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Paper Size A3
0 0.125 0.25 0.5 0.75 1
Kilometers
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54



LEGEND

Study Area
Carriageway (Section 2)

Alignment Options (Landtake)
B4-A
B4-B
B5

FFG Vegetation communities
May be present



VicRoads
Beaufort Bypass Ecology Preliminary

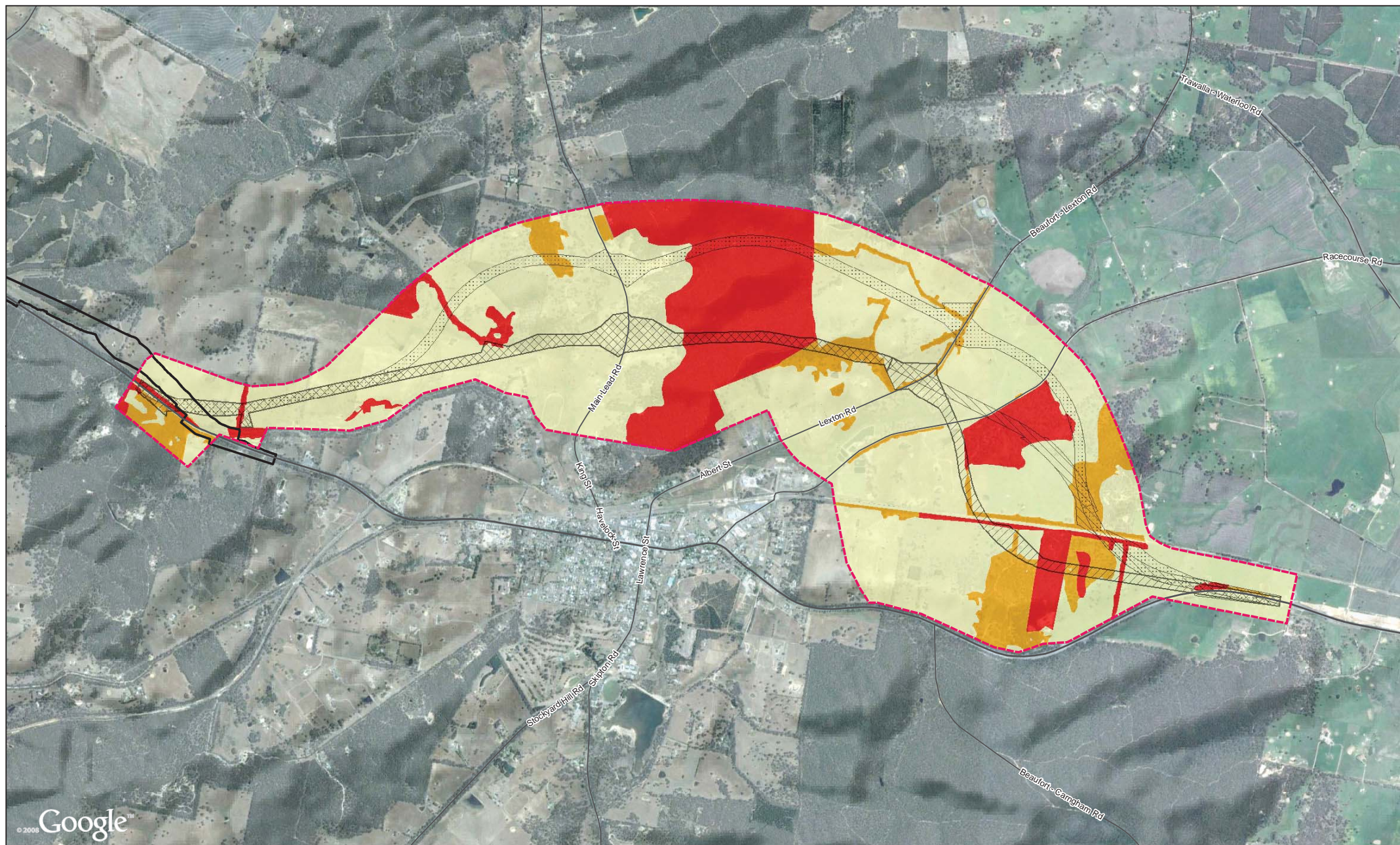
Job Number 31-32208
Revision A
Date 19 Jan 2015

FFG Vegetation Communities **Figure 7**

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DEPI, VicMap, 2014; Google Earth Pro, Aerial Imagery, 2014

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LEGEND

- Study Area
- Carriageway (Section 2)

Alignment Options (Landtake)

- B4-A
- B4-B
- B5

Likely threatened flora species habitat

- High
- Medium
- Low



VicRoads
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Likely Threatened Flora Species Habitat **Figure 8**

3.2.6 Weeds

A large number of weed species were recorded during the field investigation (44 species), including declared noxious weeds listed under the *Catchment and Land Protection (CaLP) Act 1994* and/or Weeds of National Significance (WONS), as shown in Table 10.

Table 10 Noxious weeds recorded within the study area

Scientific Name	Common Name	CALP Listed Status*	WONS
<i>Cirsium vulgare</i>	Spear Thistle	Restricted	
<i>Crataegus monogyna</i>	Hawthorn	Restricted	
<i>Genista monspessulana</i>	Montpellier Broom	Restricted	Y
<i>Rosa rubiginosa</i>	Sweet Briar	Regionally Controlled	
<i>Rubus fruticosus</i> spp. agg.	Blackberry	Regionally Controlled	Y
<i>Ulex europaeus</i>	Gorse	Regionally Controlled	Y

* within the Glenelg-Hopkins Catchment Management Authority

3.2.7 Phylloxera Infestation Zones

The study area occurs within a Phylloxera Exclusion Zone, which is known to be free of phylloxera. The nearest Phylloxera Infested Zone is located at Whitebridge, north-east of Ballarat³.

3.2.8 Cinnamon Fungus

The soil borne pathogen, Cinnamon Fungus (*Phytophthora cinnamomi*) was not detected during the field survey; however, not all of the study area was visited during this preliminary survey and this assessment did not involve any soil sampling or analysis. However, it is possible this disease may be present within the study area, and future surveys should still consider the potential presence of this pathogen.

³ <https://maps.phylloxera.com.au/virtual/pmz/> (last accessed 1st December 2014)

4. Fauna results

4.1 Desktop results

In total, the desktop results identified 184 terrestrial fauna species that are documented to occur or predicted to occur, within 5 km of the study area (VBA and PMST). These include 175 native species (17 mammals, 138 birds, nine reptiles, nine amphibians and two invertebrates) and nine non-native species (three mammals and six birds). Many of these are species of conservation significance, as threatened fauna and/or Migratory fauna.

Threatened fauna

Of the fauna species identified in the desktop searches for this project, 31 are listed as threatened (or another related category of conservation significance, such as near threatened or data deficient) under one or more of the EPBC Act, FFG Act and DEWLP Advisory Lists of Threatened Vertebrate or Invertebrate Fauna of Victoria (DSE 2013, 2009 respectively). Counts of species in different groups are provided in Table 11.

Table 11 Counts of threatened fauna species identified for the 5-km search area

Group	EPBC	FFG	DEWLP	Total
Mammals	3	4	4	4
Birds	4	12	21	21
Reptiles	1	1	2	2
Amphibians	1	2	2	2
Invertebrates	1	1	1	1
Total	10	12	31	31

Row totals are *not* simply aggregates of cells in that row because some species are listed under one or more category.

Migratory and marine fauna

Twelve species of native birds are listed under the EPBC Act as Migratory.

The Marine status of fauna species (as indicated under the EPBC Act) was not considered because the study site is not in or near a Commonwealth marine area.

Threatened fauna communities

Twenty-one of the bird species identified by the desktop searches are members of the Victorian Temperate Woodland Bird Community (VTWBC), which is listed as threatened under the Victorian FFG Act.

The description of this community identifies *key indicator bird species* (the presence of which confirm the presence of the community) and *associated bird species* (the presence of which indicate the potential presence of the community). This community is characteristically found within box-ironbark, yellow box, cypress pine and other woodlands. The geographic area that supports this bird assemblage can be broadly defined as the country that lies in the south-east along the slopes and plains of the Great Dividing Range.

Eleven *key indicator* species and ten *associated* bird species were identified by the desktop assessment for the study area.

4.2 Field results

4.2.1 Fauna habitats

Habitat for fauna in the study area covers a broad range of descriptions, but can be categorised into the following four classes: Grassland, woodland, wetlands for waterbirds, wetlands for frogs. These are described in more detail below.

Grassland. Much of the study area has been cleared for agricultural purposes. Consequently, the study area is now dominated by non-native grasslands. The condition of the grassland in regard to fauna habitat ranges from poor to medium (no good quality grassland habitat was observed). Grasslands were typically dominated by non-native pasture grasses and show evidence of frequent or occasional disturbance. Most of the grassland areas are used for grazing of cattle, horses and/or sheep. Some paddocks have been cultivated and cropped, and others showed evidence of being recently harvested for hay. Some parts of the study area are subject to flooding as evident by the presence of particular flora species such as *Juncus* spp throughout some paddocks. These wetter paddocks were considered poor quality habitat for many grassland fauna.

Many small patches of grassland retained a sparse, open woodland overstorey. Some patches of grassland were assessed as providing medium quality habitat for grassland-dependent fauna, such as the Golden Sun Moth (*Synemon plana*) and the Striped Legless Lizard (*Delma impar*).

Woodland. Small parts of the study area have retained their remnant tree cover, and provide woodland habitat for a wide range of fauna species. Treed habitats occur mostly along roadways and rail lines, but also occur along some creeklines and in some larger blocks of remnant native woodland habitat e.g. Camp Hill State Forest and Snow Gums Bushland Reserve. Given that nearly all of the study area would have supported woodland prior to European settlement, any remaining woodland now provides important habitat for woodland-dependent fauna, whose habitat has been largely fragmented and isolated. While providing foraging and breeding habitat for some fauna, remaining woodland also provides a network of connectivity for fauna that disperse widely across the landscape (e.g. birds, mobile reptiles and mammals). The condition of woodland within the study area varies widely. Larger or wider patches of remnant woodland are typically of very high quality for woodland fauna, and have a high likelihood of being used by threatened fauna species and the Victorian Temperate Woodland Bird Community (VTWBC). Smaller and narrower patches are of medium quality, but still of value for fauna dispersal. Patches of planted or non-native woodland are typically of low value for woodland-dependent fauna.

Five *key* or *associated* members of the VTWBC were detected in woodland within the study area.

Some woodland patches contain small watercourses that are likely to be suitable for toadlets (e.g., Brown Toadlet, *Pseudophryne bibronii*, which was recorded in a few locations within the study area recently; VicRoads 2012 and DEWLP Interactive maps).

Wetland habitat for waterbirds. There are three main areas with potentially suitable waterbird habitat within the study area; Beaufort Waste Water Treatment Plant, and two waterbodies on the northern boundary of the study area, one north and one south of Beaufort-Lexton Road Figure 9. There is also a low lying grassy area surrounding an unnamed waterway between Lexton Road and Racecourse Rd that provides low quality waterbird habitat.

Two species of threatened waterbird species were observed at Beaufort Waste Water Treatment Plant (from the road reserve): Australasian Shoveler, *Anas rhynchos* and Hardhead, *Aythya australis*. The Beaufort Waste Water Treatment Plant was considered unsuitable for frogs given the lack of emergent and submerged vegetation and shade. However the two other main waterbird wetlands are considered suitable frog habitat as well as discussed below.

Wetland habitat for frogs. The study area contains numerous small waterbodies, mostly farm dams for watering stock. These waterbodies generally provide low quality habitat for fauna, but some of the larger and more vegetated dams, particularly those along larger watercourses, provide medium to good quality habitat for frogs, potentially including species such as the Growling Grass Frog (*Litoria raniformis*), which is listed as vulnerable under the EPBC Act. These farm dam habitats are generally only marginally suitable for threatened species of waterbirds.

Four main areas of wetland habitat suitable for Growling Grass Frog and several small farm dams with proximity to recent records were identified within the study area Figure 9.

Suitable habitat for species identified in the above habitat has been mapped within Figure 9.

Photographs of examples of the main fauna habitats are shown in Table 12.

Table 12 Higher-quality examples of fauna habitats within the study area

Habitat	Habitat
Grassland 	Woodland 
Wetlands (waterbirds) 	Wetlands (frogs) 

4.2.2 Fauna species

Forty-eight terrestrial fauna species were identified during the site visit (Appendix E), including 45 native species (four mammals, 43 birds and one reptile) and three non-native species (two and one bird).

Three of the species detected (all birds) are listed as threatened or near threatened on the DEWLP Advisory Lists of Threatened Vertebrates (DSE 2013) though one of these; the Emu, was just outside the study area boundary. Five bird species that are members of the Victorian Temperate Woodland Bird Community were detected; one of these is listed as a near threatened species also. One of the bird species detected is listed under the EPBC Act as Migratory. These are all shown in Table 13.

Table 13 Species of conservation significance detected during the site visit

Common name	Scientific Name	EPBC	FFG	DEWLP	VTWBC
Birds					
Emu	<i>Dromaius novaehollandiae</i>			NT	Associated
Australasian Shoveler	<i>Anas rhynchotis</i>			VU	
Hardhead	<i>Aythya australis</i>			VU	
Rainbow Bee-eater	<i>Merops ornatus</i>	Mi			
Jacky Winter	<i>Microeca fascians</i>				Key
Eastern Yellow Robin	<i>Eopsaltria australis</i>				Associated
Rufous Whistler	<i>Pachycephala rufiventris</i>				Associated
Dusky Woodswallow	<i>Artamus cyanopterus</i>				Associated

Mi = Migratory; VU = Vulnerable; NT = Near Threatened; Key/Associated – see Threatened Communities in Section 4.1

4.2.3 Fauna of conservation significance

In addition to the three species of conservation significance that were detected during the site visit (i.e., not including species listed only as VWTBC members or EPBC Migratory), numerous more were identified during this assessment (i.e. species identified as known or predicted within 5 km) and have the potential to occur within habitats within the study area. For each species, the likelihood of occurrence was evaluated using the following rationale:

Known - Recorded within or adjacent to the study area boundary within last five years (includes records from this survey)

High - Suitable habitat present within the study area and/or species recorded within the study area within previous 20 years

Medium - Suitable habitat present within the study area but is modified/degraded, species may or may not have been recorded from within the study area

Low - Suitable habitat unlikely to occur within the study area, or present but substantially modified/degraded, or suitable habitat present but species not recorded for over 50 years, or suitable habitat present within the study area but species is unlikely to make substantial use of this habitat e.g. vagrant species

The likelihood of occurrence of all 31 threatened and near-threatened fauna species identified for the study area is presented in Appendix D. Twelve of these are considered to have a low likelihood of occurrence within the study area, generally due to habitat suitability. The occurrence of 19 threatened fauna species is considered possible, and these species are shown in Table 14.

Table 14 Threatened and near-threatened fauna species known or considered most likely to occur within the study area

Common name	Scientific Name	EPBC	FFG	DEWLP	Likelihood of Occurrence
Mammals					
Brush-tailed Phascogale	<i>Phascogale tapoatafa tapoatafa</i>		L	VU	High
Birds					
Emu	<i>Dromaius novaehollandiae</i>			NT	High
Brolga	<i>Grus rubicunda</i>		L	VU	Known
Australasian Shoveler	<i>Anas rhynchos</i>			VU	Known
Hardhead	<i>Aythya australis</i>			VU	Known
Blue-billed Duck	<i>Oxyura australis</i>		L	EN	Medium
Spotted Harrier	<i>Circus assimilis</i>			NT	Medium
Powerful Owl	<i>Ninox strenua</i>		L	VU	High
Black-eared Cuckoo	<i>Chrysococcyx osculans</i>			NT	Medium
Brown Treecreeper (south-eastern ssp.)	<i>Climacteris picumnus victoriae</i>			NT	High
Black-chinned Honeyeater	<i>Meliphaga gularis gularis</i>			NT	High
Painted Honeyeater	<i>Grantiella picta</i>		L	VU	Medium
Regent Honeyeater	<i>Anthochaera phrygia</i>	EN	L	CR	Medium
Diamond Firetail	<i>Stagonopleura guttata</i>		L	NT	Medium
Reptiles					
Common Long-necked Turtle	<i>Chelodina longicollis</i>			DD	Medium
Striped Legless Lizard	<i>Delma impar</i>	VU	L	EN	Medium
Frogs					
Brown Toadlet	<i>Pseudophryne bibronii</i>		L	EN	High
Growing Grass Frog	<i>Litoria raniformis</i>	VU	L	EN	High
Invertebrates					
Golden Sun Moth	<i>Synemon plana</i>	CR	L	CR	High

Note: This table includes species that are **known** to occur, or have been assigned a **high** or **medium** likelihood of occurrence within the study area. Justification for the likelihood of occurrence is provided in Appendix D.

The suitability of the study area to support threatened species was considered. Targeted surveys are recommended for a number of threatened fauna species as outlined within Table 15 and Section 9 and determined based on the presence of previous records in the local region (and when they were recorded, species identified during the field survey) and the presence of suitable habitat within the study area.

Targeted surveys have not been recommended for some listed species identified during the field assessment. This is typically because surveys are unlikely to result in more detailed information being obtained given the ecology of the species, e.g. highly mobile, vagrant or elusive. As such targeted surveys are unlikely to be required for woodland bird species (e.g., Painted Honeyeater, Regent Honeyeater) in all patches of remnant woodland and presence should be assumed.

However, prior to undertaking targeted surveys DEWLP should be consulted to determine the need for targeted surveys for each species or community that has been identified as likely to occur within the study area (see section Table 15).

Table 15 Threatened fauna species which may need to be targeted by additional survey(s) – Beaufort

Common Name	Scientific Name	Conservation Status			Observed During Assessment? (Y/N)	Targeted Surveys Recommended? (Y/N)	Location of surveys	Timing of Targeted Survey
		EPBC	FFG	DEWLP				
Golden Sun Moth	<i>Synemon plana</i>	CR	L	CR	N	Y	Grassland areas mapped as Medium or High. see Figure 9	<p>Undertaken during the local flying season (late October to early January, with peak typically in late November and December), unless otherwise extended by DEWLP.</p> <p>Undertaken only during specific weather conditions (warm, still and sunny). Repeated on four separate occasions (rounds) at approximately weekly intervals.</p>
Striped Legless Lizard	<i>Delma impar</i>	VU	L	EN	N	Y	Grassland areas mapped as Medium or High. see Figure 9	<p>Artificial shelter site surveys undertaken during the active period between September and May.</p> <p>Shelter sites to be installed at least three months prior to the initial survey/checks (i.e., by June). In Victoria, at least six months of survey is recommended.</p> <p>Shelter sites to be checked at least twice a month, and ideally once a week during spring to early summer (i.e., between early September to December).</p>

Common Name	Scientific Name	Conservation Status			Observed During Assessment? (Y/N)	Targeted Surveys Recommended? (Y/N)	Location of surveys	Timing of Targeted Survey
		EPBC	FFG	DEWLP				
Growling Grass Frog	<i>Litoria raniformis</i>	VU	L	EN	N	Y	Growling Grass Frog habitat mapped as Medium or High see Figure 9	Acoustic surveys at night during the calling/breeding period (October to December). That period may shift or extend from September through to March if suitable environmental conditions prevail. The peak activity period for the species tends to be November–December in southern Victoria. Surveys are required to be undertaken over at least two rounds.
Brown Toadlet	<i>Pseudophryne bibronii</i>	-	L	EN	N	Y	Brown Toadlet habitat mapped as Medium or High. see Figure 9	Acoustic surveys at night during the calling/breeding period (March to June, preferably in April and May). Surveys are required to be undertaken over at least two rounds.
Brush-tailed Phascogale	<i>Phascogale tapoatafa tapoatafa</i>	-	L	VU	N	Y	Woodland habitat mapped as Medium or High see Figure 9	Undertake surveys during Autumn when juveniles are also present. Surveys should involve the use of Elliott traps over at least 5 nights.

4.2.4 Threatened fauna communities

Twenty-two of the bird species identified by the desktop searches are members of the Victorian Temperate Woodland Bird Community (VTWBC), which is listed as threatened under the Victorian FFG Act. The description of this community identifies *key indicator bird species* (the presence of which confirm the presence of the community) and *associated bird species* (the presence of which indicate the potential presence of the community). This community is characteristically found within box-ironbark, yellow box, cypress pine and other woodlands. The geographic area that supports this bird assemblage can be broadly defined as the country that lies in the south-east along the slopes and plains of the Great Dividing Range.

Six *key indicator* species and two *associated* bird species were identified by the desktop assessment for the study area. Consequently, this threatened community occurs within the study area. It is considered likely that this community could occur within areas mapped as medium or high likelihood of woodland fauna habitat within Figure 9.

4.2.5 Migratory fauna

Twelve species (all birds) known or predicted to occur within 5 km of the study area are listed as Migratory under the EPBC Act (Table 16).

Table 16 Migratory Species

Common Name	Scientific Name	Likelihood of occurrence
Regent Honeyeater	<i>Anthochaera phrygia</i>	Medium
Black-faced Monarch	<i>Monarcha melanopsis</i>	Medium
Satin Flycatcher	<i>Myiagra cyanoleuca</i>	Low
Rufous Fantail	<i>Rhipidura rufifrons</i>	Low
Fork-tailed Swift	<i>Apus pacificus</i>	Low
White-throated Needletail	<i>Hirundapus caudacutus</i>	Low
Rainbow Bee-eater	<i>Merops ornatus</i>	Known
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	Low
Cattle Egret	<i>Ardea ibis</i>	Low
Eastern Great Egret	<i>Ardea modesta</i>	Low
Latham's Snipe	<i>Gallinago hardwickii</i>	Low
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	Low

While some of these species (e.g. Rainbow Bee eater) are known to use parts of the study area, none of these species is considered likely to make significant use of the study area.

In terms of the EPBC Act, an action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

- Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;
- Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or
- Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

None of the above significant impacts are considered likely to occur for Migratory species relevant to this project.

4.2.6 Wildlife corridors

Wildlife corridors are areas of habitat that facilitate the movement of fauna between areas of habitat. Corridors play important roles in linking otherwise isolated areas of habitat.

Typically, a wildlife corridor is a linear strip of habitat that connects two larger patches of habitat. However, isolated trees or patches of trees could be considered as wildlife corridors (often termed as 'stepping stones') if they facilitate the movement of species (mainly birds) between larger areas of habitat. Waterways and their associated aquatic and riparian vegetation are often considered to be wildlife corridors. Grasslands can also be considered corridors if they facilitate the movement of grassland-dependent or ground-dwelling fauna.

The success of a corridor varies, and depends on its width, length and habitat features, and on the ecology of the fauna species involved. Wildlife corridors often comprise valuable fauna habitat themselves, regardless of their connectivity value.

Because the study area lies within a region that would once have been mostly covered with woodland, yet is now largely cleared of its trees, connected patches or strips of remaining wooded habitat are likely to act as important wildlife corridors between the larger tracts of woodland that remain (e.g., the Camp Hill State Forest and Snow Gums Bushland Reserve). In this study area, corridors are numerous and include all wooded watercourses and all wooded roadsides. That said, some corridors are likely to be more important than others for fauna movement. The main patches of habitat within the study area that are likely to serve as corridors are:

- The remnant woodland along the rail reserve to the north and the south of the rail line. This corridor is likely to be used by birds (including the VWTBC), bats and possibly mammals (e.g., Brush-tailed Phascoglae);
- The remnant woodland patches in the east of the study area to the north and south of the rail line which help connect the Trawalla State Forest and Snow Gums Bushland Reserve. This corridor is likely to be used by birds (including the VWTBC), bats and possibly mammals (e.g., Brush-tailed Phascoglae);

- The remnant woodland within the road reserves of Slaughterhouse Lane. This corridor is likely to be used by birds (including the VWTBC), bats and possibly mammals (e.g., Brush-tailed Phascoglae);
- The remnant woodland within the road reserve of the Western highway in the south western corner of the study area. This corridor is likely to be used by birds (including the VWTBC), bats, possibly mammals (e.g., Brush-tailed Phascoglae) and may retain a small population of the Brown Toadlet; and
- The riparian habitat along the unnamed waterway located between Racecourse Road and Lexton Road. This is likely to be used by frogs (including possibly the Growling Grass Frog).

