



# Healesville - Koo Wee Rup Road - Pakenham Bypass, Alternate Connection. Desktop Review of Flora and Fauna Values

Project: 07-63

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VicRoads



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## Summary

Ecology Australia was commissioned by VicRoads to undertake a desktop review of potential flora and fauna values of the area proposed for a new alignment which lies south of the Pakenham Bypass between Toomuc Creek and McGregor Rd, and extends eastwards towards the Healesville - Koo Wee Rup Rd. Ecology Australia has already undertaken a desktop review, and target surveys for selected EPBC-listed flora and fauna species, for the Healesville – Koo Wee Rup Road upgrade study area. The purpose of this desktop investigation is to provide a supplementary review of the flora and fauna values for the proposed new alignment option situated in an additional study area for the project.

## Flora

### Vegetation communities

A large proportion of the study area has not been mapped as supporting remnant vegetation. Some remnant patches may still occur, however it is likely that much of the area has been cleared of remnant vegetation and is now dominated by exotic, particularly improved pasture, species. Some indigenous plant species will persist within this vegetation, including remnant trees.

Small patches of remnant Swamp Scrub and Swampy Woodland/Swampy Riparian Ecological Vegetation Classes (EVCs) have been mapped and/or recorded within the study area and surrounds. A degraded vestige of Plains Grassland was also recorded along Watson Road, west of McGregor Road during a brief site visit. All these EVCs are Endangered in the Gippsland Plain Bioregion and Plains Grassland (South Gippsland) is listed as a threatened community under the Victorian *Flora and Fauna Guarantee Act 1988*.

Constructed wetlands (i.e. farm dams and drains) occur throughout the study area and while weed species are present, many support indigenous species of variable cover and diversity.

### Significant flora

A total of 214 plant species has previously been recorded from the flora data review. Of these, 101 (47%) are introduced species. Two species are listed under the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*, one under the *Flora and Fauna Guarantee (FFG) Act 1988* and an additional five species are classified as rare or threatened in Victoria. Another three EPBC-listed species were identified as having potential habitat occurring within 5 km of the study area by the EPBC Protected Matters Search Tool. Of all these significant species, two species (River Swamp Wallaby-grass *Amphibromus fluitans* (EPBC-listed) and Austral Cranesbill *Geranium solanderi* var. *solanderi*) have a moderate likelihood of occurrence within the study area and Veined Spear-grass (*Austostipa rudis* ssp. *australis*) (rare in Victoria) was recorded during the brief roadside investigation.

## **Fauna**

### Fauna habitats

In general, fauna habitats within the study area are of low quality. Five fauna habitat types were recognised: open pasture; roadside plantings/ shelterbelts; isolated indigenous trees; Swamp Scrub; and wetland formation. Most of these habitat types, with the exception of wetland formation, support mostly common and adaptive bird species.

Farm dams in the western half of the study area support the *Environment Protection and Biodiversity Conservation Act* (EPBC) - listed Growling Grass Frog which use these as breeding sites, and use Toomuc and Deep Creeks and small drainage lines as dispersal corridors.

### Significant fauna

A total of 84 fauna species (12 exotic) was previously recorded within 5 km of the proposed alignment. Two of these species are listed under the EPBC Act 1999, a further two are listed under the FFG Act 1988, and another eight are classified as threatened in Victoria (DSE 2007b). Three significant species have a moderate to high likelihood of regular occurrence within the study area: EPBC- and FFG-listed Growling Grass Frog and state-classified Latham's Snipe and Nankeen Night Heron. In addition, an 'important population' of the Growling Grass Frog as defined under the EPBC Act, has been previously identified in the western half of the study area.

## **Potential impacts**

Based on current information, the key issues and potential impacts that have been identified for the proposed road include:

- Habitat loss for the Growling Grass Frog, including loss of farm dams, especially west of McGregor Road, and loss of foraging habitat associated with the conversion of pasture to a roadway;
- Barrier effects and fragmentation, limiting the dispersal and movement of Growling Grass Frogs, and consequently, reducing the viability of the population.
- Increased mortality of fauna due to road-kill, especially rare or threatened fauna which may attempt to cross the road, including wetland birds and frogs;
- Loss of significant flora species and/or vegetation communities because they are within the road alignment and cannot be avoided, and/or are lost as a result of indirect impacts (e.g. weed invasion);
- Loss of persistent remnant vegetation within the road alignment;
- Increased weed invasion which may be promoted by construction of the roads through general soil disturbance and the dispersal of weeds seeds by vehicles and machinery; and
- Sedimentation and pollution of creek and drainage lines from uncontrolled run-off.

## **Recommendations**

If the proposed alignment is adopted, a more detailed assessment of the flora and fauna values and potential impacts is required, particularly in relation to significant flora and fauna species and Net Gain. The most significant issue identified in this desktop study is that the study area has been identified as supporting an 'important population' of the EPBC - listed Growling Grass Frog, as defined under the EPBC Act 1999. The reason for this definition being that this population is a key source population for breeding and dispersal (Ecology Partners 2007). Consequently, and depending on the nature of the finalised alignment, a referral to the Commonwealth Department of Environment and Water Resources is likely to be required.

Further recommendations are provided in Section 6.

## 1 Introduction

A planning study is currently underway to determine options for the future upgrade of the Healesville - Koo Wee Rup Road between the Pakenham Bypass in the north and the South Gippsland Highway in the south. Proposed options for the upgrade project would entail either duplication or widening of the Healesville - Koo Wee Rup Road. Further to this, a new alignment option is presently being considered at the northern end of the project, which would provide an alternative connection to the Pakenham Bypass. Ecology Australia was commissioned by VicRoads to undertake a desktop review of potential flora and fauna values of the area proposed for the new alignment which lies south of the Pakenham Bypass between Toomuc Creek and McGregor Road, and extends eastwards towards the Healesville - Koo Wee Rup Road (Figure 1).

A previous desktop review of the flora and fauna values of the Healesville - Koo Wee Rup Road reservation and immediate surrounds between Pakenham and Koo Wee Rup was undertaken by Ecology Australia in 2005. As recommended, further targeted surveys for threatened flora and fauna potentially impacted upon by the road upgrade, were conducted later the same year and in early 2006. A larger area to the west of the Koo Wee Rup township was also surveyed in consideration of options for a bypass of the town.

The purpose of this desktop investigation is to provide a supplementary review of the flora and fauna values for the proposed new alignment option situated in an additional study area for the project. The objectives of this review were to identify:

- flora and fauna values of the study area;
- areas of potential significance within the study area;
- areas that may require further investigation; and
- potential impacts of the proposed alignment

Fish are not considered as part of this assessment. However, Streamline Research Pty Ltd has previously undertaken an assessment of drains and streams for the broader Healesville – Koo Wee Rup study area, including surveys of roadside drains, Deep Creek and the Bunyip River.



## 2 Study Area

The study area consists of the proposed new alignment route and associated road reservation currently being considered as an alternative connection to the Pakenham Bypass from the Healesville - Koo Wee Rup Road. The area to be surveyed stretches south of the Pakenham Bypass between Toomuc Creek and McGregor Road. Bounded by Watson Road at the southern end, it then continues eastwards, to the eastern side of the Healesville - Koo Wee Rup Road. At the eastern boundary, the study area is intersected by Deep Creek, and is adjoined by the South East Water Pakenham Treatment Plant. The study area includes a small section (south western corner) of the Pakenham Treatment Plant, which does not include the lagoons or treatment ponds. These wetlands are located in the northern section of the Pakenham Treatment Plant (Figure 1).

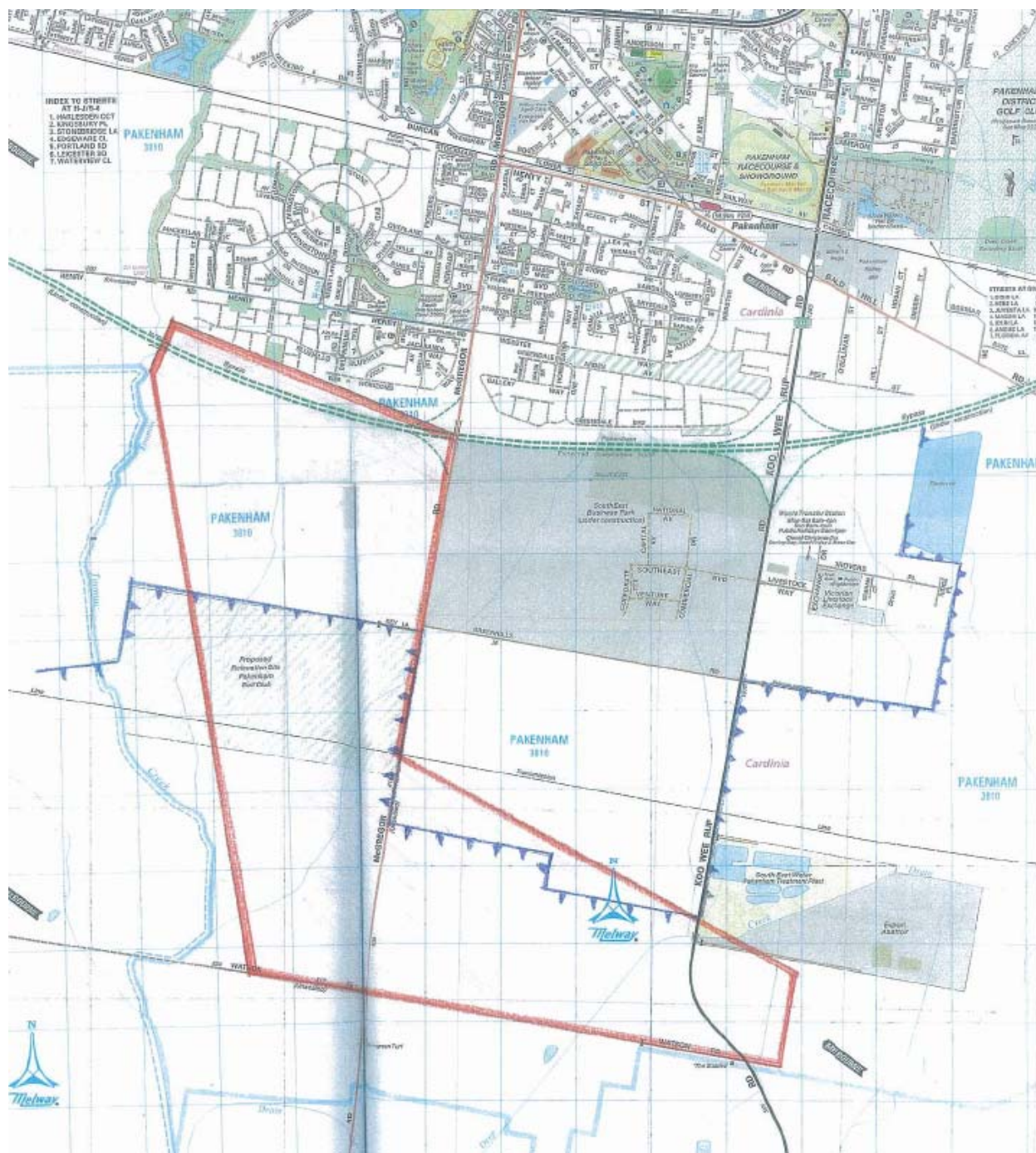
The broader area has been highly modified and subjected to a long history of disturbance since the drainage of the Koo Wee Rup Swamp, construction of drainage channels, and land clearance for agriculture. The majority of the study area and surrounding landscape comprises pastoral land, predominantly used for grazing. Small areas of land are used for crop cultivation. Relatively, small patches of remnant vegetation remain along roadsides and around Toomuc and Deep Creeks. Larger patches of remnant vegetation persist around Yallock Creek, the Healesville – Koo Wee Rup Road and around Bayles in the surrounding areas. Adjoining the study area, and immediately to the north of the Pakenham Bypass, is the residential area of Pakenham, characterised by residential gardens and non-indigenous planted street trees. The areas north of Key Lane (west of McGregor Road) and south of Greenhills Road (east of McGregor Road), now forms part of the Casey - Cardinia Urban Growth Boundary (DSE 2005a, Figure 1 blue line).

The study area falls within the Gippsland Plain Bioregion, which experiences a relatively uniform, temperate climate of warm, dry summers and cool, wet winters. The mean daily maximum temperatures at Tooradin, the closest weather station, range from 13.1°C in July and 26.0°C in January (Bureau of Meteorology data). Mean daily minimum temperatures range between 3.8°C in July to 12.1°C in February. Mean annual rainfall is 853 mm at Tooradin.

The soils are sedimentary, formed during the Pleistocene, comprising stream alluvium, floodplain and low level terrace deposits. They are comprised of Quaternary alluvium consisting primarily of stream alluvium, sand, silt, clay and gravel (Geological Survey Map Warragul Series, Mines Department, Melbourne 1971).

The south eastern section of the study area would have once formed part of the great Koo Wee Rup Swamp, prior to drainage and clearance of extensive areas of vegetation in the early 19<sup>th</sup> Century.

Both Toomuc and Deep Creeks flow into the Westernport Ramsar Wetland Site (ANCA 1996; DSE 2003), c. 10 km downstream (and south) of the study area. Ramsar wetlands are internationally important wetlands listed under the International Convention on Wetlands (i.e. the Ramsar Convention). These wetlands are important especially in regard to total numbers and/or numbers of species of waterbird, and are also matters of national environmental significance listed under the EPBC Act 1999.



**Figure 1** Map of the study area for the Healesville - Koo Wee Rup Road - Pakenham Bypass, alternate connection (red line).

## 3 Methods

### 3.1 Desktop review

The assessment of flora and fauna values consisted primarily of a desktop review of relevant databases, existing literature and background information pertaining to the study area and surrounds. The information was compiled to:

1. identify significant flora and fauna which may occur in the study area;
2. provide an overview of the flora and fauna values previously researched; and
3. identify any known or potential constraints within the proposed alignment.

A review of databases used to identify flora and fauna values, included:

- Flora records within 5 km of the study area (referred to as the Data Review Area – DRA) held in the Flora Information System (FIS), a state-wide database maintained by the Department of Sustainability and Environment (DSE 2005b) (see Appendix 1);
- Fauna records within 5 km of the study area (referred to as the Data Review Area - DRA) held in the Victorian Fauna Display (DSE 2004), a CD-ROM version of the Atlas of Victorian Wildlife (AVW) database, curated by the Department of Sustainability and Environment (see Appendix 3);
- A search for flora and fauna species listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), using the EPBC Protected Matters Search Tool (DEWR 2007) for species listed as potentially occurring (or potential habitat occurring) within 5 km of the study area (see Appendix 4);
- Aerial photography supplied by the client; and
- Ecological Vegetation Class mapping/modelling (both extant and pre-1750) (DSE 2007a) of the area.

Relevant literature reviewed included previous consultancy reports of the area by:

- Ecology Australia Pty Ltd (2002, 2003, 2004a,b,c, 2005a,b, 2006a,b,c,d,e,f);
- Wildlife Profiles Pty Ltd (2002, 2004);
- Biosis Research Pty Ltd (2003; 2005); and
- Ecology Partners Pty Ltd (2007).

### 3.2 Site visit

A brief roadside field investigation was conducted on 25 October 2007 by two zoologists and a botanist to help identify potential constraints associated with the route alignment.

### 3.3 Fauna and flora significance

Levels of conservation significance are attributed to sites, EVCs and species. Categories of significance used in this report have been derived from the following sources:

- Flora species of State and National significance from the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) listings, DSE (2005c) and/or Walsh and Stajsic (2007);
- Fauna species of State and National significance from the EPBC Act and FFG Act listings, DSE (2007b), Bannister et al. (1996), Cogger et al. (1993), Duncan et al. (1999), Garnett and Crowley (2000), Lee (1995), Maxwell et al. (1996), Pogonoski et al. (2002), Tyler (1997), Wager and Jackson (1993), or Sands and New (2003); and
- The conservation status of Ecological Vegetation Classes (EVCs) in the Gippsland Plains Bioregion is specified by DSE (2007c).

### 3.4 Nomenclature and taxonomy

Plant taxonomy and the use of common names follow the accepted authorities- Walsh and Stajsic (2007) and DSE (2005b).

An asterisk (\*) preceding the plant name is used to signify non-indigenous taxa, which are those that would not naturally occur in the particular habitat. A hash (#) is used to denote native plants that are not indigenous in the relevant vegetation types.

The scientific names, common names, and systematic orders of fauna species follow Churchill (1998), Stanger *et al.* (1998), Birds Australia (2003), Wilson and Swan (2003) and DSE (2004a). In general, common names are used in text.

An asterisk (\*) is used to define exotic species, which are those that have been introduced to Australia.

### 3.5 Limitations

This study is a desktop review of databases, existing literature and previous reports, thus, some data may be outdated. The potential constraints and recommendations provided are based on these results, and hence, the information presented should be used as a guide only. Although the flora and fauna of the Pakenham area are generally well known, more intensive on-ground surveys will be required to firm the information and recommendations presented here.

## 4 Values

### 4.1 Flora

#### 4.1.1 Vegetation communities

Two Ecological Vegetation Classes (EVCs), Swampy Woodland and Swamp Scrub, have been mapped/modelled for the study area and surrounds (Figure 2). Pre-European mapping of the vegetation communities by DSE (2007c) and Yugovic and Mitchell (2006) indicates that a large proportion of the study area (the alluvial plains) was once dominated by Plains Grassland, and the Swamp Scrub and Swampy Woodland vegetation communities were restricted to the creeks and the northern section of the former Dalmore Swamp. These vegetation communities are discussed further below. All three EVCs are Endangered in the Gippsland Plain Bioregion and Plains Grassland (South Gippsland) is listed as a threatened community under the Victorian *Flora and Fauna Guarantee Act 1988*.

A large proportion of the study area has not been mapped as supporting remnant vegetation. Some remnant patches may still occur, however it is likely that much of the area has been cleared of remnant vegetation and is now dominated by exotic, particularly improved pasture, species (Ecology Australia 2005a and Ecology Partners 2007). Some indigenous plant species will persist within this vegetation, including remnant trees (e.g. Swamp Gum *Eucalyptus ovata* var. *ovata*, Blackwood *Acacia melanoxylon* and Black Wattle *Acacia mearnsii*).

Constructed wetlands (i.e. farm dams and drains) within the study area also support a range of indigenous species including Swamp Wallaby-grass *Amphibromus nervosus*, Rushes (*Juncus* spp.), Common Reed (*Phragmites australis*), Bulrush (*Typha* sp.), Tall Sedge (*Carex appressa*), Knotweeds (*Persicaria* species), Common Spike-sedge (*Eleocharis acuta*) and Water Milfoil (*Myriophyllum* spp.). Many of the wetlands support a high cover of exotic species, however, the drain along Watson Road supports a relatively good cover of indigenous species.

#### Swamp Scrub

In the broader area, Swamp Scrub would have originally occupied large areas of the former Koo Wee Rup and Dalmore Swamps (Yugovic and Mitchell 2006) and is now predominately restricted to road reserves, drainage lines and creeks (Ecology Australia 2004a,b and 2005a). Within the study area, remnant patches of Swamp Scrub have been mapped along Toomuc and Deep Creeks (Figure 2). In addition, this EVC was also recorded during the current and previous surveys (Ecology Australia 2005a) along sections of Koo Wee Rup Road, particularly the western side where it extends into the adjoining unnamed road. A remnant of Swamp Scrub has also been recorded on Watson Road (Brown 2005).

The most common indigenous species recorded include Swamp Paperbark (*Melaleuca ericifolia*), Blackwood, Common Reed (*Phragmites australis*), Slender Knotweed (*Persicaria decipiens*), Tall

Sedge (*Carex appressa*) and Rushes (*Juncus* spp.). Patches that have been surveyed are heavily infested with high threat weed species, including Blackberry (*\*Rubus* spp.) and exotic grasses, particularly Canary Grass (*\*Phalaris aquatica*), Yorkshire Fog (*\*Holcus lanatus*) and Cocksfoot (*\*Dactylis glomerata*).

### **Swampy Woodland**

Based on previous studies Swampy Woodland and/or Swampy Riparian Woodland would have once occupied sections of Toomuc and Deep Creeks (Ecology Australia 2004a, Biosis 2003 Ecology Partners 2007). Before clearing, Swampy Woodland is also likely to have occurred as localised patches on the sand ridges of the outer sections of the Koo Wee Rup Swamp (Yugovic and Mitchell 2006).

Extant mapping of Swampy Woodland indicates that it is present within the road reserves of McGregor and Watson Roads (Figure 2). The patch on McGregor Road is not Swampy Woodland and consists of scattered Blackwoods, Common Reed and Wallaby Grasses (*Austrodanthonia* spp.). A large proportion of the ground flora is made up of exotic species. The trees in the adjoining paddock are planted non-indigenous eucalypt species and have probably resulted in the area being modelled as Swampy Woodland.

The remnant patch on Watson Road is restricted to the northern side of the road and supports Swamp Paperbark, Blackwood, Common Reed and a high cover of exotic grasses. The planted trees on the southern side adjoining the road reserve have also been mapped as supporting remnant vegetation, however as with McGregor Road, these trees have probably influenced the EVC mapping.

### **Plains Grassland**

The majority of the area between Toomuc and Deep Creeks is likely to have once supported Plains Grassland dominated by Common Tussock-grass (*Poa labillardierei*). Yugovic and Mitchell (2006) note that this community would have included an open woodland in parts, with Blackwood and to a lesser extent Swamp Gum being the dominant canopy trees when present. Blackwoods are scattered throughout the road reserves of the study area, particularly along McGregor and Watson Roads.

No extant Plains Grassland has been mapped for the study area or surrounds. Ecology Partners (2007) recorded patches of Kangaroo Grass dominated grassland within the road reserve of Greenhills Road just outside the study area. Degraded vestiges of this vegetation community were also recorded during the current survey along Watson Road, west of McGregor Road. Indigenous species recorded include: Kangaroo Grass, Common Tussock-grass, Sheep's Burr (*Acaena ovina*), Cranesbill (*Geranium* sp.), Common Wheat-grass (*Elymus scaber*), Veined Spear-grass (*Austrostipa rudis* ssp. *australis*) and Wallaby Grasses. Veined Spear-grass is classified as rare in Victoria (DSE 2005c)

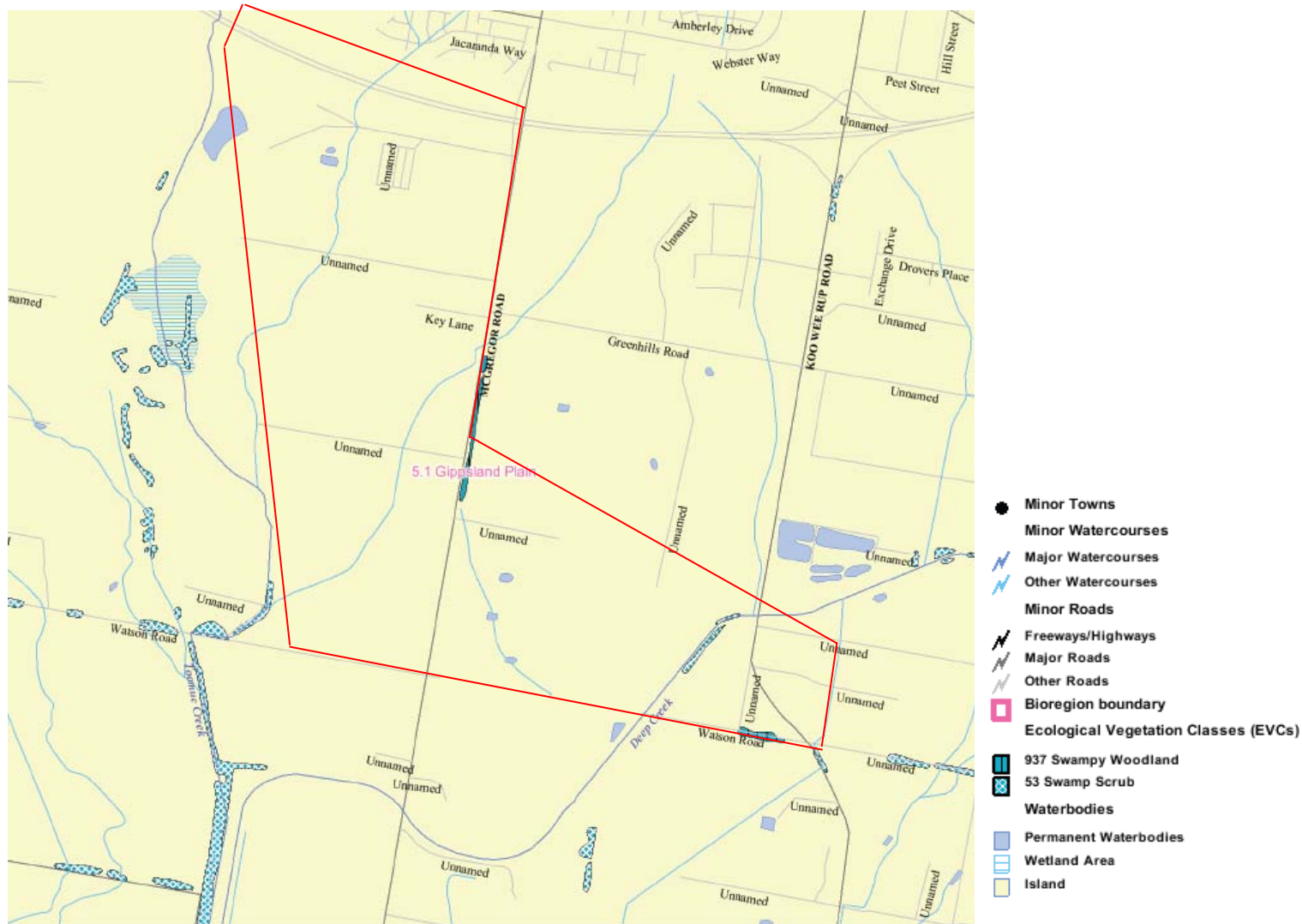


Figure 2 Extant ecological vegetation classes modelled for the study area (red line) and surrounds (taken from DSE 2007a).

#### 4.1.2 Significant plant species

A total of 214 plant species has previously been recorded from the flora data review area (Appendix 1). Of these, 101 (47%) are introduced species. Two species are listed under the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*, one under the *Flora and Fauna Guarantee Act 1988* and an additional five species are classified as rare or threatened in Victoria (Table 1). Three additional EPBC-listed species (River Swamp Wallaby-grass *Amphibromus fluitans*, Metallic Sun-orchid *Thelymitra epipactoides*, Swamp Everlasting *Xerochrysum palustre*) were identified as having potential habitat occurring within 5 km of the study area by the EPBC Protected Matters Search Tool (DEWR 2007). All of the above species have been given a likelihood of occurrence (Table 1) based on the following:

- comparisons of site factors (climate, soils, topography) within the study area to sites carrying known populations;
- general condition and land use history of the study area, i.e. level of disturbance; and
- date(s) and number of records.

Species in Table 1 with a moderate or higher likelihood of occurrence within the study area are discussed below. Species that have been recorded within the flora data review area and that have a low likelihood of occurrence are addressed in Appendix 2.



**Table 1 Threatened flora species previously recorded within 5 km of the study area from the DRA and EPBC Protected Matters Search, and their likelihood of regular occurrence (LRO) within the study area**

Name Scientific	Common	Status	Listed	Records	Year/s	Approximate location (nearest road)	LO
<i>Amphibromus fluitans</i>	River Swamp Wallaby-grass	V	EPBC	*	*	*	Low - moderate
<i>Austrostipa rudis</i> ssp. <i>australis</i>	Veined Spear-grass	r		1	2001	Bald Hill Road, Pakenham	Recorded
				1	2003	Harold Street, Officer	
<i>Carex chlorantha</i>	Green-top Sedge	k		1	1903	Princess Highway, Pakenham	Low
<i>Craspedia canens</i>	Grey Billy-buttons	e		1	2001	Bald Hill Road (Rail reserve), Pakenham	Low
<i>Dianella amoena</i>	Matted Flax-lily	E e	EPBC	4	1998 - 2002	Bald Hill Road (rail reserve), Pakenham	Low
				1	2004	Harold Street, Officer	
				1	2003	Mary Street, Officer	
					2004	Lecky Road, Officer	
<i>Geranium solanderi</i> var. <i>solanderi</i>	Austral Cranesbill	v		2	2001 - 2004	Bald Hill Rd (rail reserve), Pakenham	Moderate
<i>Prasophyllum frenchii</i>	Maroon Leek-orchid	E e	EPBC, FFG	2	2001	Bald Hill Road (Rail reserve), Pakenham	Low
				3	1930, 1932	Princess Highway & Pakenham Rd, Pakenham	
<i>Pterostylis grandiflora</i>	Cobra Greenhood	r		2	1946	Henty Street, Pakenham	Low
<i>Thelymitra epipactoides</i>	Metallic Sun-orchid	E e	EPBC, FFG	*	*	*	Negligible
<i>Xerochrysum palustre</i>	Swamp Everlasting	V v	EPBC, FFG	*	*	*	Low

Legend:

E = listed as endangered in Australia under the EPBC Act 1999

V = listed as vulnerable in Australia under the EPBC Act 1999

e = endangered in Victoria

v = vulnerable in Victoria

r = rare in Victoria

k = unknown, but thought to be rare or threatened in Victoria

FFG = listed under the Flora and Fauna Guarantee Act

EPBC = Environment Protection and Biodiversity Act

\* = no records within 5 km centred on the study area

LO = Likelihood of occurrence

### **River Swamp Wallaby Grass (*Amphibromus fluitans*)**

River Swamp Wallaby Grass is listed under the *EPBC Act* 1999 as Vulnerable. It occurs naturally on floodplains, occupying off-stream wetlands (billabongs and lakes), along small perennial streams. However, it now also occurs widely in constructed wetlands, farm dams and impoundments throughout Victoria (Carr 2005).

River Swamp Wallaby Grass can occupy more-or-less permanently wet habitats with free water, or wetlands which dry completely over summer. The natural (pre-European) hydrological regime is assumed to be typically one of summer draw-down with dry conditions over summer and autumn. Plants are quiescent or dormant during dry conditions and resume vigorous growth with the autumn break and subsequent inundation. The plants however, do not need free water (inundation) to persist in a wetland, but effectively behave as amphibious opportunists (Carr 2005).

Around south-east Melbourne, this plant has been recorded near Cranbourne. Further a field, it has been recorded in the La Trobe Valley. River Swamp Wallaby-grass may have once occurred through the Pakenham – Koo Wee Rup region before the Koo Wee Rup Swamp was drained and indigenous vegetation cleared. A survey for River Swamp Wallaby-grass within the Healesville – Koo Wee Rup Road upgrade study area was undertaken during December 2005 and no plants were recorded. The most suitable potential habitat for this species was recorded within farm dams (Ecology Australia 2006f). Given the moderate quality of the vegetation within the drain on Watson Road and the unknown quality of the wetlands (particularly constructed wetlands) within other parts of the study area, River Swamp Wallaby-grass is given a low-moderate likelihood of occurrence.

### **Veined Spear-grass (*Austrostipa rudis* subsp. *australis*)**

Veined Spear-grass is classified as rare in Victoria (DSE 2005c). It is a tufted, shortly-rhizomatous perennial, growing to 1.3 m, with scabrous leaves. The inflorescence is an open panicle to 50 cm long. It is differentiated from the two other subspecies (*A. rudis* ssp. *rudis* and *A. rudis* ssp. *nervosa*) by its longer awns and the shape of the glumes. Veined Spear-grass occurs mostly in cool areas of moderate altitude, on sandy or sandstone-derived soils and in open-forests (Walsh and Entwisle 1994).

There are records of Veined Spear-grass from north of Bald Hill Road in Pakenham. This species was recorded during the present survey within the road reserve of Watson Road (west of M<sup>c</sup>Gregor Road).

### **Austral Cranesbill (*Geranium solanderi* var. *solanderi*)**

Austral Cranesbill is classified as vulnerable in Victoria (DSE 2005a). It is a perennial herb, characterised by long stem hairs, bright pink petals and stem leaves with narrow lobes (Walsh and Entwisle 1999). This species is found predominantly around Melbourne, especially in the east. It

occurs in damp to dryish and usually sheltered sites, in grassy woodlands, often along drainage lines or in seepage areas (Walsh and Entwisle 1999).

Austral Cranesbill has been recorded in the Gippsland Rail Reserve within Pakenham (Biosis 2003). Given that potential habitat may occur within the study area, this species has a moderate likelihood of occurrence.

## 4.2 Fauna

### 4.2.1 Fauna habitats

In general, fauna habitats are highly degraded and modified. Very little native vegetation remains, and overall the value of most habitats in the study area is low. However, permanent and ephemeral drainage lines together with farm dams, are of high value to the EPBC listed Growling Grass Frog, and also support other frog species and a number of wetland bird species. Within the study area, five habitat types were identified. These include:

1. Open Pasture
2. Roadside Plantings/ Shelter Belts
3. Isolated Indigenous Trees
4. Swamp Scrub
5. Wetland Formations

#### **Open pasture**

Open pasture forms the dominant habitat type within the study area. This habitat type consists primarily of exotic grasses and degraded grassland used for cattle grazing, and in this case also refers to crop land. Open pasture provides foraging habitat mostly for common open country species (e.g. Australian White Ibis, Straw-necked Ibis, Galah, Eastern Rosella, Masked Lapwing, Australian Magpie and Magpie-lark). Pasture also provides foraging habitat for raptors such as the Brown Goshawk, Brown Falcon, Peregrine Falcon, Swamp Harrier, Black-shouldered Kite and Barn Owl. Exotic species (e.g. European Goldfinch, Common Starling and Common Myna) also make use of this degraded habitat type. Agricultural development has benefited many of these species, which have increased in abundance and expanded their ranges with the rise in land cleared for pasture.

#### **Roadside plantings/ shelter belts**

Roadside plantings and shelter belts exist throughout the study area on road reservations and on farmland. These mainly consist of exotic trees (predominantly Cypress trees), shrubs, including weeds such as Blackberry and Gorse, and plantings of non-indigenous native vegetation. They typically exist as either mono-specific strips of planted Cypress trees, or mixed plantings of exotic and non-indigenous native vegetation (such as Spotted Gums *Eucalyptus cladocalyx*, Southern Mahogany *E. botryoides* and Melaleucas).

This habitat type primarily provides resources for native and exotic bird species. Cypress Trees provide perching and nesting substrate for raptors, and ground feeding and hawking species that forage in adjoining open pasture (e.g. Yellow-rumped Thornbill). They can also provide nesting substrate for raptors and Common Ringtail Possums. Exotic shrubs and weeds, such as

\*Blackberry (*Rubus* spp.) and Gorse (*Ulex europaeus*), support many small species of native and exotic birds (e.g. Superb Fairy-wren, Willie Wagtail, House Sparrow and European Goldfinch) which can utilise this dense vegetation as nesting substrate. Native plants, non-indigenous to the area (e.g. Planted eucalypts and Melaleucas) provide feeding and nesting substrate for nectar feeding birds such as White-plumed Honeyeater, Noisy Miner and Red Wattle Bird, and for Possums (e.g. Common Ringtail Possum, Common Brushtail Possum), as well as perching and nesting substrate for birds such as Australian Magpie, Magpie-lark, Grey Butcherbird and White-plumed Honeyeater. Eucalypt trees that are hollow bearing may provide nesting resources for hollow-dependent species (e.g. Eastern Rosella, Galah and microbat species).

### **Isolated indigenous trees**

Isolated indigenous trees refers primarily to scattered indigenous Blackwoods (*Acacia melanoxylon*) and Swamp Gums (*Eucalyptus ovata*) remaining after clearing of indigenous vegetation communities for agriculture. They occur on roadside reservations, in some pastures and along creek and drainage lines. These trees support numerous nectar feeding birds (e.g. Noisy Miner, Red Wattlebird, White-plumed Honeyeater) as well as insectivorous species that feed off trunks, branches and leaves, and under decorticating bark (e.g. Thornbill sp., White-plumed Honeyeater). Other small passerine species may also use this habitat type for perching and nesting, and older hollow-bearing Swamp Gums may support hollow dependent bird and mammalian species (e.g. Microbats, Eastern Rosellas, Galahs).

### **Swamp Scrub**

This habitat type refers to isolated remnants of degraded Swamp Scrub that are scattered through the study area in road reservations and drainage lines along Deep Creek. The remnant Swamp Scrub mainly provides habitat for numerous small passerine species, including the Brown Thornbill, White-plumed Honeyeater, Willie Wagtail and Superb Fairy-wren, that is suitable for foraging, nesting and perching. Although degraded by weed invasion, Swamp Scrub remnants may also provide habitat for reptile species such as the Lowland Copperhead.

### **Wetland formations**

Wetland formation is the most significant habitat type within the study area, and encompasses a variety of different water bodies including, farm dams, drainage lines, Deep and Toomuc Creeks. These wetlands are of value to numerous common and threatened aquatic and wetland bird species and to frog species. Smaller farm dams throughout the study area support common and adaptable species of bird, such as the Chestnut Teal, Pacific Black Duck, Australian Wood Duck and White-faced Heron, and also provide drinking water for most other bird species in the area. Larger, deeper dams may support state-classified duck species (e.g. Hardhead). All farm dams potentially support locally common frog species such as the Common Eastern Froglet as well as the EPBC-listed Growling Grass Frog, which is well known from dams throughout the study area.

Toomuc and Deep Creeks and associated drainage lines are generally degraded by heavy weed infestations and grazing pressures, but nonetheless, support abundant aquatic vegetation including Common Reed *Phragmites australis*, Slender Knotweed *Persicaria decipiens*, Kikuyu *\*Pennisetum clandestinum* and Drain Flat-sedge *\*Cyperus eragrostis*. Toomuc Creek which runs along the western boundary of the study area has not flowed in 5 years, but contains many still pools of water along its course (Ecology Partners 2007). Deep Creek which intersects the eastern end of the study area flows permanently. Both Toomuc and Deep Creeks function as important dispersal corridors for the Growling Grass Frog (Ecology Australia 2003; 2006a). These Creeks in conjunction with nearby farm dams are of significant value to the Pakenham meta-population of Growling Grass Frogs, including the dynamics and continued viability of this population. The creek lines also support wetland bird species such as the Australian Reed Warbler and White-faced Heron as well as migratory species including the state significant Latham's Snipe. During the current site inspection, nine Latham's Snipe were recorded at Deep Creek adjacent to the Healesville – Koo Wee Rup Road crossing. Growling Grass Frogs have previously been consistently recorded around Toomuc and Deep Creeks over several breeding seasons (Biosis 2005; Ecology Australia 2006a, Ecology Partners 2007; A. Organ, Ecology Partners, pers. comm.).

The Pakenham Treatment Plant along the Healesville – Koo Wee Rup Road, on the eastern boundary of the study area, supports a number of threatened aquatic birds (e.g. Whiskered Tern, Blue-billed Duck, Musk Duck and Hardhead), some of which may on occasions utilise larger farm dams within the study area (current study; Appendix 5).

#### 4.2.2 Significant fauna species

A total of 84 fauna species has been previously recorded from within a 5 km radius of the proposed alignment route (Appendix 3). These comprise of 70 bird species (eight exotic), six mammalian species (two exotic), one reptilian species, one amphibian species, and six fish species (two exotic). Of the 72 native fauna species, one species, the Growling Grass Frog, is listed as threatened under both the EPBC and FFG Acts, and one other species, the Southern Brown Bandicoot, is listed under the EPBC Act 1999. Two more species (Caspian Tern, Blue-billed Duck) are listed under the FFG Act 1988, and a further eight species are classified as threatened in Victoria by DSE (2007b). Based on the habitat attributes of the study area, the number and location of previous records and the findings of previous reports, one species listed under the EPBC Act 1999 (Growling Grass Frog), and one species classified as near threatened in Victoria (DSE 2007b) (Latham's Snipe), have a high likelihood of regular occurrence (LRO) in the study area (Table 2). The Nankeen Night Heron (near threatened in Victoria) has not been previously recorded for the DRA nor identified by the EPBC Protected Matters Search. However, previous surveys by Ecology Australia have recorded this species around Pakenham and suitable habitat exists within the study area. Thus, it has a moderate likelihood of regular occurrence in the study area. These species are discussed further below.

Threatened species previously recorded for the DRA, with a low likelihood of occurrence include: Southern Brown Bandicoot, Caspian Tern, Blue-billed Duck, Whiskered Tern, Common

Sandpiper, Cape Barren Goose, Australasian Shoveler, Hardhead, Musk Duck, and Pectoral Sandpiper. These species are addressed in Appendix 5.

Many of the threatened species listed in the 5 km DRA are unlikely to occur in the study area due to unsuitable habitat, and are more likely to occur within the Pakenham Sewage Treatment Plant which is situated on the eastern boundary of the study area. In particular, this is true for the FFG-listed and state-classified (by DSE 2007b) bird species, for which the Sewage Treatment Plant and its lagoons provide good wetland habitats (e.g. Blue-billed Duck, Hardhead, Musk Duck and Whiskered Tern).

The Department of Environment and Water Resources (DEWR) EPBC Act Protected Matters Search Tool identified a number of fauna species listed as threatened and/or listed under the Migratory and/or Marine Overfly Schedules of the EPBC Act, as potentially occurring or suitable habitat potentially occurring within a 5 km radius of the study area (Appendix 4). Many of the species listed have never occurred or have not occurred recently in the vicinity of the study area. The DEWR database predicts these species to occur on the basis of broad drainage basins and Bioclim modelling. Therefore, the predicted occurrences of some species extend well beyond their actual range. Nineteen species listed under the EPBC Protected Matters Search have not previously been recorded from the DRA (Appendix 4). Three of these species may visit the study area on occasions (Grey-headed Flying-Fox, Painted Snipe and Swift Parrot) (see Biosis 2003).

The likelihood of regular occurrence in the study area of fauna species identified from the above two databases is considered in Table 2.

**Table 2 Fauna Species listed as threatened and/or Migratory or Marine-Overfly, previously recorded within 5 km of the study area from the DRA and EPBC Protected Matters Search, and their likelihood of regular occurrence (LRO) within the study area**

Common Name	Scientific Name	Last	Recs	EPBC	FFG	DSE	LRO in study area
<b>Birds</b>							
Australian Pelican	<i>Pelecanus conspicillatus</i>	1999	1	M			Low
Whiskered Tern	<i>Chlidonias hybridus</i>	1997	1	Mi,M		NT	Low
Caspian Tern	<i>Sterna caspia</i>	1997	1	Mi,M	L	NT	Low
Silver Gull	<i>Larus novaehollandiae</i>	1998	2	Mi, M			Low-Moderate
Red-kneed Dotterel	<i>Erythronyctes alba</i>	1999	1	Mi			Low
Masked Lapwing	<i>Vanellus miles</i>	1999	10	Mi			High
Double-banded Plover	<i>Charadrius bicinctus</i>	1998	1	Mi, M			Low
Black-fronted Dotterel	<i>Elseyornis melanops</i>	1999	8	Mi			Moderate
	<i>Himantopus himantopus</i>						
Black-winged Stilt	<i>leucocephalus</i>	1999	4	Mi, M			Low-Moderate
Common Sandpiper	<i>Actitis hypoleucos</i>	1998	1	Mi,M		VU	Low
Curlew Sandpiper	<i>Calidris ferruginea</i>	1999	1	Mi, M			Low
Red-necked Stint	<i>Calidris ruficollis</i>	1999	1	Mi, M			Low
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	1999	7	Mi, M			Low
Latham's Snipe	<i>Gallinago hardwickii</i>	1999	2	Mi,M		NT	High

Common Name	Scientific Name	Last	Recs	EPBC	FFG	DSE	LRO in study area
# Australian Painted Snipe	<i>Rostratula australis</i>	-	-	VU	L	CR	Low
# Painted Snipe	<i>Rostratula benghalensis s.lat</i>	-	-	Mi			Low
Straw-necked Ibis	<i>Threskiornis spinicollis</i>	1999	5	M			High
# Nankeen Night Heron	<i>Nycticorax caledonicus hilli</i>	-	-	M		NT	Moderate
Cape Barren Goose	<i>Cereopsis novaehollandiae</i>	1998	1	Mi,M		NT	Low
Australian Wood Duck	<i>Chenonetta jubata</i>	1999	4	Mi			High
Black Swam	<i>Cygnus atratus</i>	1999	7	Mi			Low
Australian Shelduck	<i>Tadorna tadornoides</i>	1999	7	Mi			Moderate
Pacific Black Duck	<i>Anas superciliosa</i>	1999	10	Mi			High
Chestnut Teal	<i>Anas castanea</i>	1999	10	Mi			High
Grey Teal	<i>Anas gracilis</i>	1999	10	Mi			Low
Australasian Shoveler	<i>Anas rhynchotis</i>	1999	8	Mi		VU	Low
Pink-eared Duck	<i>Malacorhynchus membranaceus</i>	1999	10	Mi			Low
Hardhead	<i>Aythya australis</i>	1999	7	Mi		VU	Low
Blue-billed Duck	<i>Oxyura australis</i>	1996	2	Mi	L	EN	Low
Musk Duck	<i>Biziura lobata</i>	1981	1	Mi,M		VU	Low
Swamp Harrier	<i>Circus approximans</i>	1999	1	Mi, M			Moderate
Brown Goshawk	<i>Accipiter fasciatus</i>	2001	1	Mi, M			Moderate
Black-shouldered Kite	<i>Elanus axillaries</i>	1999	1	Mi			Moderate
Peregrine Falcon	<i>Falco peregrinus</i>	1999	1	Mi			Low
Brown Falcon	<i>Falco berigora</i>	2001	2	Mi			Moderate
# White-bellied Sea-eagle	<i>Haliaeetus leucogaster</i>	-	-	Mi	L	VU	Low
# Swift Parrot	<i>Lathamus discolor</i>	-	-	EN	L	EN	Low
# Regent Honeyeater	<i>Xanthomyza phrygia</i>	-	-	EN	L	CR	Negligible
Pallid Cuckoo	<i>Cuculus pallidus</i>	1998	1	M			Moderate
Horsefield's Bronze Cuckoo	<i>Chrysococcyx basalus</i>	1999	1	M			Moderate
# White-throated Needletail	<i>Hirundapus caudacutus</i>	-	-	Mi			Moderate
# Fork-tailed Swift	<i>Apus pacificus</i>	-	-	Mi			Low
Welcome Swallow	<i>Hirundo neoxena</i>	1999	7	M			High
Flame Robin	<i>Petroica phoenicea</i>	1981	1	M			Low-Moderate
Magpie-lark	<i>Grallina cyanoleuca</i>	2001	4	M			High
# Rainbow Bee-eater	<i>Merops ornatus</i>	-	-	Mi			Low
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	1998	1	M			High
# Black-faced Monarch	<i>Monarcha melanopsis</i>	-	-	Mi			Negligible
# Satin Flycatcher	<i>Myiagra cyanoleuca</i>	-	-	Mi			Low
# Rufous Fantail	<i>Rhipidura rufifrons</i>	-	-	Mi			Low
Australian Pipit	<i>Anthus australis</i>	1999	2	M			Moderate
Little Raven	<i>Corvus mellori</i>	2001	2	M			High
# Great Egret	<i>Ardea alba</i>	-	-	Mi	L	VU	Low-Moderate
Cattle Egret	<i>Ardea ibis</i>	1999	1	Mi, M			Moderate
Pectoral Sandpiper	<i>Calidris melanotos</i>	1998	1	Mi,M		NT	Low
<b>Mammals</b>							
Southern Brown Bandicoot	<i>Isodon obesulus obesulus</i>	1991	1	EN	I	NT	Low
# Spot-tailed Quoll	<i>Dasyurus maculatus maculatus</i>	-	-	EN	L	EN	Negligible
# Long-nosed Potoroo	<i>Potorous tridactylus</i>	-	-	VU	L	EN	Negligible
# Smoky Mouse	<i>Pseudomys fumeus</i>	-	-	EN	L	CR	Negligible



Common Name	Scientific Name	Last	Recs	EPBC	FFG	DSE	LRO in study area
# Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	-	-	VU	L	VU	Low
<b>Amphibians</b>							
Growling Grass Frog	<i>Litoria raniformis</i>	2003	8	VU	L	EN	High

**Key:** EPBC – *Environmental Protection and Biodiversity Conservation Act 1999*

FFG – *Flora and Fauna Guarantee Act 1988*

DSE – Status according to DSE (2003): Advisory List of Threatened Vertebrate Fauna in Victoria – 2003.

CR – Critically Endangered; EN – Endangered; VU – Vulnerable; NT – Near Threatened; LC – Least Concern; LR-NT – Lower Risk- Near Threatened; R-IK – Rare or Insufficiently Known; R/R – Rare and Restricted; DD – Data Deficient; CD – Conservation Dependent.

L – Listed under the FFG Act 1988.

N – Nominated for listing under the FFG Act 1988

I – Ineligible for listing under the FFG Act 1988.

Mi – Migratory species under the EPBC Act 1999

M – Marine overfly species under the EPBC Act 1999

Last – Year of last record

Rec – Number of records in Fauna DRA

# - Species identified from the EPBC Protected Matters Search

### Species listed under the *Environment Protection and Biodiversity Conservation Act 1999*

#### Species with a High LRO

##### **Growling Grass Frog (*Litoria Raniformis*)**

The Growling Grass Frog is listed as vulnerable under the EPBC Act 1999, as threatened under the FFG Act 1988 and is classified as vulnerable in Victoria (DSE 2007b).

The Growling Grass Frog has been reported to occur in and around a wide array of habitats, from wetlands, swamps, marshes, lagoons, lakes, farm dams and reservoirs to the still back waters of rivers and streams, even areas artificially inundated by irrigation, artificial ditches and depressions (Pyke 2002; Littlejohn 1963; Tyler 1997). Nevertheless, it is most typically found in permanent, shallow, and still or slow moving water bodies which support a high level of aquatic vegetation (e.g. fringing, emergent and submerged vegetation) (Ashworth 1998; Pyke 2002). Fringing vegetation and grassy banks provide suitable foraging habitat and shelter. Emergent vegetation provides areas for egg deposition and development, and submerged vegetation is essential for protecting tadpoles from predators. Aquatic vegetation also provides calling platforms for males.

Adults have also been found in very wet areas of nearby woodland or shrubland (Hero *et al.* 1991). It is thought that the Growling Grass Frog, which is a highly mobile species, spends the non-breeding season (May-August) sheltering in terrestrial environments, often some distance from water. The extent to which this species makes use of semi-permanent and ephemeral water bodies is unknown however they can function as important breeding sites (Pyke 2002). Water bodies that are of reasonable water quality and free from predatory fish species (e.g. *Gambusia holbrooki*) are vital for breeding success.

At a landscape scale, the presence of other free standing water bodies nearby to accommodate dispersal, has been found to influence habitat suitability (Wildlife Profiles 2002, 2004; Biosis

2005). The probability that a body of water will be occupied is higher with the presence of other water bodies within 200 – 500 m, provided there are no barriers to dispersal such as roads or housing (Wildlife Profiles 2002). The Growling Grass Frog will sometimes be found in degraded habitats if other nearby water bodies provide suitable breeding habitat. Thus, a landscape based approach is vital for the management of populations.

The Growling Grass Frog is well known from the Pakenham area (e.g. farm dams, Toomuc Creek, Deep Creek, Bailleu Wetlands, Gippsland Railway reserve, Pakenham Golf Course) where it has been recorded in various water bodies during numerous surveys (Biosis 2003, 2005; DSE 2004; Ecology Australia 2003, 2005a, 2006b,c; Ecology Partners 2007 Wildlife Profiles 2004). These recent surveys have revealed that populations of the Growling Grass Frog are scattered throughout the Pakenham area (Table 3). This is best illustrated by a survey over the 2003 - 2004 breeding season, where records were obtained from 43 sites; 11 sites north and 32 sites south of the Pakenham Bypass. It was proposed that at least four potentially discrete areas may exist around Pakenham, where the species has been recorded (see Biosis 2005):

1. Officer group;
2. Toomuc Creek group;
3. McDonalds Drain Road group; and
4. Pakenham District Golf Course group.

Subsequent surveys by Ecology Australia over the 2005 – 2006 breeding season identified two more groups in the Pakenham area; Deep Creek group and the Koo Wee Rup group (Ecology Australia 2006b).

Most pertinent to the study area are the Toomuc Creek and Deep Creek groups. These groups include records from many sites which fall within as well as just outside of the current study area. The Toomuc Creek group contains the largest number of Growling Grass Frog sites, extending from farm dams west of McGregor Road up to Toomuc Creek and its drainage lines. The Deep Creek group comprises of a small number of sites around Deep Creek, within the study area, as well from Deep Creek where it crosses McGregor Road (DSE 2004a; Biosis 2005).

Directly within the current study area, the Growling Grass Frog was previously recorded in 2002 and during the breeding season of 2003 – 2004 (Figure 3). Most of the records form part of the Toomuc Creek group. Namely, individuals were recorded at two sites north and north-west of Key Lane in December 2002 (DSE 2004a), and during the breeding season of 2003/2004, Biosis (2005) reported Growling Grass Frogs at eleven sites. More recently, Ecology Partners (2007) confirmed their presence in the study area, having obtained records from eight sites over the 2006 - 2007 breeding season, between Toomuc Creek and McGregor Road. In particular, large numbers of individuals have been recorded from one large dam adjacent to Toomuc Creek, over recent breeding seasons (Biosis 2005; Ecology Partners 2007). Elsewhere in the study area, there are records from five sites around Deep Creek where it crosses the Healesville – Koo Wee Rup Road, obtained during the targeted survey for the Healesville – Koo Wee Rup Road (Ecology Australia 2006b) and over the 2006-2007 breeding season (Ecology Partners 2007).

The paucity of records east of McGregor Road up until Deep Creek, suggests that McGregor Road may act as a significant barrier to further eastward dispersal, and that Deep Creek is an important dispersal corridor, for local populations of Growling Grass Frogs to the east of Pakenham.

Based upon these previous records in the study area (Figure 3), and numerous records throughout the broader study area, it is highly likely that populations of the Growling Grass Frog persist within the current study area. Any farm dam would potentially be utilised and adjoining areas of pasture and vegetation used for foraging and shelter. Drains and creeks such as Deep Creek and Toomuc Creek would also be utilised, as they are known to function as habitat links through the broader Pakenham area and to be important for dispersal between water bodies (Biosis 2003, 2005; Ecology Australia 2006a, b, c).

**Table 3 Records of Growling Grass Frogs from previous surveys**

Legend: A= Adult; J= Juvenile; Met= Metamorphling  
 F= Female; M= Male  
 N= North; E= East; S=South; W= West

Date	Record	Location	Source
<b>Officer group</b>			
<i>Records begin 2 km NW of study area</i>			
1/12/2002	3 heard	N of Lecky Rd., near Gum Scrub Crk.	DSE 2004
1/12/2002	15 heard	In dam immediately S of Pakenham Bypass	DSE 2004
1/12/2002	3 heard	In dam 300 m S of Lecky Rd., west side of Cardinia Rd.	DSE 2004
23/01/2003	1 AF seen	In dam adjacent to Cardinia Rd., on the west side	DSE 2004
20/11/2003	1 AM seen	Leckey Rd, where it crosses Gum Scrub Crk	Biosis 2005
20/11/2003	17 AM heard	200 m W of Cardinia Rd., and 400 m S of Leckey Rd.	Biosis 2005
20/11/2003	5 AM heard	300 m W of Cardinia Rd., 600 m S of Princess Hwy, along railway line	Biosis 2005
3/12/2003	28 AM seen	200 m W of Cardinia Rd., and 400 m S of Leckey Rd.	Biosis 2005
3/12/2003	5 AM heard	300 m W of Cardinia Rd., 600 m S of Princess Hwy, along railway line	Biosis 2005
4/12/2003	15 AM heard	600 m SE of Officer, along railway line	Biosis 2005
4/12/2003	5 AM heard; 1 AF trapped	800 m W of Cardinia Rd., and 500 m S of Princess Hwy, along railway line	Biosis 2005
25/02/2004	1 Met. trapped	200 m W of Cardinia Rd., and 1.3 km S of Princess Hwy	Biosis 2005
25/02/2004	2 A seen	400 m W of Cardinia Rd., and 1.4 km S of Princess Hwy	Biosis 2005
13/12/2004	1 Met. trapped	400 m W of Cardinia Rd., and 1 km S of Princess Hwy	Biosis 2005
3/12/2004	3 AM heard; 2 AF trapped; 1 J seen	400 m W of Cardinia Rd., and 1.4 km S of Princess Hwy	Biosis 2005
25/12/2004	2 AM seen	Leckey Rd, where it crosses Gum Scrub Crk	Biosis 2005
<b>Toomuc Creek group</b>			
<i>Includes study area</i>			
1/12/2002	2 heard	In dam near a drainage line of Toomuc Crk, 300 m N of Wenn Rd.	DSE 2004
1/12/2002	2 heard	In dam 200 m N of Key Lane.	DSE 2004
1/12/2002	2 heard	In dam 300 m NW of Key Lane	DSE 2004
2003	3 SA seen; 6 AM heard	700 m W of McGregor Rd., and 400 m N of Watsons Rd.	Biosis 2005
20/11/2003	6 AM heard	Along Watsons Rd where it crosses Toomuc Creek, 1 km W of McGregor Rd.	Biosis 2005
4/12/2003	2 AM heard	200 m N of Key Lane, and 800 m E of Toomuc Crk.	Biosis 2005

Date	Record	Location	Source
<b>Toomuc Creek group cont.</b>			
4/12/2003	6 AM heard	200 m N of Key Lane and 600 m W of McGregor Rd.	Biosis 2005
4/12/2003	1 AM heard	150 m N of Key Lane and 500 m W of McGregor Rd.	Biosis 2005
4/12/2003	3 AM heard	150 m N of Key Lane and 200 m W of McGregor Rd.	Biosis 2005
24/12/2003	2 AM heard; 3 AM seen	Along Watsons Rd where it crosses Toomuc Creek, 1 km W of McGregor Rd.	Biosis 2005
24/12/2003	4 A, 1 J seen	750 m W of McGregor Rd., and 300 m N of Watsons Rd.	Biosis 2005
2004	39 Met., 4 AM seen; 3 AF trapped	Large dam along Toomuc Crk., 500 m S of Pakenham Bypass	Biosis 2005
12/02/2004	1 AF, 15 Met. seen	300 m S of Pakenham Bypass, along drainage line of Toomuc Crk.	Biosis 2005
12/02/2004	2 Met. Trapped	300 m S of Pakenham Bypass, and 700 m E of Toomuc Crk.	Biosis 2005
12/02/2004	3 Met. Trapped	400 m S of Pakenham Bypass, and 700 m E of Toomuc Crk	Biosis 2005
Nov - Dec 2006	unspecified record	Large dam immediately adjacent to Toomuc Crk, 500 m S of Pakenham Bypass.	Ecology Partners 2007
Nov - Dec 2006	unspecified record	Along Toomuc Crk., 1.5 km W of McGregor Rd.	Ecology Partners 2007
Nov - Dec 2006	unspecified record	200 m N of Key Lane, and 600 m W of McGregor Rd.	Ecology Partners 2007
Nov - Dec 2006	unspecified record	250 m N of Key Lane, and 600 m W of McGregor Rd.	Ecology Partners 2007
Nov - Dec 2006	unspecified record	250 m N of Key Lane, and 500 m W of McGregor Rd.	Ecology Partners 2007
Nov - Dec 2006	unspecified record	200 m N of Key Lane, and 200 m W of McGregor Rd.	Ecology Partners 2007
Nov - Dec 2006	unspecified record	250 m N of Key Lane, and 200 m W of McGregor Rd.	Ecology Partners 2007
Nov - Dec 2006	unspecified record	650 m N of Key Lane, and 1.2 km W of McGregor Rd.	Ecology Partners 2007
Nov - Dec 2006	unspecified record	300 m S of Pakenham Bypass and 900 m W of McGregor Rd.	Ecology Partners 2007
<b>McDonalds Drain group</b>		<i>Records begin 1.8 km E of SE section of study area</i>	
Jan-Feb 2003	unspecified record	Along Five Mile Rd. 1.8 km E of McDonalds Drain Rd., and 2.7 km NE of Pakenham South.	Biosis 2005
19/02/2003	16 Met., 10 AM seen	350 m E of McDonalds Drain Rd., and 1.8 km NE of Pakenham South. 1 km SE of Deep Crk.	Biosis 2005
15/11/2003	10 AM heard	350 m E of McDonalds Drain Rd., and 1.8 km NE of Pakenham South. 1 km SE of Deep Crk.	Biosis 2005
15/11/2003	5 AM heard	150 m W of McDonalds Drain Rd., and 1.1 km N of Pakenham South	Biosis 2005
15/11/2003	2 AM heard	Along McDonalds Drain, Pakenham South.	Biosis 2005
19/11/2003	5 AM heard	600 m E of Five Mile Rd., and 3.4 km NE of Pakenham South.	Biosis 2005
19/11/2003	2 AM heard	600 m E of Five Mile Rd., and 3.8 km NE of Pakenham South.	Biosis 2005
19/11/2003	25 AM heard	Along Seven Mile Rd. 5 km ENE of Pakenham South.	Biosis 2005
20/11/2003	5 AM heard	1.8 km E of McDonalds Drain Rd., and 2 km NE of Pakenham South, along Five Mile Rd.	Biosis 2005
20/11/2003	20 AM heard; 1 AM seen	Along McDonalds Drain, Pakenham South.	Biosis 2005
9/12/2003	1 Met. trapped	450 m E of McDonalds Drain Rd., and 1.2 km NE of Pakenham South.	Biosis 2005
9/12/2003	5 AM seen	Along McDonalds Drain, Pakenham South.	Biosis 2005
9/12/2003	2 AM seen	250 m W of Seven Mile Rd., and 4.5 km ENE of Pakenham South.	Biosis 2005

Date	Record	Location	Source
<b>McDonalds Drain gp (cont.)</b>			
9/12/2003	2 AM, 1 J seen	250 m W of Seven Mile Rd., and 4.7 km ENE of Pakenham South.	Biosis 2005
10/12/2003	1 SA seen	150 m E of McDonalds Drain Rd., and 1.2 km NE of Pakenham South.	Biosis 2005
10/12/2003	3 AM heard	200 m E of McDonalds Drain Rd., and 1.3 km NE of Pakenham South.	Biosis 2005
10/12/2003	20 AM heard	800 m E of McDonalds Drain Rd., and 1.3 km NE of Pakenham South.	Biosis 2005
19/12/2003	1 AM heard	800 m E of McDonalds Drain Rd., and 1.8 km NE of Pakenham South.	Biosis 2005
19/12/2003	15 AM heard	Along Seven Mile Rd. 5 km ENE of Pakenham South.	Biosis 2005
25/02/2004	6 AM seen	900 m E of McDonalds Drain Rd., and 1.3 km NE of Pakenham South.	Biosis 2005
<b>Pakenham Golf Course group</b>			
<i>Records begin 7.2 km NE of study area</i>			
1/12/2002	3 heard	In dam in a paddock along railway line.	DSE 2004
1/12/2002	1 heard	In culvert adjacent to railway line.	DSE 2004
11/12/2003	23 heard	In dams just N of railway line	DSE 2004
26/12/2002	10	Pakenham Golf course	DSE 2004
Jan-Feb 2003	unspecified record	900 m E of Ryan Rd., along railway line	Biosis 2005
Jan-Feb 2003	unspecified record	950 m E of Ryan Rd., along railway line	Biosis 2005
23/01/2003	5 seen	In dams within Golf course	DSE 2004
23/02/2003	4 heard	Five Mile Rd., adjacent to drain of Ararat Crk., feeding into McDonalds drain.	DSE 2004
13/11/2003	2 AM heard; 1 A seen	800 m E of Ryan Rd., and 800 m NE of Canty Lane	Biosis 2005
13/11/2003	10 AM heard; 5 A seen	800 m E of Ryan Rd., and 450 m NE of Canty Lane	Biosis 2005
14/11/2003	2 AM heard	Pakenham Golf Course, 800 m E of Ryan Rd., and 600 m E of Deep Creek.	Biosis 2005
14/11/2003	2 AM heard	1.05 km E of Ryan Rd., along railway line	Biosis 2005
14/11/2003	3 AM heard	1.15 km E of Ryan Rd., along railway line	Biosis 2005
14/11/2003	3 AM heard	1.5 km E of Ryan Rd., along railway line	Biosis 2005
9/01/2004	5 AM, 1 AF trapped	450 m E of Mt. Ararat Rd., and 900 m S of Princess Hwy.	Biosis 2005
27/01/2004	2 AM heard; 4 AF seen	2 km E of Ryan Rd., along railway line, 250 m W of Mt. Ararat Rd.	Biosis 2005
4/02/2004	7 AM seen; 1 AF trapped	400 m E of Mt. Ararat Rd., and 600 m S of Princess Hwy.	Biosis 2005
4/02/2004	7 A seen	600 m E of Mt. Ararat Rd., and 500 m S of Princess Hwy.	Biosis 2005
<b>Koo Wee Rup South group</b>			
<i>Records begin 2.1 km S of study area</i>			
9/01/2006	1 A seen	Waterbody 100 m N of Rossiter Rd., 200 m W of South Gippsland Hwy.	Ecology Australia
9/01/2006	1 A seen	Waterbody 70 m S of Rossiter Rd., 700 m E of Bunyip River	Ecology Australia
11/01/2006	1 A heard	Waterbody 150 m N of South Gippsland Hwy., 500 m SE of Rossiter Rd.	Ecology Australia
<b>Deep Creek Group</b>			
<i>Includes study area</i>			
23/01/2003	2 seen	Deep Crk, on the bank of channel east side of McGregor Rd.	DSE 2004
5/02/2003	2 seen	Deep Crk, on the bank of channel east side of McGregor Rd.	DSE 2004
21/12/2005	2 A seen	Waterbody 50 m W of Healesville - Koo Wee Rup Rd., at Deep Crk.	A. Organ, Ecology Partners. Pers. Comm.
21/12/2005	5 A seen (1 dead) by night; 2 A seen by day	Waterbody 50 m S of Deep Crk, west side of Healesville - Koo Wee Rup Rd.	Ecology Australia

<b>Date</b>	<b>Record</b>	<b>Location</b>	<b>Source</b>
<b>Deep Creek Group (cont.)</b>			
11/01/2006	2 A heard and seen	Along Healesville - Koo Wee Rup Rd. 1.2 km S of Hall Rd.	Ecology Australia
12/01/2006	1 A heard and seen	500 m S of Deep Crk., and 150 m W of Healesville - Koo Wee Rup Rd.	Ecology Australia
Nov - Dec 2006	unspecified record	Along Deep Crk., where it crosses McGregor Rd.	Ecology Partners 2007
Nov - Dec 2006	unspecified record	125 m W of Healesville - Koo Wee Rup Rd., on the S side of Deep Crk.	Ecology Partners 2007
Nov - Dec 2006	unspecified record	375 m E of Healesville - Koo Wee Rup Rd., on S side of Greenhills Rd.	Ecology Partners 2007



Figure 3 Growling Grass Frog records from within, and immediately adjoining, the study area.

## **Species classified as threatened in Victoria (DSE 2007b)**

### **Species with a High LRO**

#### **Latham's Snipe (*Gallinago hardwickii*)**

Latham's Snipe is classified as near threatened in Victoria (DSE 2007) and listed under the Migratory and Marine-overfly Schedules of the EPBC Act 1999. This species is a summer migrant to Victoria from their breeding grounds in Japan and the Kurile Islands. They are widely distributed throughout Victoria, occupying a wide range of permanent and ephemeral wetlands throughout the state, except for the dry northwest (Higgins and Davies 1996, Emison *et al.* 1987). Whilst they have been recorded in bogs, swamps, lagoons, lakes, marshes, billabongs, alpine heaths, herbfields, rank grasslands and heavily vegetated watercourse, they prefer open, freshwater wetlands with nearby cover (Higgins and Davies 1996, Emison *et al.* 1987). In particular, they prefer fresh meadows, seasonal and semi-permanent freshwater swamps. Latham's Snipe occupy any vegetation around wetland habitats. During migration, they sometimes occupy saline or brackish habitats. Concentrations of up to 100 birds gather at some drying freshwater swamps close to the Victorian coast (e.g. at Seaford, Geelong and Sale and at Lake Mokoan near Benalla).

There are two records of Latham's Snipe listed in the DRA. Both records originate from the South East Water Pakenham Sewage Treatment Plant in 1998 and 1999 (DSE 2004), where good habitat exists. From other studies in the area, it has also been recorded downstream of the Bayles bridge (Ecology Australia 2006c), at Deep Creek at the Healesville – Koo Wee Rup Road crossing, and at Boundary Road Drain at Koo Wee Rup (Ecology Australia, unpublished data). During the site inspection for the present project, nine individuals were recorded on the banks of Deep Creek. Toomuc Creek and farm dams within the study area may also be utilised by Latham's Snipe. Although it has been recently recorded at Deep Creek, and has a high likelihood of future regular occurrence within the study area, it is unlikely that an ecologically significant proportion of the Australian population (as defined by the EPBC Act 1999) would occur in the study area. Furthermore, the study area does not constitute critical or limiting habitat for this species. Bridging Deep Creek so that no pylons (or machinery) are within the creek would protect habitat for this species.

### **Species with a Moderate LRO**

#### **Nankeen Night Heron (*Nycticorax caledonicus hillii*)**

The Nankeen Night Heron is classified as near threatened in Victoria (DSE 2007b) and listed under the Migratory Schedule of the EPBC Act 1999.

Nankeen Night Herons occur throughout Victoria at up to elevations of 400 m (Emison *et al.* 1987). Throughout their range, they occupy a wide variety of wetland habitats from littoral and estuarine habitats to terrestrial freshwater wetlands and grasslands, sometimes making use of wet meadows, flooded grasslands and seepage from springs (Marchant and Higgins 1990). By day, they roost in trees with dense foliage, usually near water, but often up to a few kilometres from water (Emison



*et al.* 1987; Marchant and Higgins 1990). At dusk, this species moves out to forage on the margins of wetlands with still or slow moving water, on exposed shores and flats or within swampy vegetation or shrubby lakes. They typically forage in areas where shelter from emergent or ground vegetation is provided. The Nankeen Night Heron is known to regularly occur in urban areas, where it frequently makes use of urban wetlands and ornamental ponds (Marchant and Higgins 1990; McMillan and Way 2004). In urban areas, this species commonly roost in exotic trees, especially Willows, Pines and Cypress (Ecology Australia 2004a).

The Nankeen Night Heron has not previously been recorded from the DRA, however a record was obtained from a drainage line around the Healesville – Koo Wee Rup Road in 2005 (Ecology Australia 2005a). The species has also been recorded from Yallock Creek at Bayles (Ecology Australia 2005b, 2006c). Suitable roosting habitat within the current study area exists in roadside plantings and shelter belts of exotic Cypress trees, and within Willows along creek and drainage lines, while suitable foraging areas can be found at farm dams, drainage lines, Deep and Toomuc Creeks and also at the Pakenham Treatment Plant.

#### **Species listed under the Marine Overfly and/or Migratory Schedules of the EPBC Act 1999**

There are 42 species that have been recorded from within a 5 km radius of the study area which are listed under the Marine Overfly and/ or Migratory Schedules of the *EPBC Act 1999*. Two of these species (Caspian Tern, Blue-billed Duck) are listed under the *FFG Act 1988*. A further four of these species are classified as near threatened in Victoria, and four are classified as ‘Vulnerable’ in Victoria (DSE 2007b) (Table 2). The likelihood of regular occurrence of all of these species, except for Latham’s Snipe and Nankeen Night Heron, within the current study area is low (see Appendix 5). They are more likely to occur within the sewage lagoons of the Pakenham Sewage Treatment Plant, which abut the study area. Although some species may occasionally visit large dams throughout the study area, the Sewage Treatment Plant represents the most suitable habitat in the area for most of these species. The likelihood of regular occurrence in the study area for Latham’s Snipe is high, and Nankeen Night Heron is moderate, particularly around Deep and Toomuc Creeks, but also in drains, where suitable habitat exists. However, they are unlikely to occur in ecologically significant numbers.

The study area does not constitute critical habitat or support an ecologically significant proportion of the Australian population (e.g. > 1 %) for any of the species listed under the Migratory or Marine Overfly Schedules of the *EPBC Act 1999*, which may have a moderate to high likelihood of regular occurrence. Those species listed under the Migratory and or/ Marine Overfly Schedules which were identified in the EPBC Protected Matters Search, are also unlikely to occur in the study area due to unsuitable habitat.

## 5 Key Issues

Based on information obtained to date, key issues and habitats/sites of environmental sensitivity and conservation value within or adjoining the study area include:

- Growling Grass Frog and River Swamp Wallaby-grass
- Farm Dams
- Toomuc and Deep Creeks
- Remnant patches of indigenous vegetation
- Pakenham Sewage Treatment Plant

It should also be noted that a large proportion of the study area is within the 'Greater Pakenham Habitat Biosite' (Biosite 6976), which has been classified as being of National Significance (DSE 2004b).

### 5.1 Farm Dams

Farm dams within the study area and throughout the broader Pakenham area, have been identified as supporting the EPBC - listed Growling Grass Frog, over numerous breeding seasons (Biosis 2003, 2005; DSE 2004; Ecology Australia 2003, 2005a, 2006b,c; Ecology Partners 2007; Wildlife Profiles 2004). In recent years, the presence of Growling Grass Frogs within the study area has been particularly well documented (see section 4.2.2). Records of Growling Grass Frogs from farm dams have all been obtained between Toomuc Creek and McGregor Road, in the western half of the current study area (Biosis 2003, 2005; DSE 2004; Ecology Partners 2007), with the exception of five records from Deep Creek (Ecology Australia 2006b). These records also form a large proportion of all records obtained from the broader Pakenham area, and thus dams within the western half of the study area are of high conservation value. These dams provide vital breeding sites and are important for recruitment into the population. Of particular conservation value is a large dam adjacent to Toomuc Creek, where Ecology Partners (2007) has suggested breeding and recruitment are likely to occur every year. As a result, it has been suggested that this particular dam is critical for the maintenance of the local meta-population of Growling Grass Frogs (Ecology Partners 2007).

The importance of farm dams within the study area must also be considered in conjunction with creek and drainage lines which provide habitat links between water bodies. Those dams in close proximity to creek and drainage lines may be of greater value than isolated dams. Ecology Partners (2007) suggests that the area west of McGregor Road, including Toomuc Creek, is of national conservation significance, due to the 'important' population of Growling Grass Frogs, as defined by the EPBC Act 1999.

The farm dams or constructed wetlands may also potentially provide suitable habitat for the EPBC-listed River Swamp Wallaby-grass. This species has been found widely in constructed wetlands,

farm dams and artificial impounds throughout Victoria and New South Wales (Carr 2005). A targeted survey for this species was undertaken for the Healesville - Koo Wee Rup Road upgrade study area and no plants were recorded (Ecology Australia 2006f). However, given the unknown condition of the wetlands within the current study area (i.e. the alternate connection of Pakenham Bypass to Koo Wee Rup Road), this species may potentially occur and a targeted survey is recommended.

## **5.2 Toomuc and Deep Creeks**

Toomuc and Deep Creeks, in conjunction with nearby dams, play an important role in the landscape ecology of the Pakenham meta-population of Growling Grass Frogs. These creeks and their associated drainage lines facilitate the dispersal of frogs throughout the landscape by providing habitat links between water bodies both within and outside of the study area (Biosis 2003, 2005; Ecology Australia 2006a,b,c). Without these habitat links, this meta-population of Growling Grass Frogs is at risk of becoming fragmented and isolated. Hence, the creek and drainage lines are important for the continued viability of the population. Although both creeks function as valuable habitat links, Toomuc Creek is of significant value to Growling Grass Frogs due to the proximity of numerous farm dams used as breeding sites.

In addition to Growling Grass Frogs, Deep Creek also supports the threatened and migratory Latham's Snipe. During the present site inspection alone, nine Latham's Snipe were observed on the banks of Deep Creek. The vegetation around both Toomuc and Deep Creeks, although weed infested, provides a dense multi-layered structure which supports many small bushland and wetland birds. However, whether suitable habitat for Latham's Snipe occurs at Toomuc Creek as it does at Deep Creek would require more detailed assessment. Small patches of remnant indigenous vegetation also remain around Toomuc Creek (Swampy Riparian Woodland), which due to the generally degraded and modified character of the study area are also of value (Ecology Partners 2007).

## **5.3 Remnant patches of indigenous vegetation**

Small patches of remnant Swamp Scrub and Swampy Woodland EVCs have been modelled for the study area and surrounds along Toomuc and Deep Creeks, Watson and McGregor Roads (DSE 2007c, Figure 2). Based on previous reports (e.g. Brown 2005, Ecology Partners 2007 and Ecology Australia 2005a) and a brief field visit to the study area, Swamp Scrub is a little more widespread than mapped by DSE, particularly in the west around Koo Wee Rup Road. A degraded vestige of Plains Grassland was also recorded along Watson Road. Further surveys are required to determine the distribution and quality of the remnant patches within the study area.

## **5.4 Pakenham Sewage Treatment Plant**

The Pakenham Sewage Treatment Plant adjoins the study area in the north-east, with a small section included within the study area itself. Whilst the treatment plant is unlikely to be impacted

upon by the proposed alignment, it is highlighted because, like most sewage treatment plants it supports a high number of threatened water bird species (e.g. Hardhead, Whiskered Tern, Musk Duck, Blue-billed Duck and Australasian Shoveler).

## 6 Potential impacts and legislation and policy

### 6.1 Potential Impacts

Flora and fauna habitats in much of the study area, being dominated by pasture and exotic plantings, are of low conservation value. However, Toomuc and Deep Creeks, drainage lines and farm dams to the west of McGregor Road support a population of EPBC-listed Growling Grass Frog and are of high conservation value. Remnant patches of vegetation are also of value, given the highly modified nature of much of the landscape. Most of the key issues identified with the proposed alignment, relate to the resident population of Growling Grass Frogs. Based on our current knowledge, potential impacts upon the ecological values within the study area include:

- **Habitat loss for rare or threatened fauna** (in particular for the Growling Grass Frog). Specifically, this relates to the loss of farm dams, especially west of McGregor Road, which support an important population of Growling Grass Frogs, in addition to more common frog species. The loss of dams may also affect some state significant birds (e.g. Hardhead, Australasian Shoveler, Latham's Snipe) which may also occasionally make use of the dams. There is also a potential loss of foraging habitat associated with the conversion of pasture to a roadway. Growling Grass Frogs are known to forage in pasture on humid nights (C. Renowden, Ecology Australia, pers. comm.);
- **Barrier effects on rare or threatened fauna**, resulting from the proposed alignment interrupting the continuity of habitat. This impact would be most detrimental to the Growling Grass Frog, and is likely to be the key issue regarding construction of the alignment. The alignment may create a barrier to the movement and dispersal of frogs between water bodies, resulting in fragmentation of the population and isolation. These effects reduce the viability of the population. Potential disturbance to Deep Creek and the ability of this creek to function as a dispersal corridor could be avoided by bridging it so that no pylons or machinery are within the creek;
- **Increased mortality of fauna due to road kill** especially rare or threatened fauna which may attempt to cross the road, including wetland birds and frogs;
- **Loss of significant flora species and/or vegetation communities** because they are within the road alignment and cannot be avoided, and/or are lost as a result of indirect impacts (e.g. weed invasion);
- **Loss of persistent remnant vegetation** within the road alignment;
- **Increased weed invasion** which may be promoted by construction of the roads through general soil disturbance and the dispersal of weeds seeds by vehicles and machinery; and
- **Sedimentation and pollution of creek and drainage lines** from uncontrolled run-off.

## **6.2 Legislation and Policy**

Legislation and policy most relevant to the proposed new alignment is addressed in Table 4 (below). It outlines the scope of the relevant acts/policy, when it applies to the project and its relevance to the study area.

**Table 4 Legislation and policy most relevant to the study area**

Name of legislation or policy	Scope	When it applies	Relevance to study area
<b>Federal</b>			
Environment Protection and Biodiversity Conservation Act 1999	<p>Pertains to matters of national environmental significance including Ramsar Wetlands, listed threatened species and Ecological communities, listed migratory species and Commonwealth Marine Areas.</p> <p>The proponent is obliged to refer matters to the Commonwealth Environment Minister if such values may be affected by a proposed action. The Department of Environment and Heritage decides whether there will be a significant impact and if it needs to be a 'controlled action'. The commonwealth can intervene to modify or block an action if it deems this necessary for the protection of a species or community of national significance.</p>	<p>Public and Private land.</p> <p>A referral is necessary whenever a proposed action considered likely to impact on a species or ecological community listed in the Act.</p>	<p>If any <i>EPBC</i>-listed species under the act occur, or are likely to occur (e.g. Tables 1 &amp; 2), within the proposed corridor, the project will need to be referred to the Commonwealth. The Western Port Ramsar site will also need to be addressed in the referral.</p> <p>If the proposed option is adopted, referral to the Commonwealth will be required because of the significance of the area to an 'important' population of Growling Grass Frogs.</p>
<b>State</b>			
Flora and Fauna Guarantee Act 1988	<p>Lists species and ecological communities recognized as rare or threatened in Victoria. There are also provisions for listing of threatening processes. Flora identified as susceptible to over-collection although not necessarily rare or threatened, such as orchids are also protected under this Act. This is the State's primary legislature for flora and fauna; however, it is dated and poorly tied to the planning process. It effectively does not apply to private land.</p>	<p>Public land (may have implications for private to the extent planning authorities enforce).</p>	<p>Once purchased, private land will become public land. Therefore the proposed corridor may require a permit from the DSE if State listed or protected species are affected.</p> <p>The Growling Grass Frog is considered to be the only FFG-listed fauna species relevant.</p>
Wildlife Act 1975	<p>Lists protected fauna species.</p>	<p>Public and private</p>	<p>If targeted surveys are undertaken as part of the project, a permit will be required from DSE to undertake trapping and/or handling of protected fauna.</p>
Catchment and Land Protection Act 1994 (CaLP Act) (amended 2003)	<p>Provides a legislative framework for the management of land including the control of declared noxious weeds and pest animals. The 2003 amendments include increased maximum penalties for poor land management.</p>	<p>Private and public land. If pest plants or animals are detected (or other poor land management practices identified) land managers are given notice and fined if no action is taken.</p>	<p>Noxious weeds that are declared under the Act and found within the corridor will require control.</p>
Victoria's Native Vegetation Framework	<p>Is a policy for the protection, enhancement and revegetation of native vegetation in Victoria. The Framework is based on the principle of</p>	<p>Private and public land.</p>	<p>Net Gain habitat hectare calculations and offset options will need to be considered for areas within the proposed</p>

	<p>'Net Gain'. Net Gain is the outcome for native vegetation and habitat where individual losses are avoided where possible. The losses and gains are determined by a combined quality-quantity measure over a specified area and period of time. Three steps need to be addressed in order to fulfil the requirements of Net Gain:</p> <p style="padding-left: 40px;">To avoid adverse impacts; If impacts cannot be avoided, to minimise impacts through appropriate consideration in planning; &amp; Identify appropriate offset options.</p>		<p>alignment supporting greater than 25% native vegetation or a group of trees with &gt;20% canopy cover. Offset calculations and options will also need to be addressed for large trees within remnant patches, or scattered indigenous trees (small – large), that occur within the proposed road alignment.</p>
<p>Planning and Environment Act 1987 (Amended 2003)</p>	<p>Sets out objectives for planning in Victoria. One of these objectives is 'to provide for the protection of natural and man-made resources and the maintenance of ecological processes and genetic diversity'. This Act established Native Vegetation retention controls: these require a planning permit to remove, destroy or loop native vegetation (subject to certain exemptions).</p>	<p>Private or public land of greater than 0.4 ha. DSE is a mandatory referral authority for applications to clear 10 or more hectares of native vegetation.</p>	<p>Is implemented through local councils and permits will be required to remove native vegetation for the corridor.</p>
<b>Regional</b>			
<p>Port Phillip &amp; Western Port Native Vegetation Plan</p>	<p>This plan: (i) sets out a coordinated and strategic approach to managing the region's native vegetation consistent with the Native Vegetation Management Framework; (ii) establishes regional priorities and targets for retaining, protecting, enhancing and restoring native vegetation; (iii) provides direction to authorities who consider permit applications to clear native vegetation; (iv) guides investments in native vegetation planning and management; and (v) provides detailed information about the region's native vegetation.</p>	<p>This plan is a key action of the Port Phillip &amp; Westport Catchment Strategy, Victorian Planning Provisions and Victoria Native Vegetation Management Framework.</p>	<p>Considered under the FFG Act, CaLP Act, Planning and Environment Act and Net Gain system.</p>
<b>Local</b>			
<p>Local Planning Policy</p>	<p>Contains the Municipal Strategic Statement (MSS) and Local Planning Policies. MSS encapsulates significant planning directions for the municipality and in turn provides the strategic basis for the application of the zones, overlays and particular provisions in the planning scheme.</p>	<p>Public and private land. A planning scheme is binding on all people and corporations on every Minister, government department, public authority and municipal council.</p>	<p>Permits required to remove native vegetation and to undertake construction in any areas that have a significance overlay on them (e.g. Environmental Significance Overlay, ESO). No ESOs occur within the proposed corridor.</p>



## 7 Recommendations

If the proposed alignment is adopted, a more detailed assessment of the flora and fauna values and potential impacts is required, particularly in relation to significant flora and fauna species and Net Gain.

The most significant issue identified in this desktop study is that the study area has been identified as supporting an 'important population' of the EPBC - listed Growling Grass Frog, as defined under the EPBC Act 1999. The reason for this definition being that this population is a key source population for breeding and dispersal (Ecology Partners 2007). Consequently, and depending on the nature of the finalised alignment, a referral to the Commonwealth DEWR is likely to be required.

Impacts to Toomuc and Deep Creeks, which are important habitat links and foraging and sheltering habitat for the EPBC – listed Growling Grass Frog, as well as foraging and roosting habitat for Latham's Snipe, could be avoided by keeping works away from (and fence off) Toomuc Creek, and by spanning Deep Creek so that no pylons or machinery are within the creek.

An environmental management plan (e.g. similar to Biosis 2005 and Ecology Australia 2006d) would also need to be produced for the alignment route. This would include a number of conservation measures for the Growling Grass Frog and any other significant species and/or vegetation community identified.

Further recommendations can be provided once detailed flora and fauna surveys have been undertaken.

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**Appendix 1** Plant taxa recorded from within 5 km of the study area (data from DSE 2005)

**MOSSES**

Thuidiaceae

*Thuidiopsis* spp.

Weft Moss

**FERNS AND ALLIES**

Blechnaceae

*Blechnum minus*

Soft Water-fern

Dennstaedtiaceae

*Pteridium esculentum*

Austral Bracken

**CONIFERS**

Pinaceae

\* *Pinus radiata*

Radiata Pine

**MONOCOTYLEDONS**

Alliaceae

\* *Allium triquetrum*

Three-corner Garlic

Anthericaceae

*Arthropodium strictum* s.s.

Chocolate Lily

Asparagaceae

\* *Asparagus asparagoides*

Bridal Creeper

Asphodelaceae

*Bulbine bulbosa*

Bulbine Lily

Colchicaceae

*Burchardia umbellata*

Milkmaids

Commelinaceae

\* *Tradescantia fluminensis*

Wandering Jew

Cyperaceae

*Carex appressa*

Tall Sedge

*Carex brownii*

Stream Sedge

k *Carex chlorantha*

Green-top Sedge

*Carex fascicularis*

Tassel Sedge

*Carex gaudichaudiana*

Fen Sedge

*Carex inversa*

Knob Sedge

\* *Cyperus eragrostis*

Drain Flat-sedge

*Eleocharis acuta*

Common Spike-sedge

\* *Isolepis hystrix*

Awned Club-sedge

*Isolepis inundata*

Swamp Club-sedge

*Schoenus apogon*

Common Bog-sedge

Iridaceae

\* *Romulea rosea*

Onion Grass

\* *Sisyrinchium iridifolium*

Blue Pigroot

\* *Watsonia meriana* var. *bulbillifera*

Bulbil Watsonia

Juncaceae

\* *Juncus acutus* subsp. *acutus*

Sharp Rush

\* *Juncus articulatus*

Jointed Rush

*Juncus pallidus*

Pale Rush

*Juncus planifolius*

Broad-leaf Rush

*Juncus sarophorus*

Broom Rush

Juncaginaceae

*Triglochin striata*

Streaked Arrowgrass

Orchidaceae

*Acianthus caudatus*

Mayfly Orchid

*Leptoceras menziesii*

Hare Orchid

*Microtis parviflora*

Slender Onion-orchid

*Microtis unifolia*

Common Onion-orchid

f E e *Prasophyllum frenchii*

Maroon Leek-orchid

r *Pterostylis grandiflora*

Cobra Greenhood

*Thelymitra pauciflora* s.l.

Slender Sun-orchid

Phormiaceae

*Caesia calliantha*

Blue Grass-lily

E e *Dianella amoena*

Matted Flax-lily

*Dianella longifolia* var. *longifolia* s.l.

Pale Flax-lily

*Dianella revoluta* var. *revoluta* s.l.

Black-anther Flax-lily

*Tricoryne elatior*

Yellow Rush-lily

Poaceae

* <i>Agrostis capillaris s.l.</i>	Brown-top Bent
* <i>Aira elegantissima</i>	Delicate Hair-grass
* <i>Anthoxanthum odoratum</i>	Sweet Vernal-grass
<i>Austrodanthonia geniculata</i>	Kneed Wallaby-grass
<i>Austrodanthonia laevis</i>	Smooth Wallaby-grass
<i>Austrostipa pubinodis</i>	Tall Spear-grass
<i>Austrostipa rudis</i>	Veined Spear-grass
r <i>Austrostipa rudis ssp. australis</i>	Veined Spear-grass
* <i>Avena fatua</i>	Wild Oat
* <i>Briza maxima</i>	Large Quaking-grass
* <i>Bromus catharticus</i>	Prairie Grass
<i>Chloris truncata</i>	Windmill Grass
* <i>Cynodon dactylon var. dactylon</i>	Couch
* <i>Dactylis glomerata</i>	Cocksfoot
<i>Dichelachne crinita</i>	Long-hair Plume-grass
<i>Dichelachne rara</i>	Common Plume-grass
* <i>Echinochloa colona</i>	Awless Barnyard-grass
* <i>Echinochloa crus-galli</i>	Barnyard Grass
* <i>Ehrharta erecta var. erecta</i>	Panic Veldt-grass
<i>Elymus scaber var. scaber</i>	Common Wheat-grass
<i>Eragrostis brownii</i>	Common Love-grass
* <i>Hainardia cylindrica</i>	Common Barb-grass
<i>Hemarthria uncinata var. uncinata</i>	Mat Grass
* <i>Holcus lanatus</i>	Yorkshire Fog
<i>Imperata cylindrica</i>	Blady Grass
<i>Lachnagrostis filiformis</i>	Common Blown-grass
* <i>Lolium perenne</i>	Perennial Rye-grass
<i>Microlaena stipoides var. stipoides</i>	Weeping Grass
* <i>Paspalum dilatatum</i>	Paspalum
* <i>Paspalum distichum</i>	Water Couch
* <i>Pennisetum clandestinum</i>	Kikuyu
* <i>Phalaris aquatica</i>	Toowoomba Canary-grass
<i>Phragmites australis</i>	Common Reed
* <i>Poa annua</i>	Annual Meadow-grass
* <i>Poa bulbosa</i>	Bulbous Meadow-grass
<i>Poa labillardierei</i>	Common Tussock-grass
<i>Poa morrisii</i>	Soft Tussock-grass
* <i>Setaria viridis</i>	Green Pigeon-grass
* <i>Sorghum halepense</i>	Johnson Grass
* <i>Sporobolus africanus</i>	Rat-tail Grass
<i>Themeda triandra</i>	Kangaroo Grass
* <i>Vulpia bromoides</i>	Squirrel-tail Fescue
Typhaceae	
<i>Typha domingensis</i>	Narrow-leaf Cumbungi
Xanthorrhoeaceae	
<i>Lomandra filiformis subsp. coriacea</i>	Wattle Mat-rush
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush
<i>Lomandra longifolia subsp. longifolia</i>	Spiny-headed Mat-rush
<i>Xanthorrhoea minor subsp. lutea</i>	Small Grass-tree
<b>DICOTYLEDONS</b>	
Apiaceae	
<i>Centella cordifolia</i>	Centella
* <i>Daucus carota</i>	Carrot
Asteraceae	
* <i>Arctotheca calendula</i>	Cape Weed
* <i>Aster subulatus</i>	Aster-weed
<i>Cassinia aculeata</i>	Common Cassinia
<i>Chrysocephalum apiculatum s.s.</i>	Common Everlasting
* <i>Cirsium vulgare</i>	Spear Thistle
* <i>Conyza bonariensis</i>	Flaxleaf Fleabane
* <i>Cotula coronopifolia</i>	Water Buttons
<i>Euchiton involucreatus s.l.</i>	Common Cudweed
* <i>Helminthotheca echioides</i>	Ox-tongue
* <i>Hypochoeris radicata</i>	Cat's Ear
* <i>Leontodon taraxacoides subsp. taraxacoides</i>	Hairy Hawkbit
<i>Leptorhynchus tenuifolius</i>	Wiry Buttons
<i>Olearia phlogopappa</i>	Dusty Daisy-bush
<i>Senecio glomeratus</i>	Annual Fireweed
<i>Senecio minimus</i>	Shrubby Fireweed
<i>Senecio quadridentatus</i>	Cotton Fireweed
<i>Senecio squarrosus s.l.</i>	Leafy Fireweed



* <i>Senecio vulgaris</i>	Common Groundsel
* <i>Sonchus asper s.l.</i>	Rough Sow-thistle
* <i>Sonchus oleraceus</i>	Common Sow-thistle
* <i>Taraxacum officinale spp. agg.</i>	Garden Dandelion
Boraginaceae	
* <i>Echium plantagineum</i>	Paterson's Curse
Brassicaceae	
* <i>Brassica fruticulosa</i>	Twiggy Turnip
* <i>Nasturtium officinale</i>	Watercress
* <i>Raphanus raphanistrum</i>	Wild Radish
Callitricheaceae	
* <i>Callitriche stagnalis</i>	Common Starwort
Campanulaceae	
<i>Lobelia anceps</i>	Angled Lobelia
<i>Wahlenbergia multicaulis</i>	Branching Bluebell
Caprifoliaceae	
* <i>Lonicera japonica</i>	Japanese Honeysuckle
Caryophyllaceae	
* <i>Cerastium glomeratum s.s.</i>	Sticky Mouse-ear Chickweed
* <i>Stellaria media</i>	Chickweed
Chenopodiaceae	
* <i>Chenopodium album</i>	Fat Hen
Clusiaceae	
<i>Hypericum gramineum</i>	Small St John's Wort
Droseraceae	
<i>Drosera peltata subsp. auriculata</i>	Tall Sundew
Epacridaceae	
<i>Leucopogon ericoides</i>	Pink Beard-heath
Ericaceae	
* <i>Erica lusitanica</i>	Spanish Heath
Euphorbiaceae	
<i>Poranthera microphylla</i>	Small Poranthera
Fabaceae	
<i>Daviesia latifolia</i>	Hop Bitter-pea
<i>Dillwynia cinerascens s.l.</i>	Grey Parrot-pea
* <i>Genista linifolia</i>	Flax-leaf Broom
* <i>Genista monspessulana</i>	Montpellier Broom
<i>Glycine clandestina</i>	Twining Glycine
<i>Kennedia prostrata</i>	Running Postman
* <i>Lotus corniculatus</i>	Bird's-foot Trefoil
* <i>Lotus subbiflorus</i>	Hairy Bird's-foot Trefoil
* <i>Medicago polymorpha</i>	Burr Medic
<i>Platylobium obtusangulum</i>	Common Flat-pea
<i>Pultenaea gunnii subsp. gunnii</i>	Golden Bush-pea
<i>Pultenaea hispidula</i>	Rusty Bush-pea
<i>Pultenaea pedunculata</i>	Matted Bush-pea
* <i>Trifolium campestre var. campestre</i>	Hop Clover
* <i>Trifolium dubium</i>	Suckling Clover
* <i>Trifolium repens var. repens</i>	White Clover
* <i>Ulex europaeus</i>	Gorse
* <i>Vicia hirsuta</i>	Tiny Vetch
* <i>Vicia sativa</i>	Common Vetch
* <i>Vicia tetrasperma</i>	Slender Vetch
Fumariaceae	
* <i>Fumaria muralis subsp. muralis</i>	Wall Fumitory
Gentianaceae	
* <i>Centaurium erythraea</i>	Common Centaury
Geraniaceae	
* <i>Geranium dissectum</i>	Cut-leaf Cranesbill
* <i>Geranium molle var. molle</i>	Dovesfoot
v <i>Geranium solanderi var. solanderi s.s.</i>	Austral Cranesbill
<i>Geranium sp. 2</i>	Variable Cranesbill
<i>Geranium spp.</i>	Crane's Bill
Goodeniaceae	
<i>Dampiera stricta</i>	Blue Dampiera
<i>Goodenia humilis</i>	Swamp Goodenia
<i>Goodenia lanata</i>	Trailing Goodenia
Haloragaceae	
<i>Gonocarpus tetragynus</i>	Common Raspwort
<i>Myriophyllum crispatum</i>	Upright Water-milfoil
Lamiaceae	

* <i>Marrubium vulgare</i>	Horehound
* <i>Prunella vulgaris</i>	Self-heal
<b>Lythraceae</b>	
<i>Lythrum hyssopifolia</i>	Small Loosestrife
<b>Malvaceae</b>	
* <i>Lagunaria patersonia</i> subsp. <i>patersonia</i>	Pyramid Tree
* <i>Malva parviflora</i>	Small-flower Mallow
* <i>Modiola caroliniana</i>	Red-flower Mallow
<b>Mimosaceae</b>	
<i>Acacia genistifolia</i>	Spreading Wattle
<i>Acacia mearnsii</i>	Black Wattle
<i>Acacia melanoxylon</i>	Blackwood
<i>Acacia stricta</i>	Hop Wattle
<i>Acacia verticillata</i>	Prickly Moses
<b>Myrtaceae</b>	
<i>Eucalyptus ovata</i>	Swamp Gum
<i>Eucalyptus radiata</i> subsp. <i>radiata</i>	Narrow-leaf Peppermint
<i>Kunzea ericoides</i> spp. agg.	Burgan
<i>Leptospermum continentale</i>	Prickly Tea-tree
<i>Leptospermum lanigerum</i>	Woolly Tea-tree
<i>Melaleuca ericifolia</i>	Swamp Paperbark
<i>Melaleuca squarrosa</i>	Scented Paperbark
<b>Oleaceae</b>	
* <i>Fraxinus angustifolia</i>	Desert Ash
<b>Onagraceae</b>	
* <i>Epilobium hirtigerum</i>	Hairy Willow-herb
<b>Oxalidaceae</b>	
<i>Oxalis perennans</i>	Grassland Wood-sorrel
* <i>Oxalis pes-caprae</i>	Soursob
* <i>Oxalis</i> spp. (naturalised)	Wood Sorrel
<b>Plantaginaceae</b>	
* <i>Plantago lanceolata</i>	Ribwort
* <i>Plantago major</i>	Greater Plantain
<b>Polygonaceae</b>	
* <i>Acetosella vulgaris</i>	Sheep Sorrel
* <i>Fallopia convolvulus</i>	Black Bindweed
<i>Persicaria decipiens</i>	Slender Knotweed
* <i>Rumex conglomeratus</i>	Clustered Dock
* <i>Rumex crispus</i>	Curled Dock
<b>Portulacaceae</b>	
<i>Portulaca oleracea</i>	Common Purslane
<b>Primulaceae</b>	
* <i>Anagallis arvensis</i>	Pimpernel
<b>Ranunculaceae</b>	
<i>Ranunculus glabrifolius</i>	Shining Buttercup
<i>Ranunculus lappaceus</i>	Australian Buttercup
* <i>Ranunculus repens</i>	Creeping Buttercup
<b>Rosaceae</b>	
<i>Acaena novae-zelandiae</i>	Bidgee-widgee
<i>Acaena ovina</i>	Australian Sheep's Burr
* <i>Crataegus monogyna</i>	Hawthorn
* <i>Prunus cerasifera</i>	Cherry Plum
* <i>Prunus</i> spp.	Prunus
* <i>Rosa rubiginosa</i>	Sweet Briar
* <i>Rubus anglocandicans</i>	Blackberry
* <i>Rubus fruticosus</i> spp. agg.	Blackberry
<i>Rubus parvifolius</i>	Small-leaf Bramble
<b>Rubiaceae</b>	
* <i>Galium aparine</i>	Cleavers
<i>Opercularia ovata</i>	Broad-leaf Stinkweed
<b>Salicaceae</b>	
* <i>Salix babylonica</i> s.l.	Weeping Willow
* <i>Salix cinerea</i>	Grey Sallow
<b>Santalaceae</b>	
<i>Exocarpos cupressiformis</i>	Cherry Ballart
<b>Scrophulariaceae</b>	
<i>Veronica gracilis</i>	Slender Speedwell
<b>Solanaceae</b>	
<i>Solanum laciniatum</i>	Large Kangaroo Apple
* <i>Solanum nigrum</i> s.s.	Black Nightshade
* <i>Solanum nigrum</i> sensu Willis (1972)	Black Nightshade

Stylidiaceae

*Stylidium graminifolium* s.s.

Grass Triggerplant

Thymelaeaceae

*Pimelea humilis*

Common Rice-flower

## **Appendix 2** Species from the flora data review area with a low likelihood of occurrence within the study area

### **Matted Flax-lily (*Dianella amoena*)**

Matted Flax-lily is listed as Endangered under the *EPBC Act* and is considered to be endangered in Victoria (DSE 2005). It is a partially to fully summer - deciduous perennial forming loose mats to 5 m wide or more. Leaves are relatively small, to 43 cm long, and inflorescences (flower stalks) to 90 cm. Fruits are succulent, globular, off-white to dark blue-purple berries (Carr and Horsfall 1995).

Matted Flax-lily is known from Victoria (Midlands, Volcanic Plains and Gippsland Plain bioregions) and Tasmania, where it is recorded in grasslands and grassy woodlands. It is frequently associated with stony knolls and rises, red friable soil and greater than 50% surface rock cover (Carr and Horsfall 1995). All known populations are small, and most sites are extremely weedy. The species is in decline throughout its range.

This species has previously been recorded within the Gippsland Rail Reserve near Ryans Road. Matted Flax-lily has a low likelihood of occurrence within the study area because of the high levels of disturbance and modification to the area, predominately as a result to agriculture.

### **Maroon Leek-orchid (*Prasophyllum frenchii*)**

Marron Leek-orchid is listed as endangered under the *EPBC Act* and as threatened under Schedule 2 of the *FFG Act*. It has numerous fragrant varicoloured flowers and grows to 60 cm tall (Walsh and Entwisle 1994). It is found mostly as loose colonies in grassland, heathland and grassy woodland habitats (Jeanes and Blackhouse 2006).

Most of the Maroon Leek-orchid's remaining habitat occurs in railway reserves and rural airfields, where burning, herbicide spraying and heavy vehicle movement do not occur (Jeanes and Blackhouse 1995). A population has recently been discovered in the Gippsland Railway Reserve (Costello et al. 2003), close to the study area. Similar to the Matted Flax-lily, this species has a low likelihood of occurrence within the study area due to the high levels of disturbance and modification that has occurred.

### **Cobra Greenhood (*Pterostylis grandiflora*)**

Cobra Greenhood is classified as rare in Victoria (DSE 2005). This orchid grows to c. 40 cm tall and produces a white and green striped flower (rarely two flowers) from May to September. It is distributed through eastern Victoria, where it grows in heathy woodland, lowland and foothill forests. This species is only known from a few widely scattered locations (Jeanes and

Backhouse 2006). This species has a low likelihood of occurrence within the study area because it is unlikely that suitable habitat is present.

#### **Green-top Sedge (*Carex chlorantha*)**

The conservation status of Green-top Sedge is unknown in Victoria, but it is thought to be rare or threatened (DSE 2005). This sedge is loosely tufted and grows to c. 35 cm. It is known from the southern parts of Victoria and occurs within open sites on permanently moist to wet, rather fertile soils. Given that this species has not been recorded from the area since 1903 and the high level of disturbance that has occurred within the study area, Green-top Sedge has a low likelihood of occurrence.

### Appendix 3 Fauna species recorded for the fauna DRA in a 5km search of the area from the Atlas of Victorian Wildlife.

#### Key

EPBC – Environmental Protection and Biodiversity Conservation Act 1999

NAP – National Action Plan

FFG – Flora and Fauna Guarantee Act 1988

DSE – Status according to DSE (2003): Advisory List of Threatened Vertebrate Fauna in Victoria – 2003.

CE – Critically Endangered; EN – Endangered; VU – Vulnerable; NT – Near Threatened; LC – Least Concern; LR-NT – Lower Risk- Near Threatened; R-IK – Rare or Insufficiently Known; R/R – Rare and Restricted; DD – Data Deficient; CD – Conservation Dependent.

L – Listed under the FFG Act 1988.

N – Nominated for listing under the FFG Act 1988

I – Ineligible for listing under the FFG Act 1988.

Mi – Migratory species under the EPBC Act 1999

M – Marine overfly species under the EPBC Act 1999

Last – Year of last record

Rec – Number of records in Fauna DRA

Common Name	Scientific Name	Last	Recs	EPBC	NAP	FFG	DSE	Feral
<b>Birds</b>								
Dusky Moorhen	<i>Gallinula tenebrosa</i>	1998	1					
Eurasian Coot	<i>Fulica atra</i>	1999	9					
Australasian Grebe	<i>Tachybaptus novaehollandiae</i>	1998	3					
Hoary-headed Grebe	<i>Poliiocephalus poliocephalus</i>	1999	9					
Great Cormorant	<i>Phalacrocorax carbo</i>	1999	7					
Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>	1998	1					
Little Pied Cormorant	<i>Phalacrocorax melanoleucos</i>	1999	1					
Australian Pelican	<i>Pelecanus conspicillatus</i>	1999	1	M				
Whiskered Tern	<i>Chlidonias hybridus</i>	1997	1	Mi,M			NT	
Caspian Tern	<i>Sterna caspia</i>	1997	1	Mi,M		L	NT	
Silver Gull	<i>Larus novaehollandiae</i>	1998	2	Mi,M				
Red-kneed Dotterel	<i>Erythronyx cinctus</i>	1999	1	Mi				
Masked Lapwing	<i>Vanellus miles</i>	1999	10	Mi				
Double-banded Plover	<i>Charadrius bicinctus</i>	1998	1	Mi,M				
Black-fronted Dotterel	<i>Elseya melanops</i> <i>Himantopus himantopus</i>	1999	8	Mi				
Black-winged Stilt	<i>leucocephalus</i>	1999	4	Mi,M				
Common Sandpiper	<i>Actitis hypoleucos</i>	1998	1	Mi,M			VU	
Curlew Sandpiper	<i>Calidris ferruginea</i>	1999	1	Mi,M				
Red-necked Stint	<i>Calidris ruficollis</i>	1999	1	Mi,M				
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	1999	7	Mi,M				
Latham's Snipe	<i>Gallinago hardwickii</i>	1999	2	Mi,M			NT	
Straw-necked Ibis	<i>Threskiornis spinicollis</i>	1999	5	M				
White-faced Heron	<i>Egretta novaehollandiae</i>	1999	4					
Cape Barren Goose	<i>Cereopsis novaehollandiae</i>	1998	1	Mi,M			NT	
Australian Wood Duck	<i>Chenonetta jubata</i>	1999	4	Mi				
Black Swan	<i>Cygnus atratus</i>	1999	7	Mi				
Australian Shelduck	<i>Tadorna tadornoides</i>	1999	7	Mi				
Pacific Black Duck	<i>Anas superciliosa</i>	1999	10	Mi				
Chestnut Teal	<i>Anas castanea</i>	1999	10	Mi				
Grey Teal	<i>Anas gracilis</i>	1999	10	Mi				
Australasian Shoveler	<i>Anas rhynchotis</i>	1999	8	Mi			VU	
Pink-eared Duck	<i>Malacorhynchus membranaceus</i>	1999	10	Mi				

Common Name	Scientific Name	Last	Recs	EPBC	NAP	FFG	DSE	Feral
Hardhead	<i>Aythya australis</i>	1999	7	Mi			VU	
Blue-billed Duck	<i>Oxyura australis</i>	1996	2	Mi		L	EN	
Musk Duck	<i>Biziura lobata</i>	1981	1	Mi,M			VU	
Swamp Harrier	<i>Circus approximans</i>	1999	1	Mi,M				
Brown Goshawk	<i>Accipiter fasciatus</i>	2001	1	Mi,M				
Black-shouldered Kite	<i>Elanus axillaries</i>	1999	1	Mi				
Peregrine Falcon	<i>Falco peregrinus</i>	1999	1	Mi				
Brown Falcon	<i>Falco berigora</i>	2001	2	Mi				
Barn Owl	<i>Tyto alba</i>	1999	1					
Galah	<i>Eolophus roseicapilla</i>	1999	1					
Eastern Rosella	<i>Platycercus eximius</i>	2001	1					
Pallid Cuckoo	<i>Cuculus pallidus</i>	1998	1	M				
Horsfield's Bronze- Cuckoo	<i>Chrysococcyx basalis</i>	1999	1	M				
Welcome Swallow	<i>Hirundo neoxena</i>	1999	7	M				
Willie Wagtail	<i>Rhipidura leucophrys</i>	2001	6					
Flame Robin	<i>Petroica phoenicea</i>	1981	1	M				
Grey Shrike-thrush	<i>Colluricincla harmonica</i>	1981	1					
Magpie-lark	<i>Grallina cyanoleuca</i>	2001	4	M				
Black-faced Cuckoo- shrike	<i>Coracina novaehollandiae</i>	1998	1	M				
Brown Thornbill	<i>Acanthiza pusilla</i>	2001	1					
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>	1981	1					
Golden-headed Cisticola	<i>Cisticola exilis</i>	1999	6					
Superb Fairy-wren	<i>Malurus cyaneus</i>	1999	4					
White-plumed Honeyeater	<i>Lichenostomus penicillatus</i>	1999	5					
Australian Pipit	<i>Anthus australis</i>	1999	2	M				
Australian Magpie	<i>Gymnorhina tibicen</i>	2001	2					
Australian Raven	<i>Corvus coronoides</i>	1999	4					
Little Raven	<i>Corvus mellori</i>	2001	2	M				
Cattle Egret	<i>Ardea ibis</i>	1999	1	Mi,M				
Pectoral Sandpiper	<i>Calidris melanotos</i>	1998	1	Mi,M			NT	
Spotted Turtle-Dove	<i>Streptopelia chinensis</i>	2001	6					*
Common Blackbird	<i>Turdus merula</i>	2001	1					*
Skylark	<i>Alauda arvensis</i>	2001	6					*
House Sparrow	<i>Passer domesticus</i>	1999	3					*
European Goldfinch	<i>Carduelis carduelis</i>	1999	2					*
European Greenfinch	<i>Carduelis chloris</i>	1999	1					*
Common Myna	<i>Acridotheres tristis</i>	2001	6					*
Common Starling	<i>Sturnus vulgaris</i>	2001	7					*
<b>Mammals</b>								
Southern Brown Bandicoot	<i>Isodon obesulus obesulus</i>	1991	1	EN	NT	I	NT	
Common Brushtail Possum	<i>Trichosurus vulpecula</i>	1981	1					
Common Ringtail Possum	<i>Pseudocheirus peregrinus</i>	1987	1					
Bush Rat	<i>Rattus fuscipes</i>	1984	1					
Rabbit	<i>Oryctolagus cuniculus</i>	1981	1					*
Fox	<i>Vulpes vulpes</i>	1991	1					*

Common Name	Scientific Name	Last	Recs	EPBC	NAP	FFG	DSE	Feral
<b>Reptiles</b>								
Lowland Copperhead	<i>Austrelaps superbus</i>	1996	19					
<b>Amphibians</b>								
Growling Grass Frog	<i>Litoria raniformis</i>	2003	8	VU	VU	L	EN	
<b>Fish</b>								
Short-headed Lamprey	<i>Mordacia mordax</i>	1997	5					
Short-finned Eel	<i>Anguilla australis</i>	1998	13					
Common Jollytail	<i>Galaxias maculatus</i>	1998	13					
Goldfish	<i>Carassius auratus</i>	1998	5					*
Mosquitofish	<i>Gambusia holbrooki</i>	1998	5					*
Tupong	<i>Pseudaphritis urvillii</i>	1997	5					



#### Appendix 4 Species listed from the EPBC Protected Matters Search Tool

Common Name	Scientific Name	EPBC Status
<b>Birds</b>		
Swift Parrot	<i>Lathamus discolor</i>	Endangered
Australian Painted Snipe	<i>Rostratula australis</i>	Vulnerable
Regent Honeyeater	<i>Xanthomyza phrygia</i>	Endangered
<b>Frogs</b>		
Growling Grass Frog	<i>Litoria raniformis</i>	Vulnerable
<b>Mammals</b>		
Spot-tailed Quoll	<i>Dasyurus maculatus maculatus</i>	Endangered
Southern Brown Bandicoot	<i>Isodon obesulus obesulus</i>	Endangered
Long-nosed Potoroo	<i>Potorous tridactylus tridactylus</i>	Vulnerable
Smoky Mouse	<i>Pseudomys fumeus</i>	Endangered
Grey-headed Flying Fox	<i>Pteropus poliocephalus</i>	Vulnerable
<b>Ray-finned Fishes</b>		
Dwarf Galaxias	<i>Galaxiella pusilla</i>	Vulnerable
Australian Grayling	<i>Prototroctes maraena</i>	Vulnerable
<b>Plants</b>		
River Swamp Wallaby Grass	<i>Amphibromus fluitans</i>	Vulnerable
Maroon Leek-orchid	<i>Prasophyllum frenchii</i>	Endangered
Metallic Sun Orchid	<i>Thelymitra epipactoides</i>	Endangered
Swamp Everlasting	<i>Xerochrysum palustre</i>	Vulnerable
<b>Migratory Terrestrial Species</b>		
White-bellied Sea Eagle	<i>Haliaeetus leucogaster</i>	Migratory
White-throated Needletail	<i>Hirundapus caudacutus</i>	Migratory
Rainbow Bee-eater	<i>Merops ornatus</i>	Migratory
Black-faced Monarch	<i>Monarcha melanopsis</i>	Migratory
Satin Flycatcher	<i>Myiagra cyanoleuca</i>	Migratory
Rufous Fantail	<i>Rhipidura rufifrons</i>	Migratory
Regent Honeyeater	<i>Xanthomyza Phrygia</i>	Migratory
<b>Migratory Wetland Species</b>		
Great Egret	<i>Ardea alba</i>	Migratory
Cattle Egret	<i>Ardea ibis</i>	Migratory
Latham's Snipe	<i>Gallinago hardwickii</i>	Migratory
Painted Snipe	<i>Rostratula benghalensis s.lat.</i>	Migratory
<b>Migratory Marine Species</b>		
Fork-tailed Swift	<i>Apus pacificus</i>	Migratory

Great Egret	<i>Ardea alba</i>	Migratory
Cattle Egret	<i>Ardea ibis</i>	Migratory
<b>Marine Overfly species</b>		
Fork-tailed Swift	<i>Apus pacificus</i>	Marine Overfly
Great Egret	<i>Ardea alba</i>	Marine Overfly
Cattle Egret	<i>Ardea ibis</i>	Marine Overfly
Latham's Snipe	<i>Gallinago hardwickii</i>	Marine Overfly
White-bellied Sea Eagle	<i>Haliaeetus leucogaster</i>	Marine Overfly
White-throated Needletail	<i>Hirundapus caudacutus</i>	Marine Overfly
Swift Parrot	<i>Lathamus discolor</i>	Marine Overfly
Rainbow Bee-eater	<i>Merops ornatus</i>	Marine Overfly
Black-faced Monarch	<i>Monarcha melanopsis</i>	Marine Overfly
Satin Flycatcher	<i>Myiagra cyanoleuca</i>	Marine Overfly
Rufous Fantail	<i>Rhipidura rufifrons</i>	Marine Overfly
Painted Snipe	<i>Rostratula benghalensis s.lat.</i>	Marine Overfly

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## **Appendix 5** Species from the fauna data review area with a low likelihood of occurrence within the study area

### **Species listed under the *Environment Protection and Biodiversity Conservation Act 1999***

#### **Southern Brown Bandicoot (*Isoodon obesulus obesulus*)**

The Southern Brown Bandicoot is listed as 'Endangered' under the EPBC Act 1999, and is classified as 'Near Threatened' in Victoria (DSE 2007b).

The Southern Brown Bandicoot has a predominantly coastal distribution however populations exist as far inland as the Grampians in western Victoria and the Dandenong Ranges (Menkhorst 1995). Low, dense ground cover is the primary habitat requirement of this species (Paull 1995; Sanderson and Kraehenbuehl 2006). Southern Brown Bandicoots typically occupy habitats which can fulfill this requirement, such as; heathy forest and woodland, coastal heathland, Swamp Scrub, and sedgy woodland along drainage lines (Menkhorst and Seebeck 1990, Menkhorst 1995, Stoddart and Brathwaite 1979). The species shows a preference for habitats with sandy, well-drained soils that support scrubby vegetation, which is often associated with watercourses. Dense, low ground cover, even if it exists in quite degraded remnant vegetation affords shelter for animals when foraging and protection from predators. For example, Southern Brown Bandicoots often make use of blackberry bushes as cover (Sanderson and Kraehenbuehl 2006; Alessio 2000, 2002), which can present problems for land managers. The low nutrient, sandy soils characteristic of where this species occurs facilitates the creation of conical shaped diggings of the bandicoots when foraging for foods such as fungi and larvae. Leaf litter may also be an important habitat resource for the Southern Brown Bandicoot. Research has shown that this species can often be found in areas with leaf litter between 3 - 4 cm thick (Richardson 2003).

Records from the AVW database and previous Ecology Australia studies suggest that the Southern Brown Bandicoot is sparsely distributed throughout the Pakenham area. A previous targeted survey of Healesville - Koo Wee Rup Road by Ecology Australia recorded Southern Brown Bandicoots in two locations in the southern end of the study area: Boundary Drain Road/Station Street, Koo Wee Rup; and the 'Swamp Lookout' (Ecology Australia 2006e).

Also within the vicinity of the study area, there is one record at Dalmore East, near Toomuc Creek from 1991 (DSE 2004). A population of Southern Brown Bandicoots exists at Bayles, c.9 km north-east of Koo Wee Rup, and also at Koo Wee Rup (Nicholls 2007). There are three historical records at Bayles from 1976, 1977 and 1979. In 2002, Ecology Australia conducted a survey for the Southern Brown Bandicoot at Bayles, and obtained records at Yallock Creek, both upstream and downstream of the Bayles Bridge (Ecology Australia 2002). More recently, records were obtained at Yallock Creek in 2004 (Ecology Australia 2004b, 2005b), and again in 2005 (Gemma Phelan, DSE, via D.Quin, Ecology Australia). Another population is known from Tooradin and another from Clyde (Nicholls 2007).

The study area is primarily pastoral land, intersected by roads which does not constitute suitable habitat for the Southern Brown Bandicoot. Thus, it is unlikely to occur in the study area. There

is low quality habitat for the Southern Brown Bandicoot with patches of dense understorey along Toomuc Creek (Ecology Partners 2007). However, the study area is isolated from other populations, such as those at Bayles, Clyde and Tooradin due to fragmentation by roads and a lack of habitat links. Given the low quality habitat in the study area and degree of development to the north, there is a low likelihood that Southern Brown Bandicoots may re-populate the study area from adjoining areas (e.g. Cardinia).

### **Species listed under the *Flora and Fauna Guarantee Act 1988***

#### **Caspian Tern (*Sterna caspia*)**

The Caspian Tern is listed under the FFG Act 1988 and is classified as 'Near Threatened' in Victoria (DSE 2007b).

This species is widespread in sheltered coastal embayments, including harbours, lagoons, inlets, estuaries and large, brackish inland lakes where rainfall does not exceed 700mm per year (Emison *et al.* 1987, Higgins and Davies 1996). They occasionally visit large freshwater lakes with exposed sandbanks, where can they rest (Emison *et al.* 1987). When at sea, Caspian Terns can usually be found in sheltered situations, particularly near islands, they are rarely found beyond reefs. Individuals forage in open wetlands in the sheltered and shallow margins, preferably in wetlands with clear rather than muddy, turbid water. This species is also known to use artificial wetlands and sewage ponds (Higgins and Davies 1996).

There is one previous record from 1997, where an individual was recorded in the sewage lagoons of the nearby South East Water Pakenham Sewage Treatment Plant (DSE 2004). The habitat requirements of the Caspian Tern indicate that the Sewage Treatment Plant is the only area where this species may occur.

#### **Blue-billed Duck (*Oxyura australis*)**

The Blue-billed Duck is listed under the FFG Act 1988 and is classified as 'Endangered' in Victoria (DSE 2007b).

The Blue-billed Duck is an almost wholly aquatic inhabitant of terrestrial wetlands of temperate south-east and south-west of Australia (Marchant and Higgins 1990). This species shows a preference for deep, large, permanent and well vegetated wetlands, where conditions are stable (Emison *et al.* 1987). They feed in open water, yet almost always close to or in tall dense vegetation, and prefer to stay far from the shore when dense vegetation cover is available in more central parts of the wetland (Frith 1982). Flocks sometimes concentrate over deep exposed waters, but remain far from the shoreline (Marchant and Higgins 1990). Gatherings also frequently form on large freshwater lakes, swamps and sewage ponds, mainly in winter, however, some gatherings may persist through to summer. Increased amounts of freshwater run off in winter, allows birds to sometimes occupy saline wetlands and salt lakes. When breeding,

individuals typically disperse to freshwater wetlands that have well vegetated margins, which provides good nesting sites.

There are two records of the Blue-billed Duck from the AVW, in the vicinity of the study area (DSE 2004). Both of these records from 1990 and 1996 were obtained at the sewage lagoons in the South East Water Pakenham Sewage Treatment Plant, which abuts the study area on the eastern boundary. In addition to these two records from the DRA, Ecology Australia recorded the Blue-billed Duck at the Pakenham Sewage Treatment Plant, on Lagoon 18 in 2005 (Ecology Australia, unpublished data). These large, permanent wetlands provide the most suitable habitat for this species in the broader study area.

### **Species classified as threatened in Victoria (DSE 2007b)**

#### **Whiskered Tern (*Chlidonias hybridus*)**

The Whiskered Tern is classified as 'Near Threatened' in Victoria (DSE 2007b).

Whiskered Terns are summer migrants to Victoria from their wintering grounds farther north in Australia, New Guinea and Indonesia. They occur on shallow freshwater swamps and fresh or brackish lakes where annual rainfall does not exceed 700 mm. Water bodies with low emergent vegetation are preferred. This species sometimes occurs on large rivers, sewage lagoons, saltworks, and at sea when migrating (Emison *et al.* 1987).

The Whiskered Tern was last recorded at the Pakenham sewage lagoons in 1997 (DSE 2004), and again during the current field inspection, where between five to ten terns were observed foraging over the Sewage Lagoons at the Treatment Plant. This species is unlikely to occur within the study area, but is more likely to occur regularly at the Pakenham Sewage Treatment Plant, where more suitable habitat exists.

#### **Common Sandpiper (*Actitis hypoleuca*)**

The Common Sandpiper is classified as 'Vulnerable' in Victoria (DSE 2007b).

Small numbers of Common Sandpipers migrate to Victoria during summer from their breeding grounds in northern Asia and Europe (Emison *et al.* 1987). When in Victoria, they occupy a wide range of coastal or inland wetlands with varying levels of salinity. Most commonly, they visit narrow mudflats, or the rocky shores of wetlands. They also occur around estuaries, stream deltas, lakes, billabongs, dams and reservoirs and also make use of sewage ponds (Higgins and Davies 1996).

The last record of the Common Sandpiper within the 5km DRA originates from the Pakenham sewage lagoons in 1998 (DSE 2004). The current study area does not present suitable habitat for the Common Sandpiper.

### **Cape Barren Goose (*Cereopsis novaehollandiae*)**

The Cape Barren Goose is classified as 'Near Threatened' in Victoria (DSE 2007b).

The Cape Barren Goose is a mainly terrestrial inhabitant of grasslands and terrestrial wetlands of the Mainland and also off-shore islands (Marchant and Higgins 1990, Emison *et al.* 1987). Birds graze on short green herbage, grasses, pasture and crops and sometimes enter the water to graze on the margins of the wetland. Low lying vegetation, dense enough to provide cover but not so as to restrict visibility and movement, adjacent to grassy feeding areas is required for breeding. When inhabiting islands, low limestone islands, with a high cover of soil supporting grassland or open shrubland to less than one meter is typically preferred (Marchant and Higgins 1990).

There is only one record of the Cape Barren Goose from the DRA. One individual was recorded in 1998 at the Pakenham sewage lagoons (DSE 2004), which once again presents the most suitable habitat in the broader study area. Even so, the low reporting rates suggest that this species generally has a low likelihood of regular occurrence in the Pakenham area.

### **Australasian Shoveler (*Anas rhynchos*)**

The Australasian Shoveler is classified as 'Vulnerable' in Victoria (DSE 2007b).

It typically occurs on temperate zone terrestrial wetlands, but also occasionally occurs in sheltered estuarine habitats and inshore waters. The Australasian Shoveler is a filter feeder and thus requires open water or fertile wetlands with soft mud and abundant prey for foraging (Marchant and Higgins 1990). This species tends to prefer large, deep, permanent wetlands however it also frequently occurs on billabongs, watercourses, floodwaters, shallow swamps, irrigated fields, farm dams and sewage ponds (Emison *et al.* 1987).

There are eight records of the Australasian Shoveler (1981-1999) from the Pakenham Sewage Treatment Plant, where suitable habitat exists (DSE 2004). In addition to these records from the DRA, the Australasian Shoveler was recorded at the Pakenham Treatment Plant in 2005, at Lagoon 18 by Ecology Australia (Ecology Australia, unpublished data). All of these records suggest that the Pakenham Sewage Treatment Plant may provide the most suitable habitat for this species in the broader study area.

### **Hardhead (*Aythya australis*)**

The Hardhead is classified as 'Vulnerable' in Victoria (DSE 2007b).

The preferred habitat of the Hardhead consists of deep, permanent water bodies including terrestrial wetlands, billabongs, alluvial plains, floodwaters and in particular deep swamps. Occasionally birds frequent estuarine habitats and inshore waters (Marchant and Higgins 1990). The Hardhead tends to avoid dense cover, instead frequenting open water in channels with deep

central parts. Birds will frequent farm dams if they are sufficiently deep (Broome and Jarman 1983).

The Hardhead is unlikely to regularly occur within the study area due to the lack of suitable habitat. Large, deep dams, which are uncommon within the study area, may be utilised and smaller farm dams in the study area may also be used occasionally. However, the most suitable habitat for this species is present at the Pakenham Sewage Treatment Plant, within the sewage lagoons. Seven previous records (1981-1997) for this species from the DRA are all from the Pakenham Sewage Treatment Plant (DSE 2004). Ecology Australia also recorded the Hardhead at the Pakenham Sewage Treatment Plant in 2005 (Ecology Australia, unpublished data).

### **Musk Duck (*Biziura lobata*)**

The Musk Duck is classified as 'Vulnerable' in Victoria (DSE 2007b)

The Musk Duck is found in the south-west and south-east corners of the continent and occupies both freshwater wetlands and estuarine habitats. Like the Blue-billed Duck, Musk Ducks prefer large, deep and well vegetated water bodies where conditions are stable (Marchant and Higgins 1990). They are less often found on shallow swamps, billabongs and small water bodies, and they tend to be transient on farm dams. Only farm dams with dense emergent vegetation are sometimes used as breeding grounds (Masters and Milhinch 1974; Marchant and Higgins 1990).

The South East Water Pakenham Treatment Plant provides the best habitat in the area for this species. One previous record of a Musk Duck within the Pakenham area was obtained from there in 1981 (DSE 2004).

### **Pectoral Sandpiper (*Calidris melanotos*)**

The Pectoral Sandpiper is classified as 'Near Threatened' in Victoria (DSE 2007b).

Pectoral Sandpipers are summer migrants to Victoria from their breeding grounds in arctic Siberia and North America (Emison *et al.* 1987). They typically occur in coastal and near coastal shallow freshwater and saline swamps, however they occasionally also occur further inland. Other habitats occupied by the Pectoral Sandpiper include coastal lagoons, estuaries, bays, floodplains and inundated grasslands (Higgins and Davies 1996). Individuals often feed from mud or in shallow waters, remaining close to vegetation (Emison *et al.* 1987).

There is only one record of the Pectoral Sandpiper from the DRA at the Pakenham Sewage Treatment Plant in 1988 (DSE 2004).