* 2004a, 2004b). For example, studies have shown there is a positive correlation between the presence of the species and the distance of freestanding waterbodies to another occupied site. This is comparable to the spatial dynamics of many amphibian populations, including the closely related Green and Golden Bell Frog *Litoria aurea* (Hamer *et al.* 2002).

1.3.2 Swamp Skink *Egernia coventryi*

EPBC Act Conservation Status: Vulnerable

FFG Act Conservation Status: Listed.

Swamp Skink occurs predominantly in Victorian, south and east of the Great Dividing Range, but also extends from south-east South Australia to south-east New South Wales (AVW 2007) (Plate 2). The species is currently listed as threatened under the *Flora and Fauna Guarantee Act 1988* (FFG Act) and listed as vulnerable by DSE (2007). It is an omnivorous, medium, robust skink (approximately 100 millimetres) of a fourth toe that is noticeably longer than the third, and the presence of separated parietal scales. It produces live young, usually around January to February, and litter sizes vary from one to eight (Greer 1989).

Plate 2. Swamp Skink (caught in Creekline Tussock Grassland – western Victoria, Ecology Partners Pty. Ltd. 2009)

The Swamp Skink can be found in a range of habitats, most notably in densely vegetated freshwater swamps and watercourses, wet heaths, sedgelands (often sedge-rich, low lying marshes or drainage lines) or saltmarshes (Organ pers obs.). However, the species is not restricted to these vegetation types and it has been recorded in areas where vegetation structure consisted of dense ground cover, up to two metres, with sparse to no overstorey (Clemann 2006; Ecology Partners Pty. Ltd. 2009).

1.3.3 Southern Brown Bandicoot *Isoodon obesulus obesulus*

EPBC Act Conservation Status: Endagered

FFG Act Conservation Status: Invalid

DSE 2007 Conservation Status: Near Threatened

National Action Plan *Conservation Status*: Near Threatened

The Southern Brown Bandicoot has coarse brindled dark grey to yellow-brown fur on its back, with creamy white feet and underbelly (Plate 3). Ears are short and rounded, barely extending above the head. Animals tend to be 28-35 centimetres in length (head-body), with an 8-13 centimetre long tail. Females weigh 400-1000 grams, whilst males weigh 500-1500 grams (Menkhorst and Knight 2004).

Southern Brown Bandicoots are solitary and nocturnal, usually foraging alone. Their diet consists largely of soil invertebrates, seeds and underground fungi. Breeding is usually seasonal, with most births occurring between July and December.

Young remain in the pouch for two months, and become sexually mature at seven months, with females able to give birth to over eight young per year. The death rate of juveniles is usually high, while adults may live up to 3.5 years (Strahan 2004).

The Southern Brown Bandicoot is listed as endangered under the *Environment Protection and Biodiversity Conservation Act 1999*, and as near threatened under the *Advisory List of Threatened Vertebrate Fauna in Victoria* (DSE 2003) and the *Action Plan for Australian Marsupials and Monotremes* (Maxwell *et al.* 1996). It may be found in most mainland States and Tasmania, but has a very patchy distribution, even in continuous habitat, and occurs in a series of regionally isolated populations. In Victoria, it has been found on coastal or fluvial plains, rarely more than 50 km from the coast (Menkhorst and Seebeck 1990).

Plate 3. Southern Brown Bandicoot, Isoodon obesulus obesulus (Source: Strahan 2004).

1.3.4 Glossy Grass Skink *Pseudemoia rawlinson*

DSE 2007 Conservation Status: Near Threatened

The Glossy Grass Skink is dark brown to black above with a narrow, dark brown vertebral stripe from the nape to the base of the tail (Cogger 1996). A narrow, white or cream, dorso-lateral stripe extends from the temporal region to the base of the tail. Glossy Grass Skinks can grow up to 62 millimetres length and are known to inhabit areas close waterbodies including dense vegetation coverage (i.e. rushes and grasses).

The Glossy Grass Skink prefers confined humid microhabitats including waterbodies such as swamps and wetlands including dry sclerophyll forests that adjoin wet heathland areas that are exposed to frequent bouts of flooding (Cogger 1996). The Glossy Grass Skink uses dense vegetation, fallen logs, dead trees or rocky outcrops for shelter, and their distribution spreads through the highlands of south-eastern Australia, with peripheral or outlying populations on the Blue Mountains, west of Sydney (NSW), and in the Gisborne region and Otway Ranges in Victoria (Cogger 1996).

1.3.5 Southern Toadlet *Pseudophryne semimarmorata*

DSE 2007 Conservation Status: Vulnerable

The Southern Toadlet is a small frog, with adult body length up to 30 millimetres (Plate 4). The back is warty and varies from brown to dark olive-green with darker flecks (Barker *et al.* 1995; Robinson 2000). The chest has black and white marbling, while the throat, lower belly and underside of the limbs are tan to orange in colour (Barker *et al.* 1995; Robinson 2000). Males have a granular belly, while the female belly is smooth (Hero *et al.* 1991; Barker *et al.* 1995; Robinson 2000).

Plate 4: Southern Toadlet (Source: Peter Robertson – Wildlife Profiles Pty. Ltd)

The species occurs throughout southern Australia, predominantly in Victoria and Tasmania. It is a ground-dwelling frog with a preference for walking (Hero *et al.* 1991). It is found in forest, woodland, scrubland, grassland and heathland habitats. Adults shelter under leaf litter, rocks, logs and other debris in damp, boggy areas and breed from March to May (Hero *et al.* 1991; Robinson 2000).

1.3.6 Dwarf Galaxias *Galaxiella pusilla*

EPBC Act Conservation Status: Vulnerable

FFG Act Conservation Status: Vulnerable

DSE 2007 Conservation Status: Vulnerable

Dwarf Galaxias are known to occur through the western region of Victoria, West Gippsland and isolated locations around Melbourne (Plate 5). The Victorian Fauna Database (VFD) lists records of Dwarf Galaxias within the Cardinia catchment from 1983 to 1999. There is a known self sustaining Dwarf Galaxias population within the Cardinia Creek Retarding Basin (Saddlier *et al*. 2008). The population within the Retarding Basin is considered an important population within the Recovery Action requiring high priority toward management actions (Saddlier *et al*. 2008). The Pakenham bypass requires monitoring and management of a population of Dwarf Galaxias associated with the bypass (Organ, A. pers. comm.). The ANGFA Aquatic Survey Database shows that the Dwarf Galaxias has recently been collected from Cardinia Creek near Beaconsfield within the Flora and Fauna Reserve in January 2009 (ANGFA website).

Dwarf Galaxias are considered 'Vulnerable' in Australia (IUCN Red list, EPBC Act 1999), 'Vulnerable' in Victoria (DSE 2007) and is listed under the FFG Act. Dwarf Galaxias are generally found in isolated pools of ephemeral waterways and slow flowing waterways. They prefer waterways with a high percentage of cover of aquatic vegetation and trailing bank vegetation.

Plate 5: Dwarf Galaxias (Ecology Partners Pty. Ltd.)

The Final Draft Dwarf Galaxias National Recovery Plan (Saddlier *et al* 2008) lists the following as threats to the survival of the Dwarf Galaxias

- Degradation and loss of habitat;
- Alteration to flow regime;
- Climate Change;
- Introduced Aquatic Species; and,
- Illegal Collection;

In addition, this species has declined primarily due to the destruction of habitats and fragmentation through wetland degradation (Wager and Jackson 1993).

The Biodiversity Action Planning Landscape Plan for the Gippsland Plain bioregion Landscape Zone Koo Wee Rup (DSE 2003) lists the following threats within the region as: loss of habitat through modification of river and floodplain system, changes in hydrology, predation and alteration to waterways. The management actions include exclude grazing from riparian zone, Enhance flow regime, improve water quality and enhance and restore riparian vegetation

Wetland degradation may occur as a result of drainage, inundation by damming, trampling and fouling by stock, pollution by chemicals or silt, ploughing of temporary wetlands, surface and groundwater abstraction, and changes to catchment hydrology by tree plantations (Jackson 2003).

1.3.7 Australian Grayling *Prototroctes maraena*

EPBC Act Conservation Status: Vulnerable

FFG Act Conservation Status: Vulnerable

DSE 2007 Conservation Status: Vulnerable

Australian Grayling are found in coastal flowing waterways through isolated sites through Victoria. The VFD shows records of this species occurring within Cardinia Creek near Thompson Road in 1985 and anecdotal evidence from the Fish Victoria website:
http://www.fishvictoria.com/pyoursay/reports/cardinia_ck_berwick_sp050821.php
suggests an Australian Grayling was accidentally collected in 2003, downstream of the Chasemore Road, Officer.

Australian Grayling are considered nationally 'Vulnerable' (IUCN Red List, EPBC Act 1999), 'Vulnerable' in Victoria (DSE 2007) and is listed under the FFG Act. The Australian Grayling is generally found in relatively fast flowing waterways with relatively good water quality with substrates of cobbles and boulders (Backhouse et al.

2008). The species breeds within the lower reaches of coastal waterways, larvae are washed into the estuarine environments and the juveniles return to the adult habitats.

Little is known on this vagrant species with habitat condition, waterway type and water quality different between populations. The National Recovery Plan for the Australian Grayling (Backhouse *et al.* 2008) states the threats to this species include barriers to movements, river regulation, poor water quality, siltation, introduced fish, climate change, disease, angling and whitebaiting. The National Recovery Plan also lists Cardinia Creek as containing an important population and that the Cardinia Creek is a high priority for recovery actions. The high priority population is to ensure the long-term survival of this species, those populations at the limits of the species range, and those known to contain large breeding populations or occur in areas with extensive spawning habitat.

The Biodiversity Action Planning Landscape Plan for the Gippsland Plain bioregion Landscape Zone Koo Wee Rup (DSE 2003) lists the following threats to the Australian Grayling within the study area as: loss of habitat through modification of river and floodplain system and artificial instream barriers. The management actions include: exclude grazing from riparian zone, enhance flow regime, improve water quality, remove artificial instream barriers which impede movement or add fish ladders where this is an appropriate alternative.

1.4 Study Area

The study area falls within the Casey-Cardinia Shire new Urban Growth Boundary (UGB) as specified in the *Melbourne 2030: Casey-Cardinia Growth Area Final Report* recently released by the Victorian State Government (DSE 2005a). The report identifies areas within the two municipalities as potential residential and industrial zones for an increasing population. The report also stipulates that land within the UGB must be used as efficiently as possible due to developmental limitations in surrounding environmentally sensitive areas.

The study area is approximately 50 kilometres south-east of the Melbourne CBD (Melways ref. pp. 212 E3). It encompasses the area bounded by Brown Road to the north, Brunt Road to the east, Gum Scrub Creek to the west and roughly by the Pakenham Bypass to the south, (Figure 1). The study area to the north and south of the Gippsland Railway Line consists of predominantly privately owned pasture land, homesteads, and low density residential blocks.

While most of the study area is relatively flat, it gently slopes from north to south. There are over 30 dams, multiple drainage lines (which are mostly ephemeral) along the railway and Gum Scrub Creek which forms a rough eastern boundary.

According to DSE's Biodiversity Interactive Map (www.dse.vic.gov.au) the study area is within the Gippsland Plain Bioregion, which extends from Port Phillip Bay in the west to Bairnsdale in the east, between the southern slopes of the Great Dividing Range and Wilsons Promontory, excluding the Strzelecki Ranges.

The study area is within the municipality of Cardinia Shire Council and within the Port Phillip and Westernport catchment.

2 METHODS

2.1 Nomenclature

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

Terrestrial and aquatic vertebrate fauna (mammals, birds, reptiles, amphibians and fish) follow the AVW (2007), data which is managed by DSE.

2.2 Literature Review

Information from the FIS and AVW (2007) for the study area was reviewed. Additionally information on significant species habitat, distribution and morphology was obtained from literature such as FFG Act Action Statements, Recovery Plans, local experts and other relevant literature. Previous reports prepared by Ecology Partners Pty. Ltd. and other relevant authorities relating to the study area and to significant species were also reviewed.

2.3 Database Searches

Both the FIS and AVW, biological databases maintained by the DSE, were reviewed to obtain a list of records within the study area and within 10 kilometres of the study area. The Melbourne Water Fish Database (MWFD) was accessed for fish data. To determine any anecdotal evidence of other fish records the Fish Victoria records http://www.fishvictoria.com/pyoursay/reports/cardinia_ck_berwick_sp050821.php were viewed. The Australian New Guinea Fish Aquatic Survey Database was also accessed for relevant results of surveys within the area (http://db.angfa.org.au/).

Information referring to matters (listed taxa and ecological communities, Ramsar wetlands, etc.) protected under the EPBC Act was obtained from 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 Targeted Flora Surveys

The survey aimed to identify and map all locations of target flora species within the study area. The exact locations of plants, and the number of plants in each population were recorded by a qualified botanist with a hand-held GPS between March and April.

For all target species, the study area was searched thoroughly and methodically by traversing the specific area on foot.

Road reserves were surveyed by close, slow zigzagging, whereas paddocks were more haphazardly sampled due to the larger area, paying greater attention to areas of floristic value.

When surveying for Matted Flax-lily extra care was taken around areas of rocks or shelter, and also fence lines. An estimate of the size, number of tillers, any flowers or fruit present and the health of the plant was recorded.

Green Scentbark surveys often consisted of searching large areas with numerous trees, so more haphazard methods were employed as it was not necessary to check every tree in a given area. If a tree with similar bark to the target species was spotted, other diagnostic characteristics such as leaves, buds and fruiting capsules were then assessed to identify whether it was the correct species. All Green Scentbark trees recorded during the survey were marked on a field map and by GPS.

Farm dams and any waterways were surveyed for River Swamp Wallaby-grass.

2.5 Targeted Fauna Surveys

2.5.1 *Growling Grass Frog*

Two personnel experienced in surveying for the Growling Grass Frog conducted two nocturnal surveys within the study area during mild (~24^{o}C mean) conditions on the 18 and 26 of March 2009. Nocturnal surveys were comprised of initial quiet listening periods, followed by active searching for defined periods at waterbodies for which access was permitted. Although the species is most active between the months of October and December, when adult males are calling, the current surveys were conducted at a time of year when the species is known to be active, but when calling activity is reduced.

Given that the final survey was undertaken towards the end of the active period for the species, an additional site (Pakenham Bypass, Toomuc Creek, constructed frog pond – Melways 215 H11) just outside of the study area was surveyed. This pond currently supports a large Growling Grass Frog population and was surveyed prior to conducting surveys within the current study area. Surveys were undertaken here to confirm the seasonality and weather conditions during the targeted field survey within the precinct were conducive to Growling Grass Frog activity. In addition, Ecology Partners Pty. Ltd. is currently undertaking several monitoring projects of known Growling Grass Frog populations during the latter stages (March – April) of the active period of the species. The species has remained active at several sites due to the unseasonably warm conditions experienced over the past month.

Surveys were conducted after dusk, on calm, still nights. The water surface and margins of specific dams upon request within the precinct were carefully searched for active frogs using 30 watt, 12 volt hand-held spotlights.

Suitable refuge sites such as rocks and other ground debris were lifted opportunistically to locate inactive or concealed individuals.

2.5.2 *Swamp Skink*

Previous habitat assessments conducted throughout the Officer 'Precinct Structure Plan' by Ecology Partners Pty. Ltd. (2008) identified at least several or more sites identified as potentially containing suitable habitat, or adjacent habitat for Swamp Skink. Four of which were used for targeted surveys. Habitat attributes noted for suitable habitat included low lying areas (e.g. areas supporting Swamp Scrub and dense understorey vegetation) within the precinct.

Detailed Swamp Skink survey techniques were conducted at four sites across the study area (Figure 2). Small Elliot traps were employed for a period of between 2-5 days at each site and were spaced approximately 10 metres apart (Figure 2). Visual searches were also conducted at each site using active searching and binoculars.

A Garmin 76 GPS hand held unit was used to accurately record the site locations. This fauna survey was undertaken in accordance with the DSE *Scientific Research Permit: 10004532*.

2.5.3 *Southern Brown Bandicoot*

Previous records of Southern Brown Bandicoot from the local area were obtained and reviewed (AVW). A targeted survey (active searching) was undertaken by an experienced zoologist within the study area to identify the presence of Southern Brown Bandicoot.

Multiple daytime searches of at least two hours within potentially suitable habitat, including areas with dense understorey and thick ground cover were undertaken during March and April 2009. Daytime searches for signs of activity, including tracks, scats, nests and conical foraging holes were undertaken concurrently with habitat assessments. Potential scats or remains were also identified. Due to the lack of potential habitat within the study area direct detection techniques, such as cage trapping and/or hair sampling surveys were not undertaken.

2.5.4 *Glossy Grass Skink*

Potentially suitable habitat (albeit low quality) for the species occurred within the precinct and targeted surveys coincided with those carried out for Swamp Skink within suitable habitat types (i.e. Plains/Swampy Woodland EVC 651 and Swamp Scrub EVC 53). Additionally roadside areas comprising of dense vegetation and/or drainage lines were also surveyed (Figure 3 and 4).

2.5.5 *Southern Toadlet*

Surveys for the Southern Toadlet were conducted twice during both diurnal and nocturnal periods of the day within the study area during the 26th of March 2009, and 2nd April 2009 respectively (Figure 2). Ephemeral drainage lines and depressions were carefully searched using 30 watt 12 volt hand-held spotlights, while the advertisement call of a male Southern Toadlet was imitated to elicit a response from any adult males residing within the study area. Suitable refuge sites such as logs, rocks and other ground debris were lifted opportunistically to locate inactive frogs.

2.5.6 *Dwarf Galaxias*

Surveys for Dwarf Galaxias were undertaken through three locations within the study area (Figure 4) using Backpack Electrofishing, bait traps and completing dip net surveys. Backpack Electrofishing was conducted using a LR24 Smith-Root Backpack Electrofisher through all available aquatic habitats. The backpack electrofishing survey was conducted under a safe manner following the Code of Practice Electrofishing (SCFFA 1997) and Ecology Partners' Standard Operating Procedures for Fish Surveys (Ecology Partners Pty. Ltd. 2008). Bait traps were set overnight and had a light source within the bait pouch to act as an attractant. Bait traps were retrieved the following morning. Dip netting was conducted through all available microhabitats and the collected sample was screened for fish species present.

2.5.7 *Australian Grayling*

Australian Grayling are typically found in large waterways which are clear and are flowing, generally over large substrate (Backhouse *et al.* 2008). The targeted survey for Dwarf Galaxias standard fish collection methods (especially Electrofishing and Bait Traps) were used concurrently to survey for Australian Grayling. However, due to the habitat, water quality and flow regimes at the waterways within the study area, there was a low likelihood that the Australian Grayling would occur.

2.6 Assessment Qualifications and Limitations

Terrestrial flora and fauna data collected during the field survey and information obtained from relevant sources (e.g. biological databases and relevant literature) were reviewed. This information was sufficient to provide an assessment of the likely occurrence of the EPBC Act listed species within the study area, and to determine potential impacts associated with the proposed development on any of these species.

As with any biological survey, there is a chance that the presence of some species or specimens may go undetected. Targeted flora and fauna surveys, such as the present survey, aim to reduce the probability of this occurring, but it is an inherent risk that often is difficult to avoid.

The field work was undertaken in early autumn, which often coincides with the finish of flowering season for some plants, including target species Veined Spear-grass, Maroon Leek-orchid and Matted Flax-lily. Flowers and seeds which are absent reduce the number of diagnostic characteristics which make the plant identifiable. As such, there is a possibility that individuals of these target flora species may have eluded detection during the current surveys.

Nevertheless, given the level of survey effort undertaken (i.e. over several weeks using a variety of survey techniques) for each of these species within the study area, the information provided in this report meets the objectives of the project.

3 RESULTS

3.1 Targeted Flora Surveys

3.1.1 *Matted Flax-lily*

One new individual Matted Flax-lily population was recorded within study area, on Rix Road. The majority of the plants were difficult to identify in the field due to lack of flowering structures present and isolated individual occurrences. It is possible that other Matted Flax-lily specimens occur along roadsides within the precinct.

Calculating the number of plants within recorded 'mats' was difficult to estimate due the strongly rhizomatous habit of the Matted Flax-lily. As such occurrences of Matted Flax-lily recorded within the current survey have been identified as 'populations' with one plant per population recorded.

According to FIS (2007), Matted Flax-lily has been recorded on one occasion within the local area (i.e. within a 10 kilometre radius of the study area) (FIS 2007). All of these records are from between 1999 and 2008. However previous surveys of the area (Biosis Research Pty. Ltd. 2004) indicate that there are at least 17 Matted Flax-lily individuals present within the study site.

3.1.2 *Green Scentbark*

Forty-one Green Scentbark trees were recorded during the current survey (Figure 5). Some specimens recorded during the current survey have been previously recorded by Biosis Research Pty. Ltd. (2004), although many of these trees are new records.

3.1.3 *Swamp Everlasting*

No Swamp Everlasting specimens were recorded during the current survey. Swamp Everlasting has not been previously recorded in the study area (FIS 2007). However, the species does appear on the EPBC Act Protected Matters Search Tool within the local area (i.e. a 10 kilometre radius of the precinct). This means that the species has likelihood to occur in the area, although the reduction of habitat in the Officer area may have reduced their likelihood of occurrence.

3.1.4 *River Swamp Wallaby-grass*

No River Swamp Wallaby-grass specimens were recorded during the current survey. As with Swamp Everlasting, this grassland species has a low likelihood of occurrence in the local area, and has not been previously recorded in the study area.

3.1.5 *Veined Spear-grass*

Several Veined Spear-grass specimens were found along Stephens Road during the current survey, however these individuals had been previously recorded by Biosis Research Pty. Ltd. (2004). Veined Spear-grass has been previously recorded on multiple occasions in the local area, and over 15 times within the Officer precinct.

3.1.6 *Arching Flax-lily*

No Arching Flax-lily specimens were recorded during the current assessment, however over 10 plants have been previously recorded by Biosis Research Pty. Ltd. (2004). It is assumed that these plants are still present within the study area, and that they went undetected due to lack of flowering structures, or due to a deteriorated condition after severe hot weather during the summer period.

3.1.7 *Maroon Leek-orchid*

No Maroon Leek-orchid specimens were recorded during the current assessment. Five Maroon Leek-orchids have previously been recorded in the local area (FIS 2007), and one within the study area by Biosis Research Pty. Ltd. (2004). Field work undertaken in March and April is generally considered too late to identify the Maroon Leek-orchid as all flowering structures are absent, and no above-ground parts of the plant are present. Subsequent to this, individuals of the species may have gone undetected, due to their cryptic appearance during the time of year that the surveys were undertaken.

3.2 Targeted Fauna Surveys

3.2.1 *Growling Grass Frog*

During the present study no Growling Grass Frogs were recorded within dams or waterbodies in the precinct, and also those identified in the immediate vicinity of the precinct. Of the twenty-one dams identified from aerial photographs and daytime walkover assessments, two were completely dry (15A and 17A; Figure 1), and an additional two were considered unsuitable due to degraded surrounding habitat (i.e. cattle grazing) and water conditions (18A and 19A; Figure 1). Of the remaining 21 dams, none were identified as containing Growling Grass Frogs (Figure 1).

It is evident that a significant population of the species exists within or in the proximity of the study area as Ecology Partners Pty. Ltd. (2006) has identified. Ecology Partners Pty. Ltd. have also completed several detailed surveys within the study area and surrounds over the past three breeding seasons, including a detailed mark-recapture study (Hamer and Organ 2006*a*; 2006*b*, 2006*c*), and more recently extensive monitoring of the local Growling Grass Frog population as part of the Pakenham Bypass Project (Ecology Partners Pty. Ltd. 2009 in prep.).

There have also been over 100 documented records of the species documented from the local area (AVW 2007). Officer Precinct Structure Plan also lies within the greater Pakenham *meta-population* of this species, which is considered an 'important population' (nationally significant) by the criteria outlined in the EPBC Act Policy Statement developed specifically for the species.

The results of this year's monitoring have revealed that the species' site occupancy is lower (on average) than a previous survey carried out by Ecology Partners Pty. Ltd. (2006) within the Officer precinct (Table 1). In 2006 there were 24 Growling Grass Frogs found within the study area, and none within the present study. Although the surrounding habitat at the majority of waterbodies is commonly pasture grasses, water quality and surrounding habitat within the dams surveyed in 2006 was more suitable (Table 1). Other explanations for lower numbers during the current surveys may be attributed to a natural fluctuation in the population, or other factors, such as the prevailing drought, or the presence of Plague Minnow *Gambusia holbrookii* or other predatory fish in the waterbodies surveyed.

For example, Organ (2004*a*) recorded a correlation between the presence of the Growling Grass Frog and the distance of waterbodies to main drainage channels. From these investigations it appears that frogs may move from drains to farm dams to breed. when habitat (e.g. water levels, vegetation) and climatic conditions (e.g. prolonged rain) become more favourable. Conversely, frogs may move from farm dams to the drains when conditions become unfavourable. Indeed, this phenomenon has been documented at a number of other sites occupied by the species such as at the Western Treatment Plant where frogs are known to move between treatment lagoons and drainage channels when habitat conditions become suitable or unsuitable (Organ 2003a, 2003b, Organ 2005d).

Table 1. Comparison of dams surveyed for Growling Grass Frog within the Officer Precinct Structure Plan during 2006 and 2009.

	Dominant flora	Dominant Surrounding Habitat	Dominant Refuge sites	Overall Water Quality	Fish present in majority of dams	%CAN	%OP	%FR	%EM	%SUB	%FL	Total number *GGF* observed
						Mean (Range)						
Survey for 2006	*Eleocharis spp.*	Pasture	Farm Debris/ Rocks	Good	No	0.2 (0-5)	74 (5-100)	35 (0-100)	16 (0-95)	9 (0-80)	7 (0-60)	24
Survey for 2009	*Eleocharis sphacelata*	Pasture	None	Poor	No	3 (0-30)	90 (90-100)	18 (0-90)	10 (0-40)	0	2 (0-30)	0

The study area is considered to be of national significance for the Growling Grass Frog as it supports a breeding population of the species, provides several high quality breeding sites in the form of farm dams, and the provision of suitable dispersal habitat along Gum Scrub Creek. It is likely that Gum Scrub Creek is an important dispersal corridor for the species in the study area, and hence, the far south-east corner of the study area and the Gum Scrub Creek riparian corridor is considered a high conservation priority area, despite being a modified rural environment.

Any development that proposes to remove breeding sites within this area should be preceded by the establishment of alternative sites located close to occupied sites to improve population viability, together with the creation and maintenance of dispersal routes consistent with a management plan for the species. Although there are examples throughout metropolitan Melbourne of Growling Grass Frog successfully colonising and breeding in newly created wetlands, the long-term viability of these populations in an urban context is unknown.

It is reasonable to conclude that a high likelihood for this species occurring within the study site remains as the population in the study area is part of the far north-west corner of a meta-population that extends throughout Pakenham, Nar Nar Goon and Bayles, south of the Princes Highway.

3.2.2 *Swamp Skink*

Potential habitat for Swamp Skink was identified within the study area where the understorey vegetation was dense and not shaded out by Swamp Scrub or trees and larger shrubs (Figure 3; Figure 4). Trapping was undertaken at these sites (Table 2; Figure 3; Figure 4). Potential habitat was determined based on vegetation and habitat attributes only, and no Swamp Skink records exist in the vicinity of the study area (AVW 2007).

Table 2. Summary of Swamp Skink survey results at trap sites (Figure 3)

Targeted Survey Area	Sites	Survey Dates	Swamp Skink	Other species
Drainage Line South (Princess Hwy)	West Section - 10 Elliott Traps	18/3/2009 – 22/3/2009	0	8 House Mouse
Drainage Line South Princess Hwy – VicUrban	Central Section (Running NorthW – SouthE) – 20 Elliott Traps	18/3/2009 – 22/3/2009	0	4 House Mouse
Station Street Drainage Line	South Section – 5 Elliott Traps	23/3/2009 – 24/3/2009	0	3 House Mouse
Station Street Drainage Line	North Section – 5 Elliott Traps	23/3/2009 – 24/3/2009	0	2 House Mouse

Although, it is unlikely that Swamp Skink are present within any of the study areas (Table 2), trapping was conducted to verify any potential presence at sites where potential habitat was identified. Swamp Skink surveys were undertaken between 18 March and 24 March 2009 (Table 2). Weather conditions were fine and mild (average temperature 25.7; minimum tempature 10^{o}C and maximum temperature 34.5^{o}C). No Swamp Skinks were detected at any of the sites across the study catchments (Table 2).

As densely inhabited vegetation occupied by the Swamp Skink provides excellent coverage, survey methods such as active searching may have failed to locate this species. Therefore, it is important to note that this species may still occur despite both previous records and survey results indicating otherwise from this study. Although the study area contains potentially suitable habitat for the Swamp Skink, the lack of previous records and results from targeted surveys suggests there is an overall low likelihood that this species does occur within the precinct.

3.2.3 *Southern Brown Bandicoot*

There is only one documented record of the Southern Brown Bandicoot within a 10 kilometre radius of the study area was from 1919 (AVW 2007). This record is from the Beaconsfield Upper region, approximately five kilometres north-west of Officer. Interestingly, within 15 kilometre radius of Officer there are a total of 37 records distributed mainly towards southern areas such as Cranbourne (i.e. Cranbourne Botanic Gardens), Cardinia and Dalmore East (AVW 2007). There are also several records further north towards Belgrave South and Lysterfield (i.e. Lysterfield Park).

The Southern Brown Bandicoot tends to prefer sandy soils with scrubby vegetation and/or areas of low ground cover that are periodically burnt. Active searching during March and April 2009 for the Southern Brown Bandicoot was carried out within remnant woodland patches (Grassy Forest) towards the north-west corner of the precinct (Figure 4). In addition, large areas containing Plains Grassy Woodland and Swampy Woodland were also searched near the Officer Train station for any incidental evidence of the species.

The AVW (2007) indicates there have been no recent records of the Southern Brown Bandicoot within the precinct, and additionally, there was no evidence to suggest that the species occurs within potentially suitable habitat, as a result of active searching during March and April 2009. Subsequently, there is a low likelihood of this species occurring within the precinct and any suitable habitat being directly affected as a result of future development in the area.

3.2.4 *Glossy Grass Skink*

There are no previous AVW records within a 10 kilometre radius of the precinct for the Glossy Grass Skink. Potentially suitable habitat (albeit low quality) for the Glossy Grass Skink was identified and actively searched within the precinct during March 2009 (Figure 3; Figure 4). Results from this indicated no visual or incidental evidence that this species occurs within the precinct.

The Glossy Grass Skink prefers humid microhabitats such as swamps or wetlands and although this habitat did occur partially along drainage lines and within densely vegetated areas there were no sightings of this species within its preferred habitats. As there are no previous records of this species within the precinct, and potentially suitable habitat is of generally low quality, there is a low likelihood of occurrence for the Glossy Grass Skink within the precinct.

3.2.5 *Southern Toadlet*

There have been 82 AVW records within a 10 kilometre radius of the precinct. Despite the use of a variety of fauna survey techniques the Southern Toadlet was not detected within the study area (Figure 2).

The Southern Toadlet is known to be more active within their breeding season (i.e. males call more frequently) after a substantial rain event. The surveys took place within a known breeding period (March to May). However, very little rainfall (<1mm) was experienced in and around Melbourne during these surveys. This may have delayed calling and breeding activity in this species and therefore they may not have been active.

Other survey techniques such as spotlighting and active searching were also unsuccessful during surveys within the precinct (Figure 2). With the exception of the

remnant vegetation north and north-west of the Officer train station, there is a low likelihood that this species occurs south of the Princess Highway, and a low to moderate likelihood that the species occurs within the remainder of the precinct.

3.2.6 *Dwarf Galaxias*

There are two records in 1983 of Dwarf Galaxias occurring within Cardinia Creek (AVW 2007), and there is a known population within Cardinia Creek retarding basin (Saddlier *et al.* 2008). No Dwarf Galaxias were collected through the current survey (Figure 4). This species is relatively small, and although not found within the current survey, there is potential that this species may still occur within the study area due to the rareness and patchiness of the population and the strong historical data that demonstrates that species occurs in certain locations within the catchment. Therefore it cannot be unequivocally stated that the species does not occur within the study area.

3.2.7 *Australian Grayling*

There were no Australian Grayling collected through the current survey (Figure 4). There is a low likelihood that this species occur within the precinct due to the lack of suitable habitat (i.e. poor water quality, lack of flow).

4 ENVIRONMENTAL POLICY AND LEGISLATION

4.1.1 *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 Commonwealth 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 seven 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)

World Heritage properties and National Heritage places

The study area is not located within or near a World Heritage property or National Heritage property.

Ramsar wetlands of international significance

The DEWHA Protected Matters Search Tool (http://www.environment.gov.au/erin/ert/epbc/ index.html) does not list any wetlands of international significance as occurring within the same catchment as the study area. As such, the proposed development is unlikely to impact upon any Ramsar values.

Listed flora and fauna species, and ecological communities

An action requires approval from the Commonwealth 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: Populations of Matted Flax-lily, listed as endangered under the EPBC Act, were recorded during the current surveys, in addition to the species being previously recorded within the study area (Biosis Research Pty. Ltd. 2004; FIS 2007).

Fauna: The likelihood that targeted species within this study will be affected is low. Previous records suggest, along with the findings of targeted surveys, that there were no species listed under **national, state or regional** significance recorded during the current surveys.

Despite this, the study area is considered to be of **national** significance for the Growling Grass Frog, as it supports a meta-population of the species. Any development that proposes to remove breeding sites within this area should be preceded by the establishment of alternative sites located close to occupied sites to improve population viability, together with the creation and maintenance of dispersal routes consistent with a management plan for the species.

Communities: There are no endangered communities located within the study area, and none potentially occurring within the local area (i.e. within a 10 kilometre radius of the study area).

The Department of Sustainability and Environment extant and current vegetation mapping along with the field assessment classified native vegetation within the study area as Swampy Woodland (Ecological Vegetation Class 937), Grassy Woodland (EVC 175), Grassy Forest (EVC 128) and Plains Grassland (EVC 897). As such remnant native vegetation within the study area is not part of either ecological community listed under the EPBC Act as potentially occurring within the local area.

Listed migratory and marine species

A small number of common migratory and marine species were recorded during the present survey (Appendix 3.1). While a number migratory and marine species may occupy habitats within the study area on occasions, the study area does not 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 the proposed development

Matted Flax-lily and Growling Grass Frog which are both listed under the EPBC Act have been recorded within the precinct. As such, a separate EPBC Act referral (i.e. separate to the Officer referral prepared by VicUrban) to the Commonwealth Minister for DEWHA may be required as part of the precinct structure planning process.

EPBC Act Referral

EPBC Act referrals are submitted on behalf of the proponent if actions (i.e. development) are likely to impact upon matters of national significance (i.e. in this instance EPBC Act-listed flora and fauna).

An EPBC Act referral identifies the person (proponent) proposing to take the action and includes a description of the proposal, the project location, the nature and extent of any potential impacts and any proposed mitigation measures.

The Minister then makes a decision within 20 business days on whether approval is required under the EPBC Act and on the process of assessment. The Minister will either deem the action:

1. *A Controlled Action* - Action is subject to assessment and approval process as described under the EPBC Act.
2. *Not controlled Action 'Particular Manner'* – Approval is not required if the action is taken in accordance with the manner specified.
3. *Not Controlled Action* – Approval is not required if the action is taken in accordance with the referral.
4. *Clearly Unacceptable* – Person is informed of decision and can either withdraw the referral; submit a modified proposal as a new referral; or request the Minister to reconsider the decision.

   If reconsideration is requested, 10 business days are allowed for public consideration of the action whilst DEWHA prepares a report on relevant impacts and comments of the action. The Minister then makes a reconsideration decision within 20 business days where the action is considered either *Clearly Unacceptable* or a *Controlled Action*.

Implications for development

An action is likely to have a significant impact on an endangered (Matted Flax-lily) if there is any chance or possibility that it will:

- Lead to long term decrease in the size of a population;
- Reduce the areas of occupancy of the species;
- Fragment an existing population into two or more populations;
- Adversely affect habitat critical to the survival of the species;
- Disrupt the breeding cycle of a population;
- Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;

- Introduce disease which may cause the species to decline; or
- Interfere with the recovery of the species.

4.1.2 *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 – Four FFG Act listed flora species have previously been recorded in the study area and an additional three are predicted to occur in the local area based on their habitat requirements (Appendix 1). Only one FFG Act-listed species, the Matted Flax-lily, was recorded during the current targeted flora surveys. Other previously recorded species are still considered to be present at the site.

Fauna – No fauna species listed under the FFG Act were recorded during the present assessment. There have been a small number of fauna species listed under the FFG Act which have previously been recorded within the local area (AVW 2007) (Appendix 3.2). There is no limiting habitat for any FFG Act listed species in the study area.

Ecological Communities – No FFG listed ecological communities occur in the study area.

Recommendation

Given that the study area contains flora species listed as either threatened or as 'protected flora' under the FFG Act, a FFG Act permit is required for any future development of the study area.

5 POTENTIAL IMPACTS AND MITIGATION MEASURES

Any loss of habitat for nationally significant flora and fauna species due to the proposed development should be viewed in the overall context of ongoing loss, fragmentation, and deterioration in the quality of remnant vegetation for Matted Flax-lily throughout south-east Victoria.

5.1 Matted Flax-lily

5.1.1 *Potential Impacts*

With key areas of habitat and populations identified across the precinct, the proposed development will have direct and indirect impacts to Matted Flax-lily recorded during the current and previous surveys.

5.1.2 *Mitigation Measures*

The following measures to mitigate/ameliorate impacts to Matted Flax-lily associated with the proposed development should be considered:

- Undertake detailed pre-construction surveys by a qualified botanist for the plant prior to any site disturbance (i.e. clear and scrape of topsoil);
- Any plants recorded during pre-construction surveys should be salvaged and translocated according to protocols detailed within the Matted Flax-lily Conservation Management Plan which is currently being development in accordance with *Guidelines for the translocation of threatened plants in Australia* (Vallee *et al*. 2004).
- Preferably plants should be translocated into conservation areas proposed to be retained within the development;
- Retain known populations within reserves where possible
- Manage retained populations and facilitate recruitment of the species via protocols within a detailed Matted Flax-lily Conservation Management Plan; and,
- Any retained populations should be identified as 'no go' areas. Install temporary fencing to protect adjacent areas of native vegetation and to identify them as 'no go' areas (i.e. use of signage to highlight the significance of areas immediately opposite the study area).

5.2 Growling Grass Frog

5.2.1 *Potential Impacts*

Potential impacts to Growling Grass Frogs within the precinct include:

- Removal of habitat;
- Restrictions to dispersal;
- Direct and indirect mortality of individuals;
- Increases in feral and domestic animals and therefore predation;
- Modification of stormwater and overland flow regimes;
- Increase in urban, industrial, noise and light pollution;
- Habitat fragmentation; and,
- Waterbody disturbance and degradation.

5.2.2 *Mitigation Measures and Recommendations*

Mitigation measures should be instigated before the commencement of the works, and detailed mitigation measures are provided in a Conservation Management Plan for the species as part of the proposed Officer development by VicUrban.

5.3 Mitigation Measures

The following mitigation measures should be considered as part of the proposed development within the study area:

- Develop a Construction Environmental Management Plan which should outline measures to ensure ecological values on the site are protected during construction activities.
- Minimise disturbance to any waterbodies;
- Restrict construction activities to areas of modified vegetation and the roadside/gravel verges (where appropriate) to prevent access to adjacent patches of remnant native vegetation.
- Fence retained areas of ecological value should be labelled as 'no go' areas during any construction activities;
- Where possible, avoid native vegetation through construction and micro-siting techniques. If indeed necessary, trees should be lopped or trimmed

rather than removed. Similarly, soil disturbance and sedimentation within wetlands should be avoided or kept to a minimum, to avoid, or minimise impacts to fauna habitats;

- Minimise noise disturbance to birds and other fauna within the study area during construction;
- All contractors should be aware of areas of ecological value and penalties should be imposed if vegetation is removed or disturbed without permission, or outside the area of works;
- Where possible, construction stockpiles, machinery, roads, and other infrastructure should be placed away from areas supporting native vegetation, large old trees and/or wetlands;
- Use locally indigenous tree, shrub and understorey plantings in any plantings within the study area, which can be part of the roadside landscaping;
- If any trees or shrubs are proposed to be removed then fauna such as Common Brushtail or Common Ring-tailed Possums, micro-bats should be salvaged and translocated;
- Include EVC polygons (areas of sensitivity) on detailed surveying drawings and check for accuracy; and,
- Ensure that best practice sedimentation and pollution control measures to the satisfaction of EPA are undertaken at all times to prevent offsite impacts to waterways and wetlands.
- Restrict vehicular access through higher quality grassland areas to only those required for the proposed works;
- Control the further spread of environmental and noxious weeds, by thorough wash-down of plant and minimising the footprint of works;
- Natural regeneration should be encouraged in disturbed areas;
- Use indigenous plants associated with the EVCs present in the Officer precinct as part of any landscaping works if regeneration is poor and to increased habitat for native fauna; and,

6 CONCLUSION

One new Matted Flax-lily plant and several new Green Scentbark trees were recorded within the Officer precinct during the targeted surveys. Surveys were also undertaken for six other flora species and eight fauna species. However, these species were not recorded during the targeted surveys.

Due to the presence of Matted Flax-lily and Growling Grass Frog within the study area an EPBC Act referral to the Commonwealth Environment Minister is recommended as part of the precinct structure planning process.

In situ conservation of Matted Flax-lily within the study area should be undertaken. Salvage and translocation measures of Matted Flax-lily prior to any site disturbance should only be undertaken in accordance with the Conservation Management Plan which would need to be approved by relevant authorities (i.e. DEWHA and DSE). Individual Matted Flax-lily plants may be translocated into retained conservation reserves within the study area, and these areas would need to be managed appropriately in the long-term to ensure that populations persist in these areas in the future.

Where possible, areas known to support Matted Flax-lily, Green Scentbark and all other previously recorded threatened species should be protected in proposed open space/conservation areas.

Waterbodies and water courses within the Officer Precinct Structure Plan currently provide key habitat features required by the Growling Grass Frog, such as various types of aquatic vegetation and surrounding shelter sites. In addition, the proximity of dams, creeks and drainage lines throughout the area facilitate frog movement and provide important dispersal routes for the species in the Officer area. There have been a total of 107 records of the species in the local area (AVW).

The proposed Officer Precinct Structure Plan is likely to impact the nationally threatened Growling Grass Frog. A Conservation Management Plan has been prepared as part of the VicUrban Officer development, and this plan details mitigation measures and management recommendations. One of the key elements of this plan is information relating to the creation of several large wetlands (along linear corridors) which will be designed, constructed and managed specifically for the Growling Grass Frog.

FIGURES

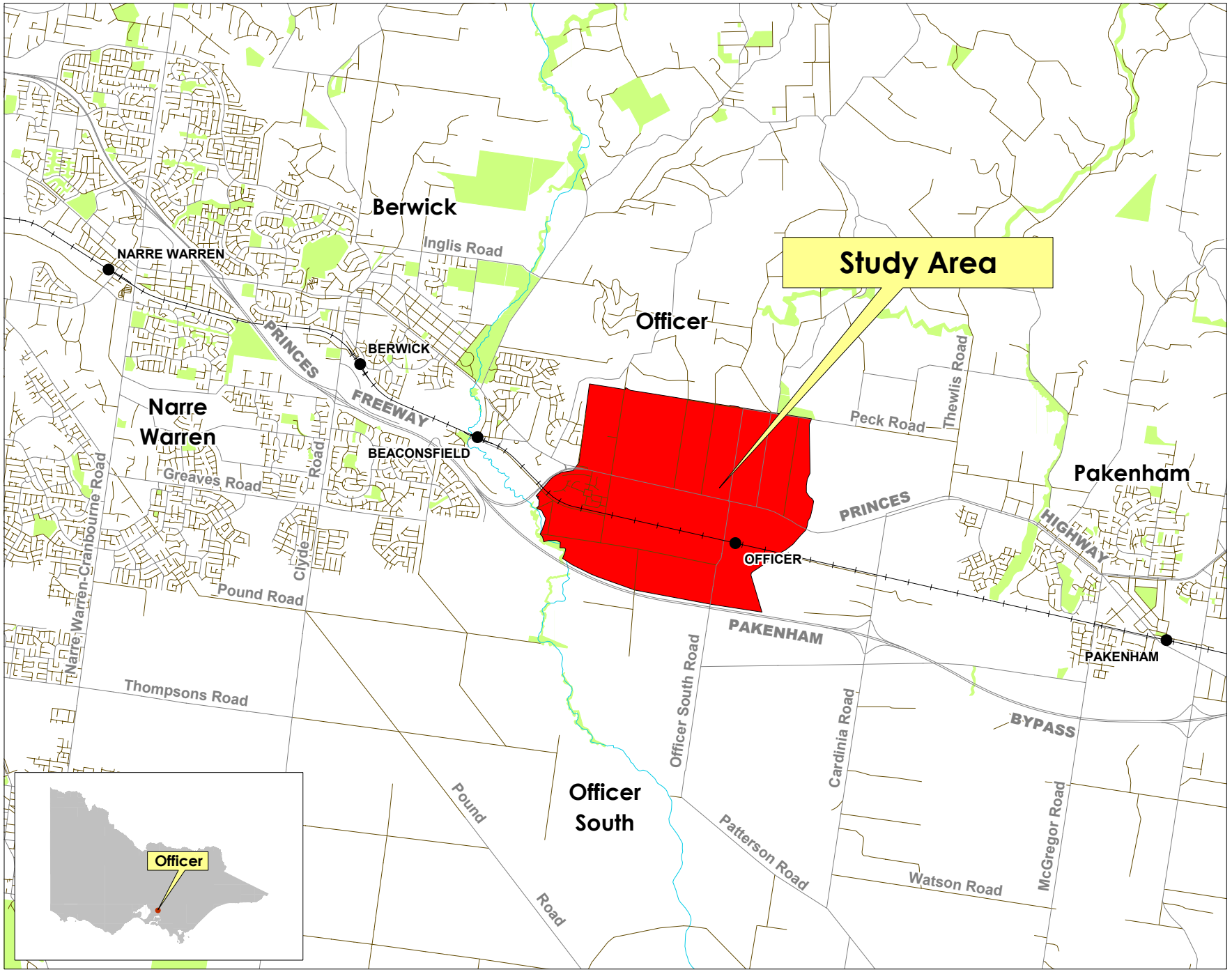
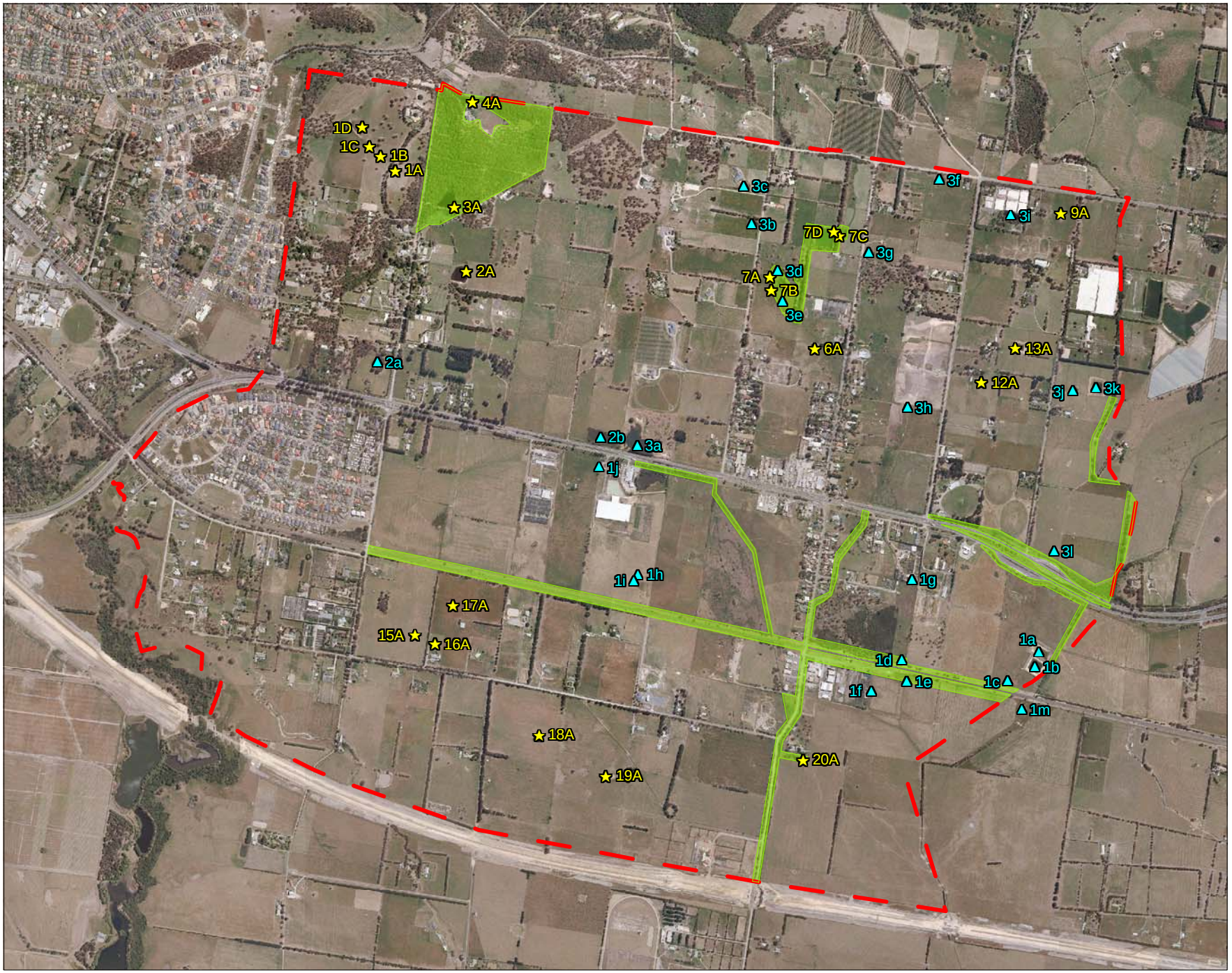


Figure 1
Location of study area, Officer Structure Plan, Officer

ecologypartners

EP Map Num: 1359 Fig 1
Issue Date: 31/3/2009



Surveyed dams

Current survey 2008/9

Previous survey 2006 (Ecology Partners Pty Ltd)

Potential/surveyed Southern Toadlet habitat

Study area

N

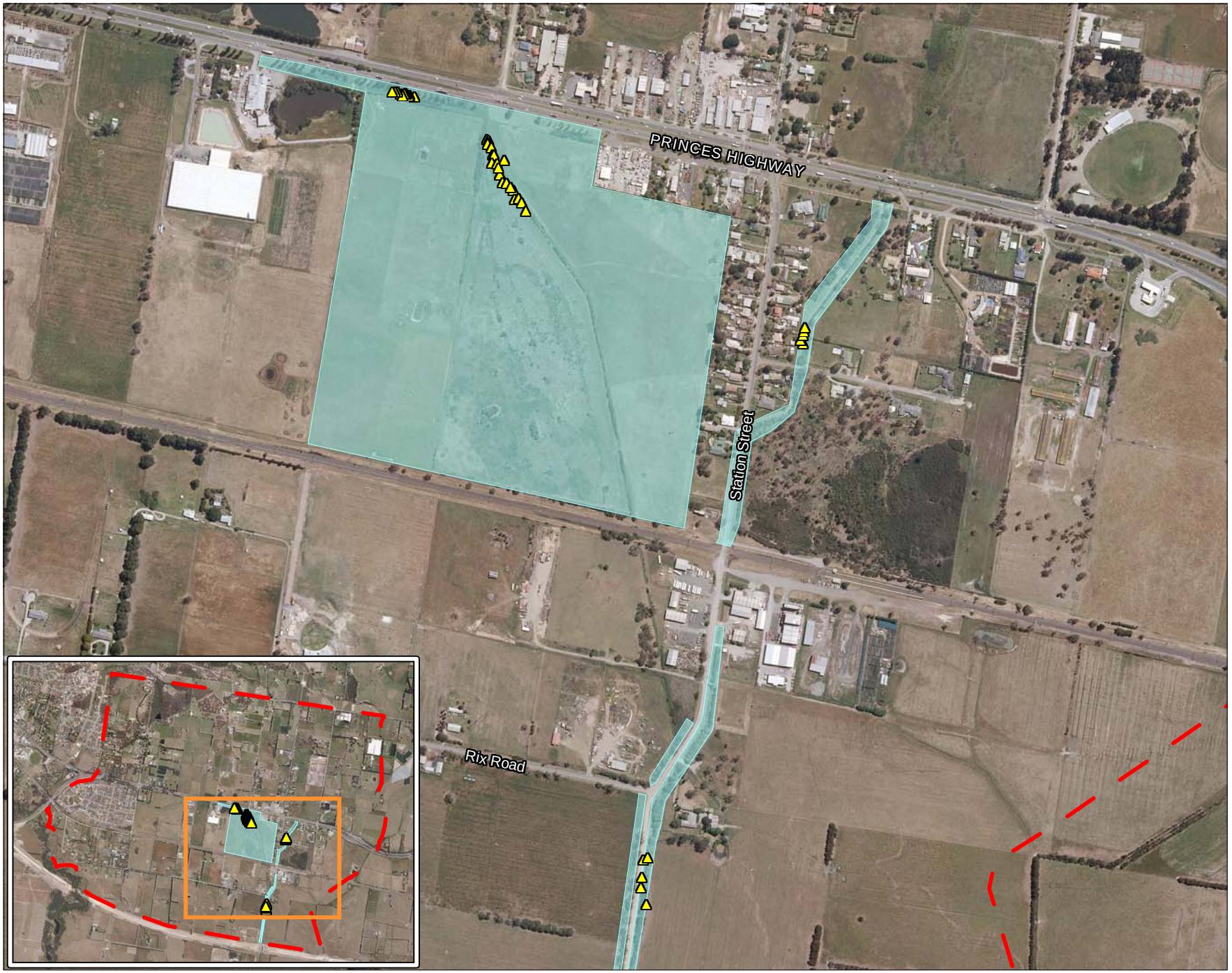
0 250 500

Metres

Figure 2
Growling Grass Frog survey sites, Officer Structure Plan, Officer

ecologypartners

EP Map Num: 1359 Fig GGF, Issue Date: 21/4/2009



Elliott trap

Active search area for Swamp Skink & Glossy Grass Skink

Study area

N

0 100 200

Metres

Figure 3
Targeted survey sites (Elliott traps) and active search areas for Swamp Skink & Glossy Grass Skink, Officer Structure Plan, Officer

ecologypartners

EP Map Num: 1359 Fig ET, Issue Date: 21/4/2009

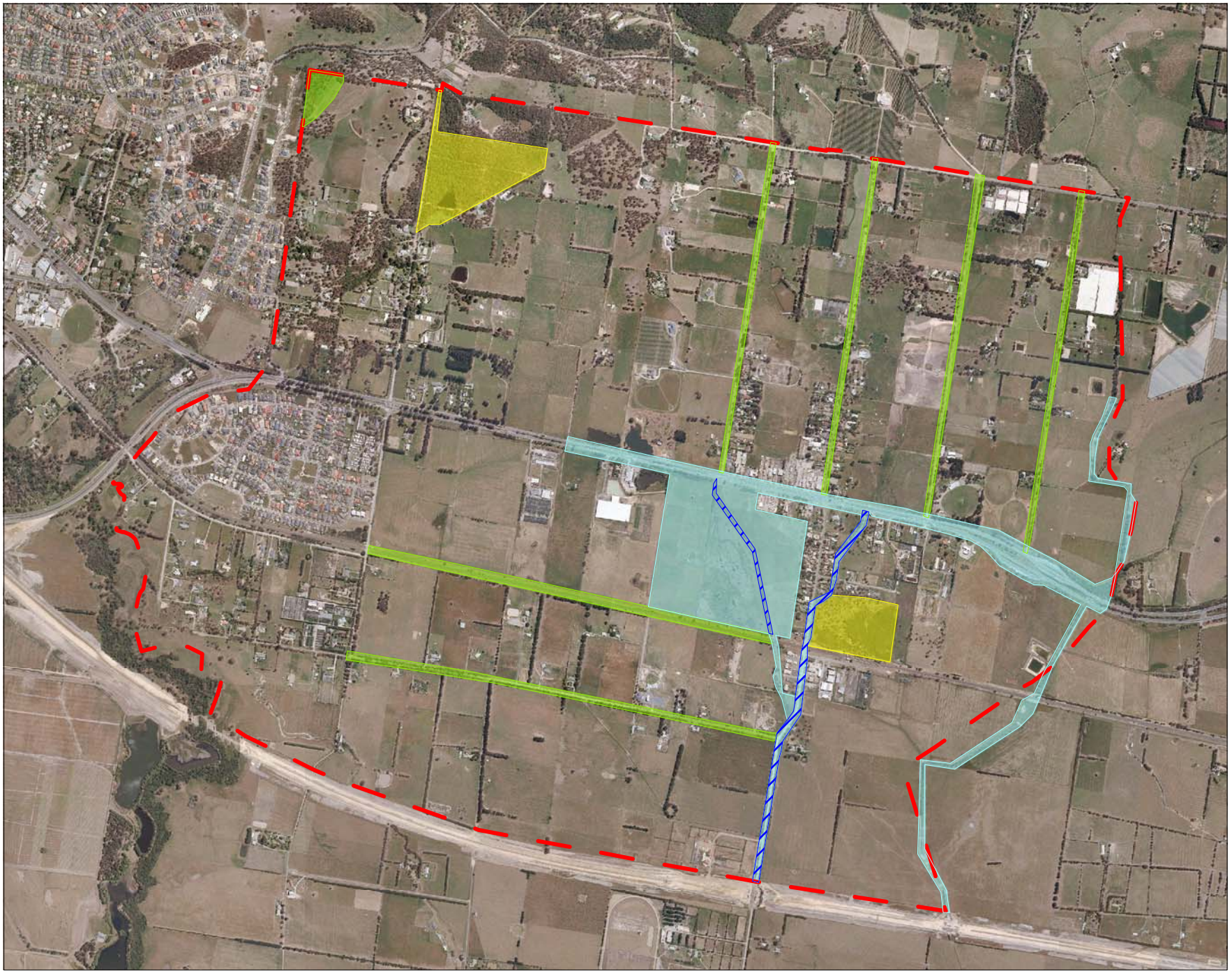


Figure 4
Targeted Habitat areas, Officer Structure Plan, Officer

ecologypartners

EP Map Num: 1359 Fig AS, Issue Date: 21/4/2009

Figure 5
Target flora species within the study area, Officer Structure Plan, Officer

ecologypartners

APPENDICES

Appendix 1 – Flora results

Table A1.1. Significant flora recorded 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 Flora in Victoria (DSE 2005b)
FFG *Flora and Fauna Guarantee Act 1988* (Victoria)

National status of species is designated by:

X Extinct
CR Critically endangered
EN Endangered
VU Vulnerable
K Poorly Known
^ Records identified from EPBC Act Protected Matters Search Tool.

State status of species is designated by:

X Extinct
e Endangered
v Vulnerable
r Rare
k Poorly Known
L Listed

Scientific Name	Common Name	Total number of documented records (FIS)	EPBC Act	DSE 2005b	FFG Act	Likely occurrence within the study area
NATIONAL						
^*Amphibromus fluitans*	River Swamp Wallaby-grass	-	VU	-	-	Possible (low likelihood)
^*Xerochrysum palustre*	Swamp Everlasting	-	VU	v	L	Possible (low likelihood)
^*Thelymitra epipactoides*	Metallic Sun-orchid	-	EN	-	-	Unlikely
^*Caladenia fragrantissima subsp. orientalis*	Cream Spider-orchid	-	EN	-	-	Unlikely
Dianella amoena	Matted Flax-lily	1	EN	e	-	Known
Glycine latrobeana	Clover Glycine	1	VU	v	L	Unlikely
Prasophyllum frenchii	Maroon Leek-orchid	5	EN	e	L	Known
STATE						
Acacia leprosa (Dandenong Range variant)	Dandenong Range Cinnamon Wattle	11	-	r	-	Unlikely
Austrostipa rudis subsp. *australis*	Veined Spear-grass	3	-	r	-	Known
Burnettia cuneata	Lizard Orchid	1	-	r	-	Unlikely
Caladenia oenochila	Wine-lipped Spider-orchid	3	-	v	-	Unlikely
Cardamine tenuifolia	Slender Bitter-cress	1	-	k	-	Unlikely
Carex alsophila	Forest Sedge	1	-	r	-	Unlikely
Cladium procerum	Leafy Twig-sedge	1	-	r	-	Unlikely
Corybas aconitiflorus	Spurred Helmet-orchid	1	-	r	-	Unlikely
Desmodium varians	Slender Tick-trefoil	3	-	k	-	Unlikely
Diuris punctata var. *punctata*	Purple Diuris	10	-	v	L	No suitable habitat
Eucalyptus fulgens	Green Scentbark	15	-	r	-	Known
Geranium solanderi var. solanderi s.s.	Austral Cranesbill	1	-	v	-	Unlikely
Leionema bilobum	Notched Leionema	1	-	r	-	Unlikely
Olearia asterotricha	Rough Daisy-bush	1	-	r	-	Unlikely
Potamogeton perfoliatus s.l.	Perfoliate Pondweed	1	-	k	-	Unlikely
Prasophyllum lindleyanum	Green Leek-orchid	4	-	v	-	Unlikely
Prasophyllum pyriforme s.s.	Silurian Leek-orchid	1	-	v	-	Unlikely
Pterostylis grandiflora	Cobra Greenhood	2	-	r	-	No suitable habitat
Pterostylis sp. aff. parviflora (Southern Victoria)	Red-tip Greenhood	1	-	r	-	Unlikely
Pterostylis X ingens	Sharp Greenhood	1	-	r	-	Unlikely

Scientific Name	Common Name	Total number of documented records (FIS)	EPBC Act	DSE 2005b	FFG Act	Likely occurrence within the study area
Tetratheca stenocarpa	Long Pink-bells	1	-	r	-	Unlikely

Sources: Flora Information System (FIS 2005) and EPBC Act Protected Matters Search Tool (DEWHA)

Appendix 2.1 – Fauna results

Table A2.1. *Fauna recorded during the present survey, and previously recorded within 10 kilometres of the study area.*

Type of Record:
H – Heard
S – Seen
I – Incidental (identified from feathers, bones or scats, etc)
T – Trapped / Handheld
* 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					
Agile Antechinus	*Antechinus agilis*	2004	31	Partial	-	-
Dusky Antechinus	*Antechinus swainsonii*	1990	6	-	-	-
Common Brushtail Possum	*Trichosurus vulpecula*	2002	19	Total	-	-
Common Ringtail Possum	*Pseudocheirus peregrinus*	2002	30	Partial	-	-
Greater Glider	*Petauroides volans*	1925	2	Total	-	-
Sugar Glider	*Petaurus breviceps*	2004	16	Total	-	-
Feathertail Glider	*Acrobates pygmaeus*	1926	3	Total	-	-
Koala	*Phascolarctos cinereus*	1990	3	-	-	-
Common Wombat	*Vombatus ursinus*	2004	8	-	-	
Black Wallaby	*Wallabia bicolor*	2004	16	-	-	-
Eastern Grey Kangaroo	*Macropus giganteus*	2004	8	-	-	-
Grey-headed Flying-fox	*Pteropus poliocephalus*	2003	1	-	-	-
White-striped Freetail Bat	*Tadarida australis*	2002	8	Total	-	-
Lesser Long-eared Bat	*Nyctophilus geoffroyi*	1993	10	Total	-	-
Gould's Wattled Bat	*Chalinolobus gouldii*	1991	2	Total	-	-
Chocolate Wattled Bat	*Chalinolobus morio*	1988	2	Total	-	-

Common Name	Scientific Name	Last Documented Record (AVW)	Total # of Documented Records (AVW)	Hollow Use	Mi/ Ma	Present Survey
Southern Forest Bat	*Vespadelus regulus*	1988	2	Total	-	-
Little Forest Bat	*Vespadelus vulturnus*	1991	7	Total	-	-
Large Forest Bat	*Vespadelus darlingtoni*	1991	4	Total	-	-
Bush Rat	*Rattus fuscipes*	2004	20	-	-	-
Swamp Rat	*Rattus lutreolus*	2001	2	-	-	-
*Black Rat	*Rattus rattus*	1992	3	-	-	-
*Brown Rat	*Rattus norvegicus*	2006	1	-	-	-
*House Mouse	*Mus musculus*	2006	7	-	-	-
*European Rabbit	*Oryctolagus cuniculus*	2005	19	-	-	-
*European Hare	*Lepus europeaus*	2005	4	-	-	-
Dingo/Dog (feral)	*Canis lupus*	1992	3	-	-	-
*Red Fox	*Vulpes vulpes*	2005	19	-	-	-
*Cat	*Felis catus*	1991	2	-	-	-
Unidentified predator	*Unidentified predator*	1991	1	-	-	-
BIRDS						
Buff-banded Rail	*Gallirallus philippensis*	1994	1	-	Ma	-
Common Bronzewing	*Phaps chalcoptera*	2001	30	-	-	-
Brush Bronzewing	*Phaps elegans*	1999	4	-	-	-
Baillon's Crake	*Porzana pusilla*	2003	1	-	Ma	-
Spotless Crake	*Porzana tabuensis*	1992	1	-	Ma	-
Dusky Moorhen	*Gallinula tenebrosa*	2004	11	-	-	-
Purple Swamphen	*Porphyrio porphyrio*	2002	11	-	Ma	-
Eurasian Coot	*Fulica atra*	2005	20	-	-	-
Great Crested Grebe	*Podiceps cristatus*	2002	1	-	-	-
Australasian Grebe	*Tachybaptus novaehollandiae*	2006	20	-	-	-
Hoary-headed Grebe	*Poliocephalus poliocephalus*	2005	10	-	-	-
Great Cormorant	*Phalacrocorax carbo*	2005	8	-	-	-
Little Black Cormorant	*Phalacrocorax sulcirostris*	2005	8	-	-	-
Pied Cormorant	*Phalacrocorax varius*	1997	2	-	-	-

Common Name	Scientific Name	Last Documented Record (AVW)	Total # of Documented Records (AVW)	Hollow Use	Mi/ Ma	Present Survey
Little Pied Cormorant	*Microcarbo melanoleucos*	2005	14	-	-	-
Darter	*Anhinga novaehollandiae*	2002	4	-	-	-
Australian Pelican	*Pelecanus conspicillatus*	2002	4	-	Ma	-
Whiskered Tern	*Chlidonias hybridus*	2004	1	-	Ma	-
Silver Gull	*Chroicocephalus novaehollandiae*	2006	2	-	Ma	-
Red-kneed Dotterel	*Erythrogonys cinctus*	2004	1	-	-	-
Masked Lapwing	*Vanellus miles*	2005	18	-	-	-
Black-fronted Dotterel	*Elseyornis melanops*	2006	15	-	-	-
Black-winged Stilt	*Himantopus himantopus*	2004	3	-	Ma	-
Marsh Sandpiper	*Tringa stagnatilis*	2004	1	-	Mi/Ma	-
Latham's Snipe	*Gallinago hardwickii*	2006	12	-	Mi/Ma	-
Australian White Ibis	*Threskiornis molucca*	2004	11	-	Ma	-
Straw-necked Ibis	*Threskiornis spinicollis*	2004	13	-	Ma	-
Royal Spoonbill	*Platalea regia*	2005	3	-	-	-
Yellow-billed Spoonbill	*Platalea flavipes*	2002	4	-	-	-
Intermediate Egret	*Ardea intermedia*	0	1	-	Ma	-
Eastern Great Egret	*Ardea modesta*	1995	2	-	Mi/Ma	-
White-faced Heron	*Egretta novaehollandiae*	2006	22	-	-	-
White-necked Heron	*Ardea pacifica*	2002	3	-	-	-
Australian Wood Duck	*Chenonetta jubata*	2006	51	Total	-	-
Black Swan	*Cygnus atratus*	2004	12	-	-	-
Australian Shelduck	*Tadorna tadornoides*	2004	6	Total	-	-
Pacific Black Duck	*Anas superciliosa*	2006	42	-	-	-
Chestnut Teal	*Anas castanea*	2005	23	Total	-	-
Grey Teal	*Anas gracilis*	2004	9	Total	-	-
Australasian Shoveler	*Anas rhynchotis*	2005	9	-	-	-
Pink-eared Duck	*Malacorhynchus membranaceus*	2004	4	Partial	-	-
Freckled Duck	*Stictonetta naevosa*	2002	1	-	-	-
Hardhead	*Aythya australis*	2005	11	-	-	-

Common Name	Scientific Name	Last Documented Record (AVW)	Total # of Documented Records (AVW)	Hollow Use	Mi/ Ma	Present Survey
Blue-billed Duck	*Oxyura australis*	2002	10	-	-	-
Musk Duck	*Biziura lobata*	1992	2	-	Ma	-
Spotted Harrier	*Circus assimilis*	2004	1	-	-	-
Swamp Harrier	*Circus approximans*	2005	6	-	Ma	-
Brown Goshawk	*Accipiter fasciatus*	2004	9	-	Ma	-
Collared Sparrowhawk	*Accipiter cirrhocephalus*	2000	1	-	-	-
Wedge-tailed Eagle	*Aquila audax*	2001	26	-	-	-
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	0	1	-	Mi/Ma	-
Whistling Kite	*Haliastur sphenurus*	1992	2	-	Ma	-
Black-shouldered Kite	*Elanus axillaris*	2004	5	-	-	-
Australian Hobby	*Falco longipennis*	2005	6	-	-	-
Peregrine Falcon	*Falco peregrinus*	2005	2	Partial	-	-
Brown Falcon	*Falco berigora*	2002	5	-	-	-
Nankeen Kestrel	*Falco cenchroides*	1999	2	Partial	Ma	-
Southern Boobook	*Ninox novaeseelandiae*	2001	26	Total	Ma	-
Barking Owl	*Ninox connivens*	1999	1	Total	-	-
Powerful Owl	*Ninox strenua*	2003	4	Total	-	-
Pacific Barn Owl	*Tyto javanica*	2001	3	Partial	-	-
Sooty Owl	*Tyto tenebricosa*	1992	1	Total	-	-
Rainbow Lorikeet	*Trichoglossus haematodus*	2005	4	Total	-	-
Musk Lorikeet	*Glossopsitta concinna*	1999	1	Total	-	-
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	2005	37	Total	-	-
Gang-gang Cockatoo	*Callocephalon fimbriatum*	2004	28	Total	-	-
Sulphur-crested Cockatoo	*Cacatua galerita*	2005	26	Total	-	-
Little Corella	*Cacatua sanguinea*	2005	6	Total	-	-
Long-billed Corella	*Cacatua tenuirostris*	2002	3	Total	-	-
Galah	*Eolophus roseicapilla*	2005	19	Total	-	-
Superb Parrot	*Polytelis swainsonii*	0	1	Total	-	-
Australian King-Parrot	*Alisterus scapularis*	2001	8	Total	-	-

Common Name	Scientific Name	Last Documented Record (AVW)	Total # of Documented Records (AVW)	Hollow Use	Mi/ Ma	Present Survey
Crimson Rosella	*Platycercus elegans elegans*	2005	69	Total	-	-
Eastern Rosella	*Platycercus eximius*	2005	50	Total	-	-
Swift Parrot	*Lathamus discolor*	1989	1	Total	Ma	-
Tawny Frogmouth	*Podargus strigoides*	1993	6	-	-	-
Australian Owlet-nightjar	*Aegotheles cristatus*	2001	4	Total	-	-
Laughing Kookaburra	*Dacelo novaeguineae*	2005	71	Total	-	-
Sacred Kingfisher	*Todiramphus sanctus*	2002	13	Partial	Ma	-
White-throated Needletail	*Hirundapus caudacutus*	2001	2	-	Mi/Ma	-
Pallid Cuckoo	*Cuculus pallidus*	2002	18	-	Ma	-
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	2002	19	-	Ma	-
Brush Cuckoo	*Cacomantis variolosus*	1999	2	-	-	-
Horsfield's Bronze-Cuckoo	*Chrysococcyx basalis*	2002	4	-	Ma	-
Shining Bronze-Cuckoo	*Chrysococcyx lucidus*	2000	5	-	Ma	-
Welcome Swallow	*Hirundo neoxena*	2005	34	Partial	Ma	-
Tree Martin	*Hirundo nigricans*	2002	3	Total	Ma	-
Fairy Martin	*Hirundo ariel*	2004	1	Partial	-	-
Grey Fantail	*Rhipidura albiscarpa*	2006	93	-	-	-
Rufous Fantail	*Rhipidura rufifrons*	2000	7	-	Mi/Ma	-
Willie Wagtail	*Rhipidura leucophrys*	2005	34	-	-	-
Leaden Flycatcher	*Myiagra rubecula*	2000	3	-	-	-
Satin Flycatcher	*Myiagra cyanoleuca*	2000	8	-	Mi/Ma	-
Restless Flycatcher	*Myiagra inquieta*	1978	1	-	-	-
Jacky Winter	*Microeca fascinans*	2000	3	-	-	-
Scarlet Robin	*Petroica boodang*	2001	33	-	-	-
Red-capped Robin	*Petroica goodenovii*	1991	1	-	-	-
Flame Robin	*Petroica phoenicea*	2001	2	-	Ma	-
Eastern Yellow Robin	*Eopsaltria australis*	2001	70	-	-	-
Golden Whistler	*Pachycephala pectoralis*	2002	37	-	-	-
Rufous Whistler	*Pachycephala rufiventris*	2002	36	-	-	-

Common Name	Scientific Name	Last Documented Record (AVW)	Total # of Documented Records (AVW)	Hollow Use	Mi/ Ma	Present Survey
Grey Shrike-thrush	*Colluricincla harmonica*	2006	63	Partial	-	-
Magpie-lark	*Grallina cyanoleuca*	2005	57	-	Ma	-
Crested Shrike-tit	*Falcunculus frontatus*	2000	8	-	-	-
Eastern Whipbird	*Psophodes olivaceus*	2000	14	-	-	-
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	2006	34	-	Ma	-
White-winged Triller	*Lalage sueurii*	2005	1	-	-	-
Australasian Figbird	*Sphecotheres viridis*	1963	1	-	-	-
White-fronted Chat	*Epthianura albifrons*	1993	1	-	-	-
Weebill	*Smicrornis brevirostris*	1999	2	-	-	-
Striated Thornbill	*Acanthiza lineata*	2001	52	-	-	-
Yellow Thornbill	*Acanthiza nana*	2001	2	-	-	-
Brown Thornbill	*Acanthiza pusilla*	2005	80	-	-	-
Buff-rumped Thornbill	*Acanthiza reguloides*	1990	2	-	-	-
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	2004	11	-	-	-
White-browed Scrubwren	*Sericornis frontalis*	2002	39	-	-	-
Large-billed Scrubwren	*Sericornis magnirostris*	1999	1	-	-	-
Brown Songlark	*Cincloramphus cruralis*	1982	1	-	-	-
Rufous Songlark	*Cincloramphus mathewsi*	2002	1	-	-	-
Little Grassbird	*Megalurus gramineus*	1978	1	-	-	-
Clamorous Reed Warbler	*Acrocephalus stentoreus*	2005	11	-	Mi/Ma	-
Golden-headed Cisticola	*Cisticola exilis*	2002	9	-	-	-
Superb Fairy-wren	*Malurus cyaneus*	2005	86	-	-	-
White-browed Woodswallow	*Artamus superciliosus*	1982	1	-	-	-
Dusky Woodswallow	*Artamus cyanopterus*	2004	17	Partial	-	-
Varied Sittella	*Daphoenositta chrysoptera*	2001	9	-	-	-
Brown Treecreeper	*Climacteris picumnus victoriae*	2000	1	Total	-	-
White-throated Treecreeper	*Cormobates leucophaeus*	2001	52	Total	-	-
Mistletoebird	*Dicaeum hirundinaceum*	2001	5	-	-	-
Spotted Pardalote	*Pardalotus punctatus*	2005	63	-	-	-

Common Name	Scientific Name	Last Documented Record (AVW)	Total # of Documented Records (AVW)	Hollow Use	Mi/ Ma	Present Survey
Silvereye	*Zosterops lateralis*	2002	18	-	Ma	-
White-naped Honeyeater	*Melithreptus lunatus*	2001	26	-	-	-
Brown-headed Honeyeater	*Melithreptus brevirostris*	2001	11	-	-	-
Eastern Spinebill	*Acanthorhynchus tenuirostris*	2001	43	-	-	-
Yellow-faced Honeyeater	*Lichenostomus chrysops*	2001	16	-	-	-
White-eared Honeyeater	*Lichenostomus leucotis*	2001	46	-	-	-
Helmeted Honeyeater	*Lichenostomus melanops cassidix*	1915	1	-	Mi	-
White-plumed Honeyeater	*Lichenostomus penicillatus*	2004	22	-	-	-
New Holland Honeyeater	*Phylidonyris novaehollandiae*	2001	12	-	-	-
Bell Miner	*Manorina melanophrys*	2005	38	-	-	-
Noisy Miner	*Manorina melanocephala*	2005	35	-	-	-
Little Wattlebird	*Anthochaera chrysoptera*	2000	5	-	-	-
Red Wattlebird	*Anthochaera carunculata*	2005	68	-	-	-
Beautiful Firetail	*Stagonopleura bella*	1999	3	-	-	-
Zebra Finch	*Taeniopygia guttata*	0	1	-	-	-
Red-browed Finch	*Neochmia temporalis*	2004	26	-	-	-
Olive-backed Oriole	*Oriolus sagittatus*	2001	6	-	-	-
Satin Bowerbird	*Ptilonorhynchus violaceus*	2001	1	-	-	-
Pied Currawong	*Strepera graculina*	2005	16	-	-	-
Grey Currawong	*Strepera versicolor*	2001	12	-	-	-
Grey Butcherbird	*Cracticus torquatus*	2005	62	-	-	-
Australian Magpie	*Gymnorhina tibicen*	2005	80	-	-	-
Bassian Thrush	*Zoothera lunulata*	2000	8	-	Ma	-
Unknown Raven	*Corvus sp.*	2004	7	-	-	-
Australian Raven	*Corvus coronoides*	2004	18	-	-	-
*Northern Mallard	*Anas platyrhynchos*	2004	1	-	-	-
Little Raven	*Corvus mellori*	2005	22	-	Ma	-
*Rock Dove	*Columba livia*	1988	1	-	-	-
Striated Pardalote	*Pardalotus striatus*	2002	12	Partial	-	-

Common Name	Scientific Name	Last Documented Record (AVW)	Total # of Documented Records (AVW)	Hollow Use	Mi/ Ma	Present Survey
Cattle Egret	*Ardea ibis*	2004	4	-	Mi/Ma	-
*Spotted Turtle-Dove	*Streptopelia chinensis*	2005	67	-	-	-
*Common Blackbird	*Turdus merula*	2006	67	-	-	-
*Song Thrush	*Turdus philomelos*	2002	1	-	-	-
*European Skylark	*Alauda arvensis*	2001	4	-	-	-
*House Sparrow	*Passer domesticus*	2005	8	-	-	-
*European Goldfinch	*Carduelis carduelis*	2004	17	-	-	-
*European Greenfinch	*Carduelis chloris*	2005	2	-	-	-
*Common Myna	*Acridotheres tristis*	2006	40	-	-	-
*Common Starling	*Sturnus vulgaris*	2006	44	Partial	-	-
	FISHES					
Short-finned Eel	*Anguilla australis*	2005	14	-	-	-
Long-finned Eel	*Anguilla reinhardtii*	1985	1	-	-	-
*Rainbow Trout	*Oncorhynchus mykiss*	1985	1	-	-	-
*Brown Trout	*Salmo trutta*	1985	2	-	-	-
Australian Grayling	*Prototroctes maraena*	1985	2	-	-	-
Broad-finned Galaxias	*Galaxias brevipinnis*	1997	6	-	-	-
Common Galaxias	*Galaxias maculatus*	1997	10	-	-	-
Spotted Galaxias	*Galaxias truttaceus*	1985	2	-	-	-
Dwarf Galaxias	*Galaxiella pusilla*	1999	9	-	-	-
*Eastern Gambusia	*Gambusia holbrooki*	1999	9	-	-	-
Southern Pigmy Perch	*Nannoperca australis*	1999	17	-	-	-
*Redfin Perch	*Perca fluviatilis*	2006	1	-	-	-
River Blackfish	*Gadopsis marmoratus*	1985	1	-	-	-
Tupong	*Pseudaphritis urvillii*	1997	3	-	-	-
	FROGS					
Southern Bullfrog	*Limnodynastes dumerilii*	2006	16	-	-	-
Striped Marsh Frog	*Limnodynastes peronii*	2006	34	-	-	-
Spotted Marsh Frog	*Limnodynastes tasmaniensis*	2004	10	-	-	-

Common Name	Scientific Name	Last Documented Record (AVW)	Total # of Documented Records (AVW)	Hollow Use	Mi/ Ma	Present Survey
Southern Toadlet	*Pseudophryne semimarmorata*	1981	82	-	-	-
Common Froglet	*Crinia signifera*	2006	61	-	-	-
Southern Brown Tree Frog	*Litoria ewingii*	2005	150	-	-	-
Growling Grass Frog	*Litoria raniformis*	2006	86	-	-	-
Verreaux's Tree Frog	*Litoria verreauxii*	1992	123	-	-	-
Southern Brown Tree Frog (southern)	*Litoria ewingii (southern)*	1989	3	-	-	-
WhistlingTree Frog	*Litoria verreauxii verreauxii*	2006	50	-	-	-
Spotted Marsh Frog SCR	*Limnodynastes tasmaniensis SCR*	2006	39	-	-	-
	INVERTEBRATES					
Granular Burrowing Cray	*Engaeus cunicularius*	1982	1	-	-	-
	REPTILES					
Tree Dragon	*Amphibolurus muricatus*	1972	1	Partial	-	-
McCoy's Skink	*Nannoscincus maccoyi*	2000	5	-	-	-
Delicate Skink	*Lampropholis delicata*	1981	12	-	-	-
Garden Skink	*Lampropholis guichenoti*	2005	26	-	-	-
Weasel Skink	*Saproscincus mustelinus*	2002	9	-	-	-
Metallic Skink	*Niveoscincus metallicus*	1977	2	-	-	-
Blotched Blue-tongued Lizard	*Tiliqua nigrolutea*	2000	5	-	-	-
Eastern Small-eyed Snake	*Rhinoplocephalus nigrescens*	1981	6	-	-	-
White-lipped Snake	*Drysdalia coronoides*	1964	3	-	-	-
Eastern Three-lined Skink	*Bassiana duperreyi*	1964	1	-	-	-
Black Rock Skink	*Egernia saxatilis intermedia*	1904	1	Partial	-	-
Southern Water Skink	*Eulamprus tympanum tympanum*	1977	1	-	-	-
Lowland Copperhead	*Austrelaps superbus*	1996	26	-	-	-
Unidentified scincid	*Scincidae sp.*	2000	1	-	-	-
Unidentified grass skink	*Pseudemoia sp.*	1993	1	-	-	-

Source: DSE Atlas of Victorian Wildlife (2007)

Appendix 2.2 – Significant fauna species

Table A2.2. 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)

Species status:

EX Extinct
RX Regionally extinct
CR Critically endangered
EN Endangered
VU Vulnerable
RA Rare
NT Near threatened
CD Conservation dependent
LR Lower risk (least concern)
DD Data deficient (insufficiently or poorly known)
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								
Superb Parrot	*Polytelis swainsonii*	0	1	VU	EN	L	VU	-
# Swift Parrot	*Lathamus discolor*	1989	1	EN	EN	L	EN	-

Common Name	Scientific Name	Last documented record	Total # of records	EPBC Act	DSE (2007)	FFG ACT	National Action Plan	Likely use of study area
Helmeted Honeyeater	*Lichenostomus melanops cassidix*	1915	1	EN	CR	L	CR	-
# Grey-headed Flying-fox	*Pteropus poliocephalus*	2003	1	VU	VU	L	VU	-
# Growling Grass Frog	*Litoria raniformis*	2006	86	VU	EN	L	VU	-
# Australian Grayling	*Prototroctes maraena*	1985	2	VU	VU	L	VU	-
# Dwarf Galaxias	*Galaxiella pusilla*	1999	9	VU	VU	L	VU	-
# Regent Honeyeater	Anthochaera phrygia	-	-	VU	VU	L	VU	
# Australian Painted Snipe	Rostratula australis	-	-	VU	CR	L	VU	
# Golden Sun Moth	Synemon plana	-	-	CR	-	L	-	
# Spot-tailed Quoll	Dasyurus maculatus maculatus	-	-	EN	EN	L	VU	
# Southern Brown Bandicoot	*Isoodon obesulus obesulus*	-	-	EN	NT	I	NT	
# Long-nosed Potoroo	*Potorous tridactylus tridactylus*	-	-	VU	EN	L	VU	
# Smoky Mouse	*Pseudomys fumeus*	-	-	EN	CR	L	RA	
STATE SIGNIFICANCE								
Baillon's Crake	*Porzana pusilla*	2003	1	-	VU	L	-	-
Royal Spoonbill	*Platalea regia*	2005	3	-	VU	-	-	-
Intermediate Egret	*Ardea intermedia*	0	1	-	CR	L	-	-
Eastern Great Egret	*Ardea modesta*	1995	2	-	VU	L	-	-
Australasian Shoveler	*Anas rhynchotis*	2005	9	-	VU	-	-	-
Freckled Duck	*Stictonetta naevosa*	2002	1	-	EN	L	-	-
Hardhead	*Aythya australis*	2005	11	-	VU	-	-	-
Blue-billed Duck	*Oxyura australis*	2002	10	-	EN	L	-	-
Musk Duck	*Biziura lobata*	1992	2	-	VU	-	-	-
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	0	1	-	VU	L	-	-
Barking Owl	*Ninox connivens*	1999	1	-	EN	L	NT	-
Powerful Owl	*Ninox strenua*	2003	4	-	VU	L	-	-
Sooty Owl	*Tyto tenebricosa*	1992	1	-	VU	L	-	-
Brown Treecreeper	*Climacteris picumnus victoriae*	2000	1	-	NT	-	NT	-
REGIONAL SIGNIFICANCE								
Pied Cormorant	*Phalacrocorax varius*	1997	2	-	NT	-	-	-

Common Name	Scientific Name	Last documented record	Total # of records	EPBC Act	DSE (2007)	FFG ACT	National Action Plan	Likely use of study area
Whiskered Tern	*Chlidonias hybridus*	2004	1	-	NT	-	-	-
Latham's Snipe	*Gallinago hardwickii*	2006	12	-	NT	-	-	-
UNKNOWN SIGNIFICANCE								

Source: DSE Atlas of Victorian Wildlife (AVW 2007); DEWHA Protected Matters Search Tool (http://www.environment.gov.au/erin/ert/epbc/index.html)

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