

Preliminary Flora and Fauna Assessment - Penshurst Wind Farm

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Prepared for:

RES Australia



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Summary

This report provides a preliminary assessment of the key flora and fauna issues and resultant risks associated with the proposed Peshurst wind farm in southwest Victoria. The findings are based on an interrogation of existing databases, review of recent wind farm documents and decisions, site inspection, and consultation with DSE and other relevant experts.

The wind farm site is predominantly located on stony rise terrain, with undulating volcanic plains to the west and south. Both of these landforms have been substantially cleared and have a long agricultural use including cattle and sheep production.

The main issues for the proposal have been well articulated in recent assessments of other wind farms in the south-west. These were confirmed during the site inspection and in discussions with DSE and include known collision risk species namely:

- Brolga (FFG Act 1988) nest and flocking sites and migration routes;
- Migratory waterbirds listed under the EPBC Act 1999;
- Southern Bent-wing Bat (EPBC); particularly in relation to foraging movements on-site and dispersal routes to and from the roosting caves at Byaduk and Mt Napier;
- Other listed or otherwise threatened waterbirds e.g. Great Egret, Blue-billed Duck.

Several other items are potentially at risk due to loss of habitat / clearing either on the wind farm site or along service utility or transmission line routes and include:

- Plains Grassland FFG syn. Natural Temperate Grassland (EPBC)
- Plains Grassy Woodland FFG syn. Grassy Eucalypt Woodland (EPBC)
- Growling Grass Frog (EPBC)

The status of a number of other threatened fauna or flora potentially occurring at the wind farm site or along service routes is currently highly speculative.

The risk assessment suggests a moderate level of risk for most items. The Brolga is the only item to be currently assessed at high. Recent wind farm approvals suggest that these issues will most likely influence the design of the wind farm than be regarded as fatal flaws.

The proposal will need to be referred to the Commonwealth under the *Environmental Protection Biodiversity Conservation Act 1999* and to the State under the *Environment Effect Act 1978*. The recent bilateral agreement between the State and Commonwealth should ensure a more efficient process if the project requires EPBC Act approval.

1 Introduction

Ecology Australia Pty Ltd (EA) was commissioned by RES Australia Pty Ltd in July 2009 to undertake a preliminary flora and fauna assessment of the proposed Peshurst Wind Farm.

The proposed wind farm is located in south-western Victoria approximately 3 km south-west of the Peshurst township. Under the current design proposal, approximately 250 turbines will be positioned on agricultural land spanning a 14 km stretch between the Macarthur-Peshurst Road and the Peshurst–Warrnambool Road.

The aim of the preliminary assessment is to:

- Review all available information on the study area and surrounds;
- Undertake a preliminary site visit to identify the key environmental issues on-site and the likelihood of occurrence for threatened flora and fauna;
- Identify the key environmental issues in the surrounding area;
- Identify legislative and policy implications under the Federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act), the Victorian *Environmental Effects Act 1978* (EE Act), the State Native Vegetation Management Framework and local planning provisions in the Moyne and Southern Grampians Shires;
- Undertake a Risk Assessment for all potential issues on-site and in the surrounding area; and
- Identify the next stages of assessment

Specifically, this assessment will determine the significant environmental issues and assess any potential high risks associated with the development.

2 Study Area

The study area is situated in the Victorian Volcanic Plains bioregion approximately 3 km south west of Peshurst and c. 30 km south east of Hamilton (See Figure 1). The study area is located within Moyne and Southern Grampians Shire and is currently zoned as Farming Zone (FZ) (DPCD 2009). The site is not subject to any overlays.

The area of investigation has several components:

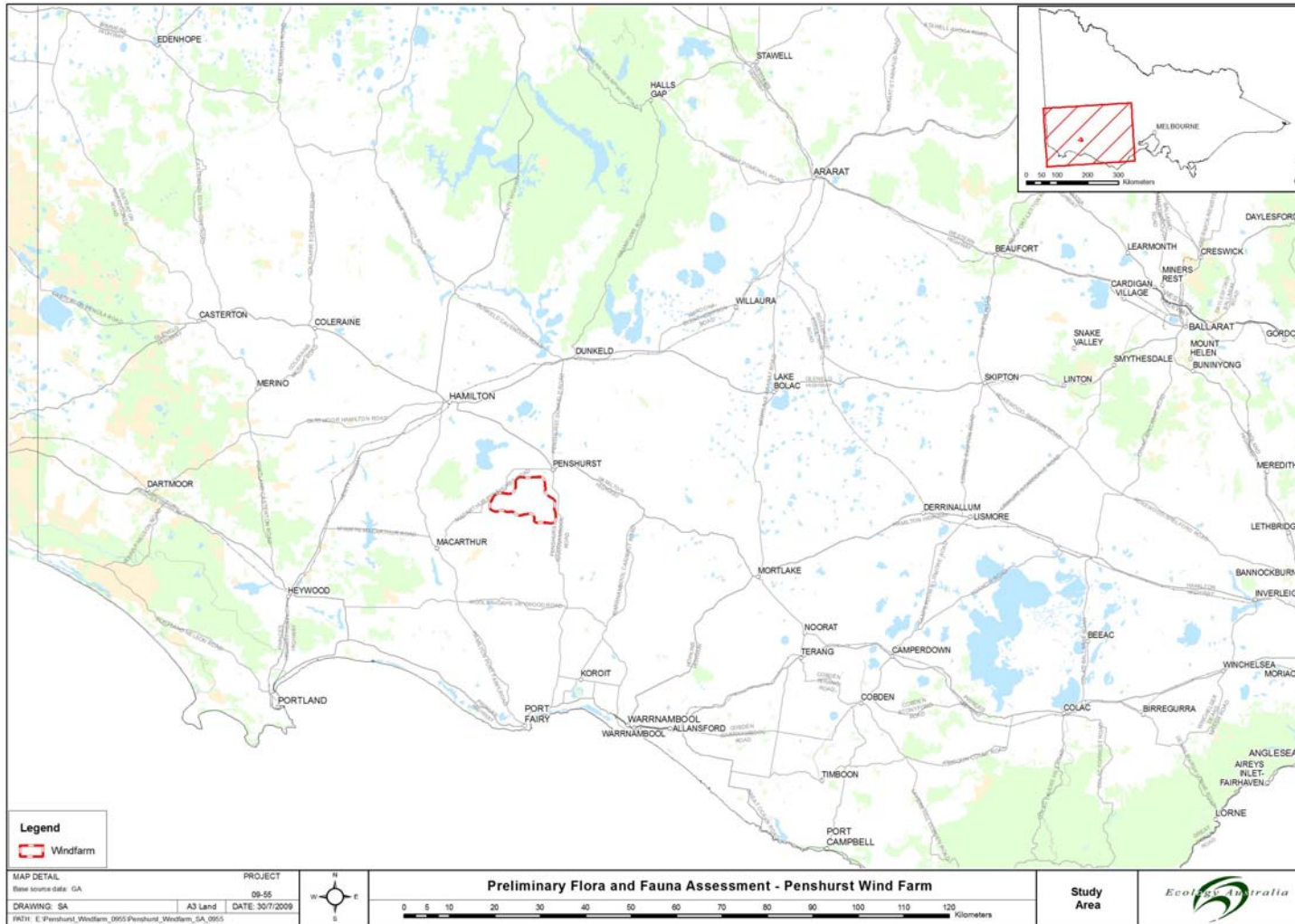
- Wind farm site – an area of c. 130 kms² extending roughly from the Peshurst–Warrnambool Road to the Macarthur–Peshurst Road in the west and south towards the Gerrigerrup–Minhamite Road;
- Landscape zone – effectively a 10 km radius around the wind farm site;
- Transmission line routes – connecting the wind farm site to the power grid.

The wind farm site has been thoroughly cleared and has a long history of grazing. It has two predominant landforms comprised of Newer Volcanics – stony rises – jumbled rocky rises and troughs formed by valley-filling basalts, and the older weathered volcanic plains. The site includes several streams including the headwaters of the Moyne River, and Whiteheads and Warburtons Creeks. The stony rises are populated by numerous mostly ephemeral wetlands known locally as ‘black flats’ – a reference to the generally dark, heavy clays. There are also several permanent wetlands – the largest of which appear to be associated with the more gently undulating topography of the plains. At the time of the field inspection there was considerable surface water across the wind farm site.

The 10 km landscape zone is of similar geology and land use history. It does however include Mount Napier State Park, a forested eruption point and larva flow some 10 km to the west, and regional-scale wetlands, e.g. Lake Linlithgow and Lake Kennedy located to the north. Former large swamps including Buckley Swamp and Soldier Swamp to the north-west of Peshurst have been cleared and drained and appear to be ephemeral. These and other low lying areas are a common feature of the zone. The main catchments include Muston Creek to the east, Spring Creek and Moyne River to the south and Eumeralla River to the west. The township of Peshurst, Hawkesdale, Woolsthorpe, Orford and Macarthur are within the 20 km radius of the wind farm site.

While cattle and sheep production are the dominant rural landuses, wind farms are becoming increasingly common in the broader landscape of the south-west. The approved Macarthur wind farm is located within the present landscape zone to the immediate south of the proposed wind farm site.

Figure 1 Proposed Penshurst Wind Farm: Study area location, showing the boundary of the proposed wind farm site.



3 Methods

3.1 Information Review

Databases and other information pertaining to the study area and surrounds were reviewed including:

- flora records within 30 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) (DSE 2007c);
- fauna records from within an area of 30 km radius of the study area held in the Victorian Fauna Display (DSE 2007b), a version of the Atlas of Victorian Wildlife (AVW) database maintained by DSE;
- a search for flora and fauna species listed under the Federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) using the EPBC Protected Matters Search Tool (DEWHA 2008) for species potentially occurring (or potential habitat occurring) within a 15 km radius of the study area;
- Ecological Vegetation Class mapping/modelling of the area (both extant and pre-1750) (DSE 2009);
- DSE’s modelling for native grassland communities (Matt White, Arthur Rylah Institute, unpublished data); and
- Aerial photography.

Ecological reports and other information on the surrounding area were reviewed including:

- Macarthur Wind Farm Panel Report (2006);
- Stockyard Hill Wind Farm flora and fauna assessment (BLA 2009);
- Stockyard Hill Targeted Brolga Assessment (BLA 2008a);
- Mortlake Wind Farm – Flora and fauna assessment (BLA 2008b);
- Proposed Mortlake Wind Farms Brolga Breeding Season Study (BLA 2008c)
- Brolga Impact Assessment Summary Report – Mortlake Wind Farm, Victoria (Ecology Partners 2008).
- Biodiversity Assessment for “The Sisters” Wind Farm Facility (Parsons Brinckerhoff 2008); and
- Mt Eccles and Mount Napier Management Plan (DNRE 1996).

3.2 Preliminary site assessment

A preliminary assessment of the study area was undertaken by EA's Principal Ecologist (Andrew McMahon) and Zoologist (Ruth Marr) from 14 to 16 July 2009. The assessment involved brief inspection of a number of properties within the study area and key environmental sites within the surrounding landscape zone such as Byaduk Caves, Lake Linlithgow and Buckley Swamp.

The site visit included:

- A preliminary ground truthing of EVC classification based on DSE mapping;
- An overview assessment of flora and fauna habitats including major ecological features of the study area (e.g. stony rises, swamps, drainage lines and other habitats);
- Preliminary assessment of the study areas ability to support threatened flora and fauna;
- Landscape context, particularly in relation to the highly mobile threatened fauna species such as FFG-listed Brolga and EPBC-listed Southern Bent-wing Bat.
- Key constraints to development for both on-site and off-site issues.

As per the scope of works a detailed flora and fauna inventory was not documented during the assessment.

Photographs of the study area were taken to document key areas and overall landscape features.

3.3 Liaison

A scoping meeting was held with DSE Warrnambool (Andrew Pritchard – Biodiversity Manager and Clair Tesselaar – Biodiversity/Planning), RES Australia (Simon Kerrison) and Ecology Australia (A. McMahon and R. Marr) on 16 July 2009 to discuss the initial design of the proposed wind farm and outline all known and potential environmental issues on-site and in the surrounding landscape zone. Section 4 provides a brief summary of the issues discussed during this meeting.

Land owners within the study area were contacted during the site assessment. Information gathered during discussion with land owners has been considered during the preliminary findings.

3.4 Conservation Status

Conservation status of species and communities was determined by reference to DSE's advisory lists (DSE 2005 and 2007a), DSE's bioregional Ecological Vegetation Class conservation area statement, listings under the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) and the Federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and by reference to National Action Plans for vertebrates and invertebrates (Cogger et al. 1993, Wager and Jackson 1993, Lee 1995, Bannister et al. 1996, Maxwell et al. 1996, Tyler 1997, Duncan et al. 1999, Garnett and Crowley 2000, Pogonowski et al. 2002 or Sands and New 2003).

3.5 Terminology and Taxonomy

Plant names and the use of common names in this report follows (Walsh and Stajsic 2007) and the Victoria Flora Species Index (DSE 2005). An asterisk (*) preceding a species name denotes exotic (introduced) species and a hash sign (#) denotes native plants that are not indigenous in the relevant vegetation types. For fauna, scientific names, common names and systematic orders used here follow DSE (2007a).

4 Background information

Information examined during the database and document review was used to identify potential flora and fauna issues on-site and in the surrounding landscape zone. It was evident from this analysis that despite the vegetation clearance and high modification within the study area and the region more broadly, known records and/or potential habitat exists for a number of threatened species including EPBC-listed and FFG-listed species.

From the review of relevant wind farms documents (e.g. Macarthur Panel report 2006; Mortlake - 2008b; Stockyard Hill - BLA 2009 and 2008a; and The Three Sisters - Parsons Brinckerhoff 2008) and preliminary discussions with DSE (Andrew Pritchard and Clair Tesselaar DSE, pers. comm.), a number of threatened species and communities were identified, with further investigation required both within the study area and surrounding landscape zone. Key environmental issues identified during the review and discussions with DSE are separated into known and potential occurrences. Known environmental issues have been identified as high priority due to records in the surrounding area and/or their previous recognition of potential impacts on these species from other wind farms within the region. These include:

- Southern Bent-wing Bat *Miniopterus schreibersii bassanii* (listed as Critically Endangered under the EPBC Act, threatened under the FFG Act and Endangered in Victoria (DSE 2007a));
- Brolga *Grus rubicunda* (listed as threatened under the FFG Act and Vulnerable in Victoria (DSE 2007a));
- Avifauna listed under the Migratory and/or Marine provisions of the EPBC Act;
- Natural Temperate Grasslands of the Victoria Volcanic Plain (NTGVVP) (Listed as Critically Endangered under the EPBC Act and threatened under the FFG Act); and
- Grassy Eucalypt Woodland of the Victoria Volcanic Plain (Listed as Critically Endangered under the EPBC Act and threatened under the FFG Act).

Other potential issues identified from the information review and consultation include:

- Threatened flora listed under the Federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) such as Curly Sedge *Carex tasmanica*, Adamson's Blown Grass *Lachnagrostis adamsonii*, and Swamp Fireweed *Scenico psilocarpus*;
- Threatened fauna listed under the EPBC Act including, Striped Legless Lizard *Delmar impar*, Growling Grass Frog *Litoria raniformis*, Golden Sun Moth *Synemon plana*, Dwarf Galaxias *Galaxiella pusilla*, Yarra Pygmy Perch *Nannoperca obscura* and Australian Grayling *Prototroctes maraena*;
- Threatened fauna listed under the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) such as Great Egret *Ardea alba*, Blue-billed Duck and Freckled Duck; and

- Fauna and flora species classified under DSE's Advisory List of Threatened Vertebrate Fauna (DSE 2007b) or Rare and threatened plants in Victoria (DSE 2005) such as Fat-tailed Dunnart *Sminthopsis crassicaudata*, Latham's Snipe *Gallinago hardwickii*, Australian Shoveller *Anas rhynchotis*, Leek-orchids *Prosopphyllum* spp., and Arching Flax-lily *Dianella* sp. aff. *longifolia*.

Key findings of background information and consultation with DSE

- EPBC-listed Southern Bent-wing Bat and FFG-listed Brolga have been identified by DSE and recognised at surrounding wind farms, as high priority issues to be investigated within the wind farm site and the surrounding landscape zone.
- Migratory species listed under the EPBC Act are recorded from the landscape zone. Potential impacts on migratory avifauna determined the Federal Government's decision for Mortlake Wind Farm as a "controlled action".
- Other Federal and State threatened flora and fauna have been identified as potential issues within the wind farm site and landscape zone.

5 Wind Farm Site and Landscape Zone Values

5.1 Flora

5.1.1 Data Review

Ecological Vegetation Classes

DSE's Ecological Vegetation Class (EVC) mapping displays a scattered vegetation mosaic for much of the wind farm site: EVC 714 Stony Knoll Shrubland / Plains Grassy Woodland / Plains Grassy Wetland Mosaic. Its conservation status is endangered. The mosaic applies to the stony rise terrain east of the Eumeralla River. To the west, the predominant and similarly scattered EVC is Plains Grassy Woodland (EVC 55). This EVC is FFG-listed and is also listed as critically endangered under the EPBC as Grassy Eucalypt Woodland of the Victorian Volcanic Plain, i.e. the FFG and EPBC listings are largely synonymous.

Other EVC modelled for the wind farm site include:

- EVC 125 Plains Grassy Wetland – status endangered
- EVC 691 Aquatic Herbland / Plains Sedgy Wetland Mosaic – endangered
- EVC 641 Riparian Woodland – endangered
- EVC 68 Creekline Grassy Woodland – endangered

This latter group of EVCs are associated with the streams – particularly Eumeralla River, and the major wetlands.

EVC 132 Plains Grassland is not modelled for the wind farm or immediate surrounds. Plains Grassland is also FFG and EPBC listed – as part of the Natural Temperate Grassland of the Victorian Volcanic Plain community. It is known from road reserves outside the wind farm site but within the landscape zone, including the Peshurst – Warrnambool Road, Hamilton – Port Fairy Road and the Hamilton Highway. The recent predictive modelling of grasslands (Arthur Rylah Institute, DSE) also suggest scattered remnants within the wind farm site and on the plains to the south.

Overall, the issues arising from the information review include:

- vegetation remnants are likely to be only of scattered occurrence;
- all EVCs are threatened with most having a conservation status of endangered;
- two have state (FFG) and federal (EPBC) listing:
 - EVC 55 Plains Grassy Woodland.
 - EVC 132 Plains Grassland.

Threatened plant species

The species in Appendix 1 represent an edited version of listed (EPBC and FFG) or otherwise threatened (vulnerable or endangered – DSE’s Advisory List 2005) taxa known from the data review area.

While most have some potential for occurring in the wind farm site those that are known to persist under long-term grazing are the most likely to occur. These include for example:

- Swamp Wallaby-grass – known from very degraded wetland habitats including farm dams;
- Curly Sedge – known from a large population on Breakfast Creek just north of Macarthur. Persists under heavy grazing and favours mildly brackish conditions;
- Leek-orchids – several are given in Appendix 1 and there is a possibility of some species persisting, notably in the seasonally wet remnants in the stony rises.

Native grassland and/or grassy woodland remnants, including EPBC-listed Natural Temperate Grassland and Grassy Eucalypt Woodland and FFG-listed Plains Grassland, are likely to be significant issues influencing transmission line routes. Such remnants could support a number of the grassland species in Appendix 1 including Lanky Buttons, Plains Yam-daisy, Basalt Peppergrass, Arching Flax-lily, Purple Eyebright and Clover Glycine.

5.1.2 Wind farm site

The field inspection confirmed that the site has been substantially cleared and is dominated by pasture. The distribution and type of remnant vegetation is quite different to that suggested by DSE’s EVC mapping and grassland modelling. The slopes and crests of the stony rises are mostly devoid of indigenous vegetation apart from Bracken (*Pteridium esculentum*) and occasional herbs – e.g. Sheep’s Burr (*Acaena* spp.). It is likely that Wallaby-grasses (*Austrodanthonia* spp.) also persist, but these will be more noticeable later in Spring. The original vegetation of the rises would have been some form of EVC 203 Stony Rises Woodland, probably not too dissimilar in composition from the Mt Napier vegetation or that from stony rises south-west of Colac. Whether they were eucalypt or wattle (*Acacia* spp.) dominated remains speculative, but the preliminary field evidence is that very little of this EVC remains.

Most remnants occur in the troughs or other poorly drained sites. These are characterised by swards of Common Tussock-grass (*Poa labillardieri*), associated sedges including Poong’ort (*Carex tereticaulis*) and rushes (*Juncus* spp.). There are few if any woody components and the vegetation has high exotic component. Swamp Gum (*Eucalypt ovata*) may have been part of the original vegetation but there was scant evidence of eucalypts in this or any other environment in the stony rises.

The former vegetation of the troughs is likely to have been quite heterogeneous depending on the extent and duration of seasonal wetting. The distribution of eucalypts could have been influenced by seasonal drought (cracking clay soils) and/or prolonged inundation, with the extremes of both severely restricting eucalypt growth and establishment. At present the original vegetation of these

troughs remains uncertain but potential EVCs include: EVC 125 Plains Grassy Wetland, EVC 647 Plains Sedgy Wetland and EVC 68 Creekline Grassy Woodland. All have a conservation status of endangered.

Outside of the stony rises and on the more weathered undulating plain, there are scattered remnants of Plains Grassy Woodland. The largest observed is on the south side of the Macarthur – Peshurst Road just north (south?) of the junction with Mount Napier Road. This stand, occupying some 20 to 30 hectares is dominated by Swamp Gum with scattered Red Gum (*E. camaldulensis*). This is an example of the EPBC and FFG-listed Grassy Woodland community, but would need to be assessed against the condition thresholds to be eligible under the EPBC. This stand is just to the west of the present wind farm layout.

The wind farm site has some potential to support listed or otherwise threatened plant species. Judging by the type and distribution of remnants these are likely to be wetland rather than dryland, but the range could be broad i.e. species known from seasonally to permanent wet habitats. This suggests that from the list of potential species (Appendix 1) Curly Sedge, Swamp Wallaby-grass and some Leek-orchids remain the most probable.

5.1.3 Landscape zone

The site inspection confirmed Plains Grassland and the Plains Grassy Woodland remnants within the landscape zone. The most obvious remnants are in road reserves including the Peshurst – Warrnambool Road. Both communities are FFG and EPBC listed and remnants have potential to support listed or otherwise threatened species.

Key flora findings:

- The wind farm site is substantially cleared and dominated by pasture, the distribution and type of remnants does not reflect DSE's EVC modelling;
- Remnants on the stony rises are largely restricted to the troughs and other poorly drained sites. All possible EVC's are Endangered.
- Remnants on the plains within the wind farm site include Plains Grassy Woodland (EPBC and FFG listed). Plains Grassland – also EPBC and FFG listed - is known from the roadside remnants south of the wind farm site and is likely to also be an issue for the transmission line route.
- Some habitats on the wind farm site have the potential to support threatened plant species.

5.2 Fauna

5.2.1 Fauna habitats

The following fauna habitats were identified during the brief assessment of the study area:

- Water bodies (e.g. permanent and ephemeral wetlands, creeks, drainage lines, marshes, wet depressions in stony rises and flooded pasture) (see Plate 3);
- Plantations – mostly Monterey Pine (*Pinus radiata*) (see Plate 4)
- Stony rises (see Plate 1);
- Seasonally wet native grassland (see Plate 2); and
- Exotic pasture.

These habitats will be further refined during the habitat assessment undertaken as part of the detailed flora and fauna survey of the wind farm site and transmission line easement.

5.2.2 Fauna records

A detailed fauna inventory was not compiled during this assessment. The majority of species observed were common native bird species that utilise open agricultural habitats. An abundance of water dependent birds such as Black Swan, Purple Swamp Hen, Australasian Grebe and Chestnut Teal were recorded in the larger wetlands (Plate 3). Raptors, including Wedge-tailed Eagle, Nankeen Kestrels and Brown Falcon were recorded multiple times within the wind farm site and landscape zone. Plantations provide potential nesting habitat for these species (see Plate 4). One pair of FFG-listed Brolga was recorded within the wind farm site, with an additional pair recorded just outside the site along the Macarthur-Peshurst Road (See Figure 2, Plate 7).

A total of 111 vertebrate species have been recorded for the fauna DRA on the AVW (DSE 2007b), comprising 86 bird species (six introduced species), seven mammal species (two introduced), nine reptile species, four frog species and five fish species (one introduced) (Appendix 2).

Threatened fauna recorded or those considered to have potential habitat in the study area are discussed below.

5.2.3 Significant fauna species

Thirty-five threatened fauna species have been previously recorded within the data review area. Threatened species and species listed under the Migratory and/or Marine-Overfly Schedules of the EPBC Act and their likelihood of regular occurrence in the study area are presented in Appendix 3. The likelihood of occurrence is based upon the number, distribution and age of previous records in

vicinity of the study area, known habitat requirements for the species, and an assessment of suitable habitat available in the study area.

Threatened species listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

Database Records (AVW)

Five species listed as threatened under the EPBC Act have been recorded on the AVW within the fauna DRA (Appendix 3). Two of these are considered to have a moderate likelihood of regular occurrence within the study area.

Striped Legless Lizard (listed as Vulnerable under the EPBC Act, threatened under the FFG Act and considered Endangered in Victoria (DSE 2007a)) was once widely distributed across the native lowland grassland areas of south-eastern Australia. However, since European settlement and the subsequent loss and modification of native grassland areas through agricultural practices and other developments, substantial declines in abundance and distribution of this species has occurred (Webster et al. 2003).

Multiple AVW records for Striped Legless Lizard exist in the landscape zone predominantly from the plains and not the stony rises. Records include those at Caramut in 2005 and 2006 (c. 19 km from the study area) and two records along the Penshurst-Dunkeld Rd in 1989 and 2004, c. 10 km and 17 km north of the study area respectively (See Figure 2). Rocky knoll and *Poa* grassland was identified as potential Striped Legless Lizard habitat within the Macarthur Wind Farm development area although none were recorded on-site (Macarthur Panel report – 2006). This area is approximately 12 km south-west of the wind farm site.

The wind farm site supports potential habitat for this species, particularly within the plains and some potential within the stony rises (Plate 1). The native *Poa* grasslands are mostly seasonally inundated and therefore unlikely to support a population of this species. Furthermore, areas of pasture in the study area that are heavily grazed with compacted soils from stock do not provide tussock cover used for shelter and are considered unlikely to support this species. Assessment of the transmission line easement must address potential Striped Legless Lizard habitat. Striped Legless Lizard is considered to have a moderate likelihood of regular occurrence within the wind farm site, but particularly within the grassland and grassy woodland remnants on the plains.

Growling Grass Frog *Litoria raniformis* (listed as Vulnerable under the EPBC Act; Listed as Nationally Vulnerable by Tyler (1997) – National Action Plan for Frogs; Listed as threatened under the FFG Act; and Listed as Endangered in Victoria by DSE (2007a)) is widely distributed in shallow, still or slow-moving waters across Victoria. Population declines have been recorded across much of southern and central Victoria (Tyler 1997; Pyke 2002; Robertson et al. 2002).

Multiple AVW records for Growling Grass Frog exist within the surrounding landscape zone including Glenelg Highway in 2000, c. 28 km to the north of the study area, and east of Caramut in 2004, c. approximately 21 km east of the study area (See Figure 2). Growling Grass Frog was also recently recorded within the Macarthur Wind Farm site, directly south of the study area.

The permanent and ephemeral wetlands in the Peshurst wind farm site are potential habitat for this species (Plate 3). The Eumeralla and Moyne Rivers and drainage lines may provide dispersal and some breeding habitat for frogs. Furthermore, the inundated depressions in the stony rises may provide temporary habitat for this species. Growling Grass Frog is considered to have a moderate-high likelihood of regular occurrence within the study area.

EPBC-listed **Yarra Pygmy Perch** and **Dwarf Galaxias** have been recorded within 30 km of the study area. Yarra Pygmy Perch was last recorded in 1996 in Spring Creek, Woolsthorpe-Heywood Road approximately 26 km south-west of the study area. The distribution of this species coincides with Victoria's volcanic region (Briggs 1999, cited in DEWHA 2009). Two old records for Dwarf Galaxias at Lake Linlithgow in 1971 are on the DRA. Both these species may have some potential to occur within the major streams and associated wetlands within the wind farm site.

Potential impacts from the wind farm development on these four EPBC-listed species above would likely to be from loss or degradation of habitat and/or the creation of barriers to movement. These impacts could potentially be avoided and/or minimised through careful design and planning.

EPBC Act Protected Matters Search Tool

Significant fauna and/or habitat predicted to occur in local area

The Department of Environment, Water, Heritage and the Arts (DEWHA) EPBC Act Protected Matters Search Tool identified a number of fauna species listed as threatened and/or under the Migratory and/or Marine Overfly Schedules of the EPBC Act 1999, as potentially occurring or suitable habitat potentially occurring within a 30 km radius of the study area (Appendix 3). The DEWHA 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.

Ten additional species listed as threatened under the EPBC Act have been identified within the EPBC Act Protected Matters Search (Appendix 3):

- Two birds - Swift Parrot and Australian Painted Snipe;
- Six mammals (Spot-tailed Quoll, Southern Bent-wing Bat, Long-nosed Potoroo (SE mainland), Smoky Mouse, Heath Rat and Grey-headed Flying-fox);
- One fish (Australian Grayling); and
- One invertebrate (Golden Sun Moth).

None of these species have been recorded on the fauna DRA under the current 2007 version of the AVW.

From the preliminary fauna assessment, information review and consultation with DSE, four of these species, are considered to have some potential to occur within the study area and are discussed further below. No other fauna listed under the EPBC Act and predicted to occur in the study area are considered likely.

The **Southern Bent-wing Bat** *Miniopterus schreibersii bassanii* is listed as Critically Endangered under the EPBC Act, listed as threatened under the FFG Act, and considered Endangered in Victoria (DSE 2007a). This species is an insectivorous cave dwelling bat found only in south-eastern South Australia and Western Victoria (DEWHA 2008). Southern Bent-wing roosts in caves during the day and forages, taking insects on the wing at night across most habitats (Churchill 1998). Bats may disperse up to 30 km in search of food (Lindy Lumsden, Arthur Rylah Institute, pers. comm.). Areas used for foraging may vary from native woodland/forest, drainage lines, wetlands and occasionally crops (Lindy Lumsden, Arthur Rylah Institute, pers. comm.). Large dispersal/migration movements are made from breeding to non-breeding roost sites. Due to a number of threatening factors the population has undergone dramatic declines over the last few decades (DEWHA 2009a).

Although, Southern Bent-wing Bats are not recorded on the current AVW (DSE 2007) within the DRA, they are well known from the landscape zone (See Figure 2). A breeding site is known from Starlight Cave Warrnambool, one of only two known maternity colonies for this species. During the non-breeding season, this species uses over-wintering caves, the closest to the wind farm site are located at Byaduk Caves, Mt Napier and Mt Eccles, approximately 16 km west, 8 km west and 21 km south-west of the study area respectively (see Plate 6, Figure 2). Targeted surveys for bats directly south of the study area within the Macarthur Wind Farm revealed low levels of Southern Bent-wing Bat activity in the area (Macarthur Wind Farm – Panel Report 2006). Furthermore, this species has also been recorded within the Mortlake Wind Farm area, approximately 57 km east of the study area (BLA 2008b).

Southern Bent-wing Bat is likely to utilise the study area for either foraging or dispersal/migration to and from non-breeding (over-wintering) and breeding roost sites. Wetland (Plate 3), drainage lines, scattered trees (Plate 4) and occasionally even pasture within the study area may provide potential foraging sites. It is unknown if any suitable areas for roosting occur within the study area. Potential roost site may include boulder stacks, cracks in large vertical rock surfaces and caves.

The wind farm development may cause potential impact on this species in two ways:

- Collision (strike) impact with the turbines; and
- Barotrauma – caused by a rapid air-pressure reduction near moving turbine blades. Barotrauma involves tissue damage to air-containing structures caused by rapid or excessive pressure changes (Lindy Lumsden pers. comm.). Bats are particularly susceptible to this due to their respiratory anatomy, compared to birds.

Southern Bent-wing Bat is considered to have a high likelihood of occurrence within the study area given the proximity to known over-wintering caves and potential foraging habitat particularly, over the wetland areas. This species is considered a high priority in terms of assessment of potential

impacts from the proposed wind farm (Andrew Pritchard DSE, pers. comm.). It was also a key issue for Macarthur Wind Farm assessment.

Golden Sun Moth is listed as Critically Endangered under the EPBC Act and Threatened under the FFG Act. The species previously occurred in native grassland through a wide arc from Bathurst in New South Wales through the ACT – Southern Tablelands across Victoria to the South Australian border (Clarke & O'Dwyer 2000). It was once commonly thought that at least a 40 % cover of Wallaby-grass species was required for the Golden Sun Moth to be present at a site. However, this no longer seems to be the case, with Sun Moths recorded in areas with as little as 5 % Wallaby-grass cover, a high cover of weeds (e.g. up to 70 % at some known sites) and areas dominated by Kangaroo Grass (Bainbridge et al. 2006, Endersby and Koheler 2006).

Two recent discoveries of Golden Sun Moth populations are known from the region. This includes a population at the Hamilton Golf Course (Yvonne Ingeme DSE pers comm.) and multiple recent records in 2007 -2008, south of Dunkeld (Yvonne Ingeme pers comm.), approximately 25 km north-west and 27 km north-east of the study area respectively. An old historic record of Golden Sun Moth (unknown date) is recorded on the fauna DRA and shown in Figure 2.

Potential habitat in the study area may include grassland (native and exotic) outside those seasonally inundated areas. Although, the study area, particularly stony rise areas, is unlikely to be part of this species historic distribution, the changes in vegetation structure and composition and the proximity of recent findings, the Golden Sun Moth is considered to have a moderate likelihood of regular occurrence in the study area.

Two additional species, **Australian Painted Snipe** and **Australian Grayling** have some potential to occur within the study area. The large permanent and ephemeral wetlands may provide occasional habitat for Australian Painted Snipe. The rivers may provide habitat for Australian Grayling.

Migratory species listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

The data review (DSE 2007) revealed 81 species listed under the Migratory and/or Marine Overfly Schedules of the EPBC Act 1999 (Appendices 3). An additional four species are predicted to occur within the area (DEWHA 2009b)

Fifty-three migratory and/or marine overfly species have a moderate or higher LRO in the study area due to the presence of suitable habitat (Appendix 3). Multiple records for most these species exists within the landscape zone. Five of these, are also classified as threatened under the FFG Act, and an additional five are classified as threatened in Victoria (DSE 2007a). At this preliminary stage of investigation, it is considered unlikely that the study area constitutes important habitat or supports 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.

The use of the study area by migratory birds and the potential impact of the proposed wind farm on these species are considered to be a high priority for assessment. The presence of migratory species

was a primary determinant for the Federal Government's decision to determine the Mortlake Wind Farm as a 'controlled action'. A detailed fauna assessment and targeted bird utilisation survey over multiple seasons should be undertaken to determine habitat availability and the usage of the site.

Threatened species listed under the Victorian *Flora and Fauna Guarantee Act 1999*

Eighteen species listed under the FFG Act are recorded for the fauna DRA (Appendix 3). Five of these, are considered to have a moderate or higher likelihood of occurrence in the study area.

Brolga (listed as threatened under the FFG Act and considered Vulnerable in Victoria (DSE 2007a)), was once widespread across Victoria but their range has greatly contracted now occurring only in the northern plains and adjacent parts of the Murray River and in the south-west (Du Guesclin, 2003, Marchant and Higgins, 1993). Brolga flock to permanent open waters and deep freshwater wetlands during the summer/autumn period, with pairs dispersing widely to breed from late autumn to winter (Du Guesclin, 2003). There is estimated to be between 450 – 600 brolga remaining within the south-west region of Victoria (Andrew Pritchard pers. comm.).

The Peshurst and surrounding area is known to support a large number of Brolga. Multiple records, including known breeding habitat exists within the landscape zone (DSE 2007a) (See Figure 2). During the site inspection, one pair of Brolga was recorded within the wind farm site, with an additional pair recorded just outside the site along the Macarthur-Peshurst Road (see Plate 7). Furthermore, landowners are aware of Brolga attempting to breed within the wind farm site. This species is considered to have a very high likelihood of regular occurrence and is a high priority for detailed assessment of potential impacts from the wind farm development, both within the wind farm site and in the surrounding landscape zone (Andrew Pritchard, pers. comm.). Further as discussed with DSE, due to the proximity of the approved Macarthur Wind Farm, a cumulative impact assessment on this species should be undertaken.

Four additional FFG-listed water dependent birds: **Baillon's Crane**; **Great Egret**; **Freckled Duck**; and **Blue-billed Duck**, have multiple records within the DRA. These species are known to occupy a variety of habitats including wetlands, swamps and marshes, drainage lines and occasionally rivers (Marchant and Higgins 1990; Emison et al. 1987). The permanent and ephemeral wetlands (Plate 3) and potentially the rivers/drainage lines may provide habitat for these species in the study area.

No fauna species threatened under a **National Action Plan (NAP)** are considered likely to occur within the study area given the lack of suitable habitat.

Threatened species classified under DSE's Advisory list of threatened vertebrate fauna in Victoria – 2007 (DSE 2007a)

Eighteen species considered threatened in Victoria (DSE 2007a) have been recorded for the fauna DRA within a 30 km radius of the study area (Appendix 3). Eleven of these species are considered to have a moderate or higher LRO within the study area.

Latham's Snipe (listed as Near Threatened in Victoria (DSE 2007a) and also listed under the Migratory provisions of the EPBC Act) is considered to be a potential issue on-site (Andrew Pritchard, pers. comm.). This species has multiple records from the landscape zone on the fauna DRA (DSE 2007b). The permanent and ephemeral wetlands, drainage lines and flooded pasture may provide habitat for this species in the study area.

There are also multiple records on the DRA for threatened water dependent birds such as **Australasian Shoveler**, **Common Sandpiper** and **Whiskered Tern**. These species are known to occupy a variety of habitats including wetlands and other water bodies (Marchant and Higgins 1990; Emison et al. 1987). Furthermore, the riparian zone around the wetland environs may provide habitat for **Swampland Cool-skink** and the streams may provide some suitable habitat for **Mountain Galaxias**.

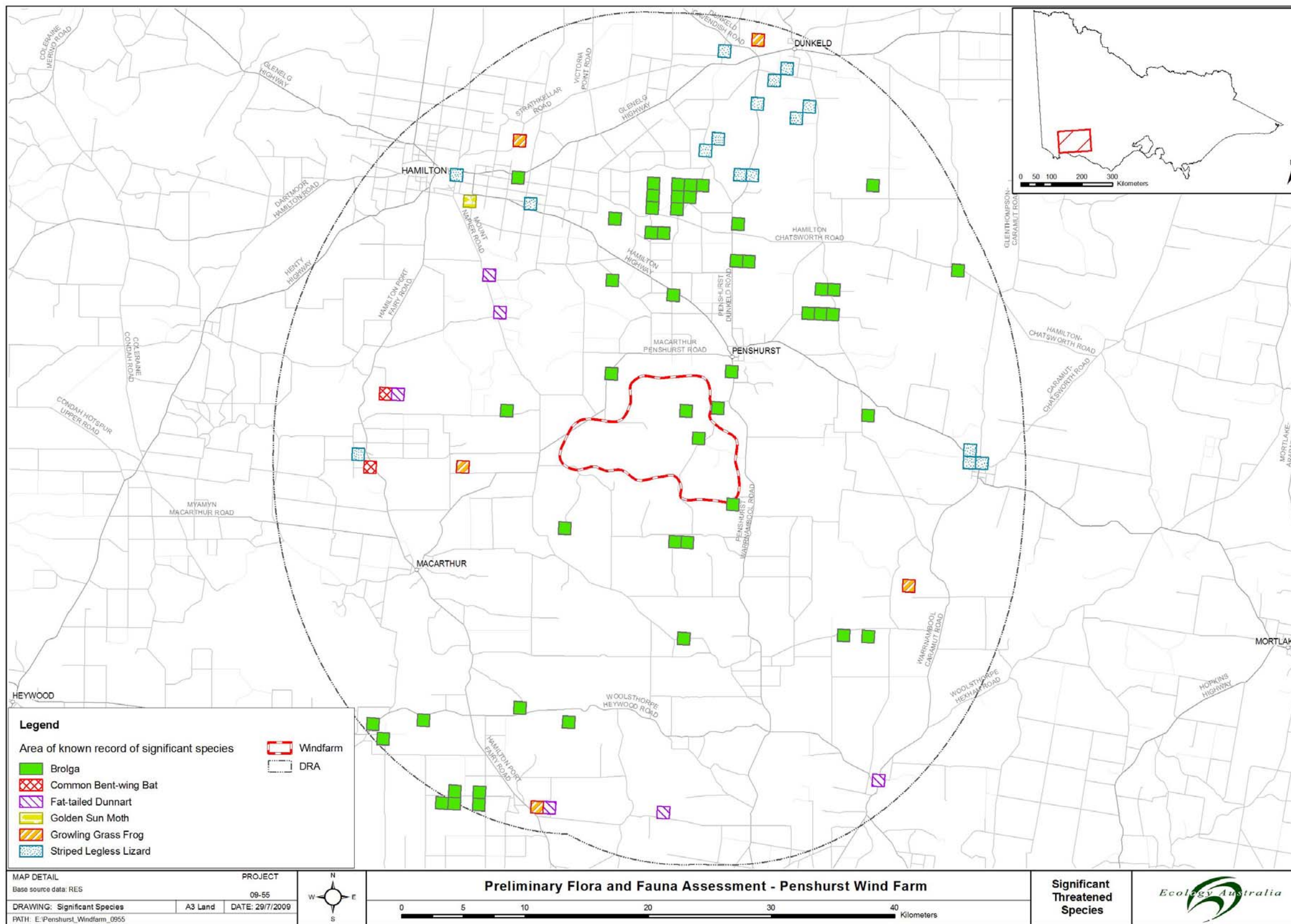
Further, given the abundance of records in the surrounding landscape zone, it is likely that some suitable habitat for **Fat-tailed Dunnart** is located in the study area, particularly within areas of stony rises. Records of Fat-tailed Dunnart on the fauna DRA are shown in Figure 2.

An additional Sun Moth species with some potential to occur within the grassland environs of the wind farm site is **Synemon sp cf collecta** - Endangered in Victoria (DSE 2007). This species has not been recorded within the fauna DRA but is considered to have some likelihood of occurrence within the wind farm site and/or transmission line easements (Yvonne Ingeme, DSE, pers. comm.). This species has been previously recorded at Hexham, approximately 34 km east of the study area (Yvonne Ingeme, DSE, pers. comm.).

Key fauna findings:

- Habitat for EPBC-listed Southern Bent-wing Bat and FFG-listed Brolga was recorded from the wind farm site and surrounding landscape zone. Brolga are known to breed and forage within the wind farm site. Numerous large wetlands and flooded pastures within the surrounding landscape zone provide potential, foraging, flocking and breeding habitat. A known over-wintering site for Southern Bent-wing Bat is located within the Byaduk caves, approximately 16 km from the site. Further, this species has been recorded within the Macarthur wind farm site.
- The wetland environs provide potential habitat for a number of migratory species listed under the EPBC Act.
- Other Federal and State threatened fauna have been identified as potential issues within the wind farm site and landscape zone. In particular, potential habitat exists for EPBC-listed Growling Grass Frog within the wetlands environs of the wind farm site. This species has been recorded from the Macarthur Wind Farm site.
- Non-threatened waterbirds and raptors are common in the wind farm site and landscape zone.

Figure 2 Proposed Peshurst Wind Farm: Selected threatened fauna records within 30 km of the proposed wind farm site.



6 Plates



Plate 1 Peshurst Wind Farm: Typical view of the stony rises which characterise much of the wind farm site.



Plate 2 Peshurst Wind Farm: Grassy swards dominated by Common Tussock-grass and sedges are the main vegetation remnants on the stony rises. Possible EVC's include Plains Grassy Wetland.



Plate 3 Peshurst Wind Farm: The site includes a number of permanent wetlands. This example is on the Eumerella River in the west of the site.



Plate 4 Peshurst wind farm: Plantations of Radiata Pine and/or Cypress are relatively common on the site and are potential habitat for several raptor species (birds of prey).



Plate 5 Peshurst Wind Farm: Lake Linlithgow is the largest wetland in the surrounding landscape zone. It occurs c.15 km north of the wind farm site.



Plate 6 Peshurst Wind farm: view of one of the Byaduk caves – collapsed section of the Mt Napier lava flow – which provides non-breeding (over-wintering) habitat for the EPBC-listed Southern Bent-wing Bat. These are some 16 km west of the wind farm site.



Plate 7 Penshurst Wind Farm: A pair of Brolga communing with sheep and grazing on wet pasture to the west of Macarthur-Penshurst Road, opposite the wind farm site.

7 Policy and Legislative Implications

Federal

EPBC Act

As there are matters of National Environmental Significance (NES) in the project area, and some potential for impacts, the proposal will need to be referred to the Department of Environment, Heritage, Water and Arts (DEHWA). The principal NES categories relevant to Peshurst are:

- Listed migratory species;
- Listed threatened species and ecological communities;

Listed migratory species known from the wind farm site and/or the landscape zone (the study area) include:

- Fifty-three migratory and/or marine overfly species with a moderate or higher LRO in the study area due to the presence of suitable habitat
 - Five of these species are listed as threatened under the FFG Act and an additional five are classified as threatened in Victoria (DSE 2007a).
- At this stage it is considered unlikely that the study area constitutes important habitat or supports 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.

Potential impacts on migratory species was a primary reason for reversing the initial decision on the Mortlake Wind Farm to a 'Controlled Action'. Similarly, Stockyard wind farm was referred as 'Not a Controlled Action', however, the Federal Minister's decision was that it required approval under the Act ('a Controlled Action'), a key reason for which was listed migratory species.

Listed threatened species likely to occur in the study area include Southern Bent-wing Bat and Growling Grass Frog. The Southern Bent-wing was a key issue for the Macarthur wind farm due to the proximity of the Byaduk roosting caves, and it will similarly be of interest for Peshurst. Growling Grass Frog would only be an issue at the wind farm site in the context of habitat loss or creating barriers to movement. It is likely that these could be avoided or adequately managed.

Other possible threatened species with impacts potentially occurring on the wind farm site or the transmission line easement include: Striped Legless Lizard, Golden Sun Moth, Dwarf Galaxias and Australian Grayling.

Two listed ecological communities are known from the study area:

- Grassy Eucalypt Woodland of Victorian the Victorian Volcanic Plain – critically endangered;
- Natural Temperate Grassland of the Victorian Volcanic Plain – critically endangered.

The preliminary investigation suggests that remnants of these two communities may be outside the current wind farm footprint but are likely to be a key issue in selecting powerline routes.

Key findings:

- An EPBC Referral will be required
- Principal Matters of National Environment Significance include: Migratory birds, Southern Bent-wing, potentially Growling Grass Frog, possibly other threatened fauna, and remnants of Grassy Eucalypt Woodland and Natural Temperate Grassland

The recent bilateral agreement between the Commonwealth and the State of Victoria accrediting the Victorian environment impact assessment process would greatly facilitate the approval process if the project requires EPBC approval.

State

FFG Act 1988

This Act does not formally apply to private land unless critical habitat has been declared. This is not the case in the study area. Nonetheless listed threatened species and communities are a major consideration for DSE in framing their decision on any particular proposal. It is also advisable to consider indirect impacts on values under their control, and the Southern Bent-wing Bat population at the Byaduk caves would be an example.

FFG listings replicate most of the threatened items already discussed under the EPBC, but add threatened status to several EPBC listed migratory species including Great Egret, Blue-billed Duck and Freckled Duck. Most notably, FFG listings for threatened fauna include Brolga – potentially the major issue for the proposal.

Brolga has been a pre-eminent issue for wind farms in the south-west including Macarthur, Mortlake, Dunkeld and Stockyard. In response, DSE have developed guidelines with respect to buffers around nest and flocking sites (3 km and 5 km respectively) and flight corridors between nest and flocking sites (Andrew Pritchard, Team Leader Biodiversity DSE Warrnambool pers. com.).

Key finding:

- The FFG-listed Brolga is likely to be a key issue in determining the wind farm layout.

Environment Effects Act 1978

The proposal should be referred to the Department of Planning and Community Development for determination by the Minister as to whether an ESS is required. The relevant individual criteria include:

- Potential clearing of 10 ha or more of native vegetation that:

- is an endangered EVC; or
 - likely to be of very high conservation significance according to Victoria’s Native Vegetation Framework (DSE 2002)
- Potential long-term loss of a significant proportion (e.g. 1 to 5%) of known remaining habitat or population of a threatened species.

The combined criteria requiring two or more impacts include:

- Clearing of 10 ha or more of native vegetation; and
- Loss of significant area of a listed community; or
- Loss of a genetically important population; or
- Loss of critical habitat; or
- Significant effects on a wetland supporting migratory bird species.

As is evident, these thresholds are relatively high and are unlikely to be approached, considering other constraints operating (EPBC, Net Gain) and a responsive wind farm layout.

Victoria’s Native Vegetation Framework (Net Gain)

Victoria’s policy on native vegetation, *Victoria’s Native Vegetation Management – A Framework for Action* (the Framework) (DNRE 2002) requires all proposals to clear native vegetation to demonstrate the three-staged process of Net Gain:

1. **Avoid** adverse impacts, particularly through vegetation clearance;
2. If impacts cannot be avoided, **minimise** impacts by careful planning, design and management; and
3. If clearing must occur, the clearing must be **offset**.

Net Gain is incorporated into local planning schemes under Clause 52.17 and DSE will be the key referral authority commenting on vegetation. DSE place great emphasis on the avoidance and minimisation steps and approach offsetting on strictly like-for-like basis. Losses associated with endangered EVCs incur a conservation multiplier of 1.5 or 2 in calculating offset targets. Further, clearing of areas of Very High Conservation Significance (endangered EVCs, with a condition score of greater or equal to 0.4) require ministerial approval.

Overall offsetting losses of endangered EVCs is problematic and it is anticipated that avoidance and minimisation of losses will be a key driver for the wind farm layout.

Key findings:

- emphasis on avoidance and minimisation steps of Net Gain;
- target offsets will be 1.5 or 2 x losses

- offsetting endangered EVCs can be difficult

Local

The study area spans two shires: Moyne and Southern Grampians. The wind farm site is on land currently zoned farming and there are no additional overlay controls. Under Clause 52.17 a permit will be required to remove native vegetation.

Key findings:

- there are no overlay controls relating to environmental issues across the wind farm site
- a permit will be required to remove native vegetation

8 Risk Assessment

The following Risk Assessment is applied to the threatened species and communities as discussed in Sections 5. It is based on the Australian/New Zealand Risk Management Standard – AS/NZS 4360 – 1999.

The Risk Assessment is based on the preliminary site visit, review of existing documents from surrounding wind farms and database searches. At this stage, the Risk Assessment assumes no mitigation, which would be developed during the course of survey findings. The Risk Assessment should be updated according to new information gathered from subsequent detailed assessment and aims to guide the wind farm planning in the next stages.

The definitions and consequence definitions and rating are given in Table 1 and the Environmental Risk Matrix in Table 2. The associated risk assessment is presented in Table 3.

Table 1 Preliminary Flora and Fauna assessment – Proposed Peshurst Wind Farm: Likelihood and consequence definitions and ratings

Likelihood (How likely is the event to occur)			Consequence (Significance of associated environmental impact)		
<i>Rating</i>	<i>Definition</i>		<i>Rating</i>	<i>Definition</i>	
<i>A</i>	Almost certain	The event is expected to occur in most circumstances	<i>5</i>	Catastrophic	Disaster with potential to lead to collapse
<i>B</i>	Likely	The event probably will occur in most circumstances(e.g. weekly to monthly)	<i>4</i>	Major	Critical event, which with proper management, will be endured
<i>C</i>	Moderate / Possible	The event should occur at some time, i.e. once in a while	<i>3</i>	Moderate	Significant event, which can be managed under normal procedures
<i>D</i>	Unlikely	The event could occur at some time	<i>2</i>	Minor	Consequences can be readily absorbed but management effort is still required to minimize impacts
<i>E</i>	Rarely	The event may occur only in exceptional circumstances	<i>1</i>	Insignificant	Consequence is negligible

Table 2 Preliminary Flora and Fauna assessment – Proposed Penshurst Wind Farm: Environmental Risk Matrix

Likelihood	Consequences				
	Catastrophic	Major	Moderate	Minor	Insignificant
Almost certain	Extreme	Very High	High	Moderate	Moderate
Likely	Very High	High	Moderate	Moderate	Low
moderate	High	Moderate	Moderate	Low	Negligible
Unlikely	Moderate	Moderate	Low	Low	Negligible
Rare	Moderate	Low	Negligible	Negligible	Negligible

Table 3 Preliminary Flora and Fauna assessment – Proposed Penshurst Wind Farm: Preliminary Risk Assessment

Known Environmental issues	Likelihood	Consequence	Inherent Risk
EPBC-listed items			
Southern Bent-wing Bat	Likely	Moderate	Moderate
Avifauna listed under the Migratory and/or Marine provisions	Likely	Moderate	Moderate
Natural Temperate Grassland	Possible	Moderate	Moderate
Grassy Eucalypt Woodland	Possible	Moderate	Moderate
FFG-listed items			
Brolga	Likely	Major	High
EVC 132 – Plains Grassland	Possible	Moderate	Moderate
EVC 55 – Plains Grassy Woodland	Possible	Moderate	Moderate
Non – threatened fauna			
Raptors	Likely	Minor	Moderate
Non-threatened water birds	Likely	Minor	Moderate
Potential Environmental issues	Likelihood	Consequence	Inherent Risk
EPBC-listed items			
Growling Grass Frog	Possible	Minor	Low
Striped Legless Lizard <small>*Note this relates to transmission lines easement as insufficient information is known for wind farm site.</small>	Possible	Moderate	Moderate

Golden Sun Moth	To be determined	To be determined	To be determined
Threatened flora	Possible	Moderate	Moderate
Threatened Fish	Unlikely	Moderate	Low
FFG-listed items			
Threatened water birds	Possible	Moderate	Moderate
Threatened flora	Possible	Moderate	Moderate
DSE’s Advisory list for threatened fauna			
Fat-tailed Dunnart	Possible	Moderate	Moderate
Threatened water birds	Possible	Moderate	Moderate
Threatened Fish	Unlikely	Moderate	Low
Swampland Cool-skink	Unlikely	Moderate	Low

In summary, there is a range of threatened flora, fauna and vegetation communities with a moderate level of risk due to the proposed development. Brolga is the only known item at this stage of assessment to be determined as high risk. Inherent Risk for any particular species or community may increase or decrease depending on the knowledge gained through further assessment.

As is evident from other wind farm decisions and discussions with DSE, these issues are more likely to influence the design of the wind farm and associated infrastructure than be regarded as fatal flaws. Two wind farms in the south-west have recently been determined a “controlled action” by the Federal Government. It is possible that the proposed wind farm at Peshurst may also require approval under the EPBC Act due to the similarity in issues. However, due to the recent bilateral agreements between the State and Federal Government, this may not necessarily cause undue delays in the approvals process. Further, as per discussions with DSE, Peshurst may require a cumulative impact assessment for some threatened fauna (e.g. Brolga) due to its close proximity to the approved Macarthur Wind Farm to the near south of the site.

9 Key Issues and Recommendations

The next stages of the project should address potential impacts to environmental values of the wind farm site, the proposed transmission line route and in the surrounding 20 10? km landscape zone. The work required addressing risks associated with multiple known and potential threatened flora, fauna and vegetation communities will need to meet DSE's standard and the AUSWEA guidelines for assessment of impacts to birds from wind farms (BLA 2005). The scope of work would include:

Wind Farm site and transmission line route

- A detailed flora, fauna and habitat assessment.
- Bird utilisation assessment as required by DSE to determine all avifauna on-site and their usage of the area. This assessment would need to be undertaken over several seasons to capture migratory, resident and nomadic birds.
- Targeted flora and/or fauna surveys as outlined below.
- Net Gain assessment.

Landscape Zone

- Targeted assessment for Brolga and potentially assessing the cumulative impact from both the Peshurst and Macarthur wind farm site.
- Targeted survey for Southern Bent-wing Bat.

The following (Table 4), summarises the key flora and fauna issues, inherent risks, and outlines the scope of the works required to address the respective items. .



Table 4 Summary of the key flora and fauna issues, inherent risk and recommended actions during the next stage of planning for the proposed Peshurst Wind Farm.

Key Issue	Inherent Risk	Actions recommended	Legislative and Policy Implications	Permits or Referrals Required
Known environmental issues				
Native fauna				
Southern Bent-wing Bat (EPBC-listed and FFG-listed)	Moderate	<p>Targeted on-site and off-site (landscape zone) assessment should occur in accordance with DSE recommendations.</p> <p><u>On-site:</u> Targeted assessment to monitor bat utilisation of the study area both at ground and rotor-swept height. Assessment of potential roost sites within the study area.</p> <p><u>Off-site:</u> Targeted assessment for bats in areas potentially used for migration/dispersal between known breeding and non-breeding roost sites and the wind farm site</p>	EPBC Act FFG Act – threatened species	A referral to the Commonwealth Minister would be required if the proposed works are likely to impact upon an EPBC listed species
Brolga (FFG-listed)	High	<p>Targeted on-site and off-site assessment must occur in accordance with DSE recommendations (Lindy Lumsden pers. comm.).</p> <p><u>On-site:</u> Targeted assessment to monitor brolga utilisation of the study area. Assessment of potential foraging and breeding sites within the study area. Monitoring of bird movements within and over and the study area between foraging/breeding sites.</p> <p><u>Off-site:</u> Targeted assessment for brolga within a 20 km radius of the study area as in areas potentially used for migration/dispersal.</p>	FFG Act – threatened species	
Avifauna listed under the migratory	Moderate	A bird utilisation assessment covering several seasons is recommended to analyse bird utilisation of	EPBC Act	A referral to the Commonwealth



Key Issue	Inherent Risk	Actions recommended	Legislative and Policy Implications	Permits or Referrals Required
schedules of the EPBC Act.		the study area. This survey should be in accordance with DSE and the AUSWEA guidelines (BLA 2005).		Minister would be required if the proposed works are likely to impact upon an EPBC listed species
Non-threatened waterbirds and raptors	Moderate	A bird utilisation assessment covering several seasons is recommended to analyse bird utilisation of the study area. This survey should be in accordance with DSE and the AUSWEA guidelines (BLA 2005).		
Plains Grassland/Natural Temperate Grassland and Plains Grassy Woodland/Grassy Eucalypt Woodland	Moderate	Systematic surveys and mapping of remnants on the wind farm site and on service / utilities and transmission line routes.	EPBC Act FFG Act – threatened community	A referral to the Commonwealth Minister would be required if the proposed works are likely to impact upon an EPBC-listed community
Possible environmental issues				
Growling Grass Frog (EPBC-listed and FFG-listed)	Low	Targeted survey for Growling Grass Frog in wetlands and associated drainage-lines to assess potential on-site impacts of the wind farm development. The recommended survey time for the Growling Grass Frog is between late October and February.	EPBC Act FFG Act – threatened species	A referral to the Commonwealth Minister would be required if the proposed works are likely to impact upon an EPBC-listed species
Striped Legless Lizard (EPBC-listed and FFG-listed)	Moderate	Targeted survey for Striped Legless Lizard is recommended in areas of suitable habitat within or adjacent to proposed areas for development. A habitat	EPBC Act FFG Act –	A referral to the Commonwealth Minister would be



Key Issue	Inherent Risk	Actions recommended	Legislative and Policy Implications	Permits or Referrals Required
		assessment should be undertaken in the wind farm site and transmission line easement to determine the extent of any suitable habitat. Targeted assessment for this species may be undertaken using tiles that are set up over winter and checked for lizards sheltering underneath between September to November.	threatened species	required if the proposed works are likely to impact upon an EPBC listed species
Golden Sun Moth (EPBC-listed and FFG-listed)	To be determined	Targeted survey for the EPBC-listed Golden Sun Moth. The Golden Sun Moth can only be detected between late October and early January when adults emerge from the underground larval stage. Survey conditions for this species are very specific. For example, Golden Sun Moths are usually only observed when flying on warm, sunny days, above 25 °C, with little or no wind or cloud cover, and at least two days after rain.	EPBC Act FFG Act – threatened species	A referral to the Commonwealth Minister would be required if the proposed works are likely to impact upon an EPBC listed species
Threatened avifauna listed under the FFG Act and classified under DSE’s Advisory list (DSE 2007a)	Moderate	A bird utilisation assessment covering several seasons is recommended to analyse bird utilisation of the study area. This survey should be in accordance with DSE and the AUSWEA guidelines (BLA 2005).	FFG Act – threatened species	
Fat-tailed Dunnart (classified under DSE 2007a Advisory list)	Moderate	Targeted survey for Fat-tailed Dunnart should occur in those areas of suitable habitat within or adjacent to proposed areas for development. Spotlighting and active searches would be used to determine the presence of this species.		

10 References

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Appendix 1 Proposed Penshurst Wind farm. Checklist of listed or otherwise threatened (vulnerable/endangered) plant species. Compiled from databases (GIS, EPBC) and expert consultation

Common name	Scientific name	EPBC	FFG	Advisory list
Wavy Swamp Wallaby-grass	<i>Amphibromus sinuatus</i>	—	—	v
Swamp Wallaby-grass	<i>Amphibromus fluitans</i>		—	
Kiwi Cave-moss	<i>Anoetangium bellii</i>	—	✓	v
Western Water-starwort	<i>Callitriche cyclocarpa</i>	V	✓	v
Tuberous Bitter-cress	<i>Cardamine gunnii</i>	—	✓	x
Curly Sedge	<i>Carex tasmanica</i>	V	✓	v
Arching Flax-lily	<i>Dianella</i> sp. aff. <i>longifolia</i> (Benambra)	—	—	v
Swamp Diuris	<i>Diuris palustris</i>	—	✓	v
Bell-flower Hyacinth-orchid	<i>Dipodium campanulatum</i>	—	—	e
Purple Eyebright	<i>Euphrasia collina</i> subsp. <i>muelleri</i>	E	✓	e
Clover Glycine	<i>Glycine latrobeana</i>	V	✓	v
Pale Swamp Everlasting	<i>Helichrysum</i> aff. <i>rutidolepis</i> (Lowland Swamp)	—	—	v
Adamson's Blown-grass	<i>Lachnagrostis adamsonii</i>	E	✓	v
Purple Blown-grass	<i>Lachnagrostis punicea</i> subsp. <i>filifolia</i>	—	✓	r
Basalt Peppergrass	<i>Lepidium hyssopifolium</i>	E	✓	e
Lanky Buttons	<i>Leptorhynchos elongatus</i>	—	—	e
Plains Yam-daisy	<i>Microseris</i> sp. 1	—	—	v
Salt-lake Tussock-grass	<i>Poa sallacustris</i>	V	✓	v
Gorae Leek-orchid	<i>Prasophyllum diversiflorum</i>	E	✓	e
Maroon Leek-orchid	<i>Prasophyllum frenchii</i>	E	✓	e
Silurian Leek-orchid	<i>Prasophyllum pyriforme</i> s.s.	—	—	e
Dense Leek-orchid	<i>Prasophyllum spicatum</i>	V	—	e
Fragrant Leek-orchid	<i>Prasophyllum suaveolens</i>	E	✓	e
Leek-orchid	<i>Prasophyllum viretum</i>		—	e
Spiral Sun-orchid	<i>Thelymitra mathewsii</i>	V	✓	v

Appendix 2 Fauna species recorded from within a 30 km radius of the study area on the Atlas of Victorian Wildlife, DSE database (DSE 2007).

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 (2007): Advisory List of Threatened Vertebrate Fauna in Victoria – 2007.

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	EPBC	NAP	FFG	DSE	Last	Recs
Birds							
Stubble Quail	<i>Coturnix pectoralis</i>	M				2000	5
Painted Button-quail	<i>Turnix varia</i>					1984	1
Common Bronzewing	<i>Phaps chalcoptera</i>					2001	9
Brush Bronzewing	<i>Phaps elegans</i>					1994	1
Crested Pigeon	<i>Ocyphaps lophotes</i>					1998	1
Buff-banded Rail	<i>Gallirallus philippensis</i>	M				1999	2
Baillon's Crake	<i>Porzana pusilla palustris</i>	M		L	VU	2000	1
Black-tailed Native-hen	<i>Gallinula ventralis</i>					2003	7
Dusky Moorhen	<i>Gallinula tenebrosa</i>					2001	11
Purple Swamphen	<i>Porphyrio porphyrio</i>	M				2006	56
Eurasian Coot	<i>Fulica atra</i>					2004	90
Great Crested Grebe	<i>Podiceps cristatus</i>					2000	22
Australasian Grebe	<i>Tachybaptus novaehollandiae</i>					2000	30
Hoary-headed Grebe	<i>Poliiocephalus poliocephalus</i>					2004	122
Great Cormorant	<i>Phalacrocorax carbo</i>					2000	26
Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>					2001	18
Pied Cormorant	<i>Phalacrocorax varius</i>				NT	2000	2
Little Pied Cormorant	<i>Phalacrocorax melanoleucos</i>					2001	48
Darter	<i>Anhinga melanogaster</i>					2005	2
Australian Pelican	<i>Pelecanus conspicillatus</i>	M				2004	22
Whiskered Tern	<i>Chlidonias hybridus</i>	Mi,M			NT	2004	39
Caspian Tern	<i>Sterna caspia</i>	Mi,M		L	NT	1997	1
Silver Gull	<i>Larus novaehollandiae</i>	Mi,M				2004	98
Red-kneed Dotterel	<i>Erythrogonys cinctus</i>	Mi				1990	1
Masked Lapwing	<i>Vanellus miles</i>	Mi				2006	189
Banded Lapwing	<i>Vanellus tricolor</i>	Mi				2000	18
Double-banded Plover	<i>Charadrius bicinctus</i>	Mi,M				1993	2
Red-capped Plover	<i>Charadrius ruficapillus</i>	Mi,M				2004	20
Black-fronted Dotterel	<i>Elsyornis melanops</i>	Mi				1993	18
Black-winged Stilt	<i>Himantopus himantopus leucocephalus</i>	Mi,M				2004	28

Banded Stilt	<i>Cladorhynchus leucocephalus</i>	Mi				2003	6
Red-necked Avocet	<i>Recurvirostra novaehollandiae</i>	Mi				2004	12
Common Sandpiper	<i>Actitis hypoleucos</i>	Mi,M			VU	1993	2
Curlew Sandpiper	<i>Calidris ferruginea</i>	Mi,M				1993	2
Red-necked Stint	<i>Calidris ruficollis</i>	Mi,M				2004	9
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	Mi,M				2004	8
Latham's Snipe	<i>Gallinago hardwickii</i>	Mi,M			NT	2004	4
Brolga	<i>Grus rubicunda</i>	Mi		L	VU	2006	49
Australian White Ibis	<i>Threskiornis molucca</i>	M				2006	51
Straw-necked Ibis	<i>Threskiornis spinicollis</i>	M				2006	54
Royal Spoonbill	<i>Platalea regia</i>				VU	1990	2
Yellow-billed Spoonbill	<i>Platalea flavipes</i>					2006	19
Great Egret	<i>Ardea alba</i>	Mi,M		L	VU	2006	9
White-faced Heron	<i>Egretta novaehollandiae</i>					2006	107
White-necked Heron	<i>Ardea pacifica</i>					2001	20
Nankeen Night-Heron	<i>Nycticorax caledonicus hilli</i>	M			NT	2001	4
Cape Barren Goose	<i>Cereopsis novaehollandiae</i>	Mi,M			NT	1988	16
Magpie Goose	<i>Anseranas semipalmata</i>	Mi,M		N	VU	2004	2
Australian Wood Duck	<i>Chenonetta jubata</i>	Mi				2004	31
Black Swan	<i>Cygnus atratus</i>	Mi				2006	306
Australian Shelduck	<i>Tadorna tadornoides</i>	Mi				2006	314
Pacific Black Duck	<i>Anas superciliosa</i>	Mi				2006	171
Chestnut Teal	<i>Anas castanea</i>	Mi				2006	38
Grey Teal	<i>Anas gracilis</i>	Mi				2006	133
Australasian Shoveler	<i>Anas rhynchos</i>	Mi			VU	2004	74
Pink-eared Duck	<i>Malacorhynchus membranaceus</i>	Mi				2006	65
Freckled Duck	<i>Stictonetta naevosa</i>	Mi		L	EN	2004	12
Hardhead	<i>Aythya australis</i>	Mi			VU	2006	56
Blue-billed Duck	<i>Oxyura australis</i>	Mi		L	EN	2004	20
Musk Duck	<i>Biziura lobata</i>	Mi,M			VU	2004	67
Spotted Harrier	<i>Circus assimilis</i>	Mi			NT	2002	2
Swamp Harrier	<i>Circus approximans</i>	Mi,M				2005	29
Brown Goshawk	<i>Accipiter fasciatus</i>	Mi,M				2005	5
Collared Sparrowhawk	<i>Accipiter cirrhocephalus</i>	Mi				1988	1
Wedge-tailed Eagle	<i>Aquila audax</i>	Mi				2006	15
Little Eagle	<i>Hieraaetus morphnoides</i>	Mi				2001	1
Whistling Kite	<i>Haliastur sphenurus</i>	Mi,M				2001	10
Black-shouldered Kite	<i>Elanus axillaris</i>	Mi				2003	19
Australian Hobby	<i>Falco longipennis</i>	Mi				1992	4
Peregrine Falcon	<i>Falco peregrinus</i>	Mi				1999	5
Brown Falcon	<i>Falco berigora</i>	Mi				2006	31
Nankeen Kestrel	<i>Falco cenchroides</i>	Mi,M				2006	21
Southern Boobook	<i>Ninox novaeseelandiae</i>	M				2001	23
Barn Owl	<i>Tyto alba</i>					2000	3
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>					2005	4
Musk Lorikeet	<i>Glossopsitta concinna</i>					2001	5
Purple-crowned Lorikeet	<i>Glossopsitta porphyrocephala</i>					2001	6
Red-tailed Black-Cockatoo	<i>Calyptorhynchus banksii graptogyne</i>	EN,M i	EN	L	EN	1993	2

Yellow-tailed Black-Cockatoo	<i>Calyptorhynchus funereus</i>					2006	30
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>					1986	2
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>					2006	48
Long-billed Corella	<i>Cacatua tenuirostris</i>					2006	57
Galah	<i>Cacatua roseicapilla</i>					2003	29
Cockatiel	<i>Nymphicus hollandicus</i>					1999	1
Crimson Rosella	<i>Platycercus elegans elegans</i>					2005	48
Eastern Rosella	<i>Platycercus eximius</i>					2003	19
Red-rumped Parrot	<i>Psephotus haematonotus</i>					2005	17
Blue-winged Parrot	<i>Neophema chrysostoma</i>	M				2006	9
Elegant Parrot	<i>Neophema elegans</i>				VU	1990	1
Laughing Kookaburra	<i>Dacelo novaeguineae</i>					2001	33
Sacred Kingfisher	<i>Todiramphus sanctus</i>	M				2001	5
Rainbow Bee-eater	<i>Merops ornatus</i>	Mi,M				1986	1
White-throated Needletail	<i>Hirundapus caudacutus</i>	Mi,M				1986	2
Fork-tailed Swift	<i>Apus pacificus</i>	Mi,M				1986	1
Pallid Cuckoo	<i>Cuculus pallidus</i>	M				1985	1
Fan-tailed Cuckoo	<i>Cacomantis flabelliformis</i>	M				2001	8
Horsfield's Bronze-Cuckoo	<i>Chrysococcyx basalis</i>	M				2001	7
Shining Bronze-Cuckoo	<i>Chrysococcyx lucidus</i>	M				2001	7
Welcome Swallow	<i>Hirundo neoxena</i>	M				2005	61
Tree Martin	<i>Hirundo nigricans</i>	M				2001	6
Fairy Martin	<i>Hirundo ariel</i>					1999	1
Grey Fantail	<i>Rhipidura fuliginosa</i>					2005	57
Rufous Fantail	<i>Rhipidura rufifrons</i>	M				1999	2
Willie Wagtail	<i>Rhipidura leucophrys</i>					2006	78
Restless Flycatcher	<i>Myiagra inquieta</i>					2006	22
Jacky Winter	<i>Microeca leucophaea</i>					1984	1
Scarlet Robin	<i>Petroica multicolor</i>					2001	4
Flame Robin	<i>Petroica phoenicea</i>	M				1999	3
Pink Robin	<i>Petroica rodinogaster</i>	M				2001	3
Rose Robin	<i>Petroica rosea</i>					2001	1
Hooded Robin	<i>Melanodryas cucullata</i>		NT	L	NT	1984	1
Eastern Yellow Robin	<i>Eopsaltria australis</i>					2001	14
Golden Whistler	<i>Pachycephala pectoralis</i>					2001	22
Rufous Whistler	<i>Pachycephala rufiventris</i>					1999	6
Grey Shrike-thrush	<i>Colluricincla harmonica</i>					2005	47
Magpie-lark	<i>Grallina cyanoleuca</i>	M				2005	69
Crested Shrike-tit	<i>Falcunculus frontatus</i>					2001	3
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	M				2005	16
White-winged Triller	<i>Lalage tricolor</i>					1986	1
White-fronted Chat	<i>Epthianura albifrons</i>					2005	9
Weebill	<i>Smicrornis brevirostris</i>					2001	3
Striated Thornbill	<i>Acanthiza lineata</i>					2001	15
Yellow Thornbill	<i>Acanthiza nana</i>					1989	1
Brown Thornbill	<i>Acanthiza pusilla</i>					2005	52

Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>						2003	47
White-browed Scrubwren	<i>Sericornis frontalis</i>						2001	48
Brown Songlark	<i>Cincloramphus cruralis</i>	Mi					2001	9
Little Grassbird	<i>Megalurus gramineus</i>	Mi					2005	5
Australian Reed-Warbler	<i>Acrocephalus stentoreus</i>	Mi					1999	1
Golden-headed Cisticola	<i>Cisticola exilis</i>						2005	2
Superb Fairy-wren	<i>Malurus cyaneus</i>						2005	75
White-browed Woodswallow	<i>Artamus superciliosus</i>						1986	1
Dusky Woodswallow	<i>Artamus cyanopterus</i>						1984	1
Varied Sittella	<i>Daphoenositta chrysoptera</i>						2001	6
Brown Treecreeper	<i>Climacteris picumnus victoriae</i>		NT		NT		1984	1
White-throated Treecreeper	<i>Cormobates leucophaeus</i>						2001	27
Mistletoebird	<i>Dicaeum hirundinaceum</i>						2000	3
Spotted Pardalote	<i>Pardalotus punctatus punctatus</i>						2001	19
Silvereye	<i>Zosterops lateralis</i>	M					2001	22
White-naped Honeyeater	<i>Melithreptus lunatus</i>						2001	34
Eastern Spinebill	<i>Acanthorhynchus tenuirostris</i>						2001	10
Regent Honeyeater	<i>Xanthomyza phrygia</i>	EN, Mi	EN	L	CE		1961	1
Singing Honeyeater	<i>Lichenostomus virescens</i>						1984	1
Yellow-faced Honeyeater	<i>Lichenostomus chrysops</i>						2005	31
White-eared Honeyeater	<i>Lichenostomus leucotis</i>						2001	26
White-plumed Honeyeater	<i>Lichenostomus penicillatus</i>						2001	9
New Holland Honeyeater	<i>Phylidonyris novaehollandiae</i>						2001	49
Noisy Miner	<i>Manorina melanocephala</i>						2003	5
Little Wattlebird	<i>Anthochaera chrysoptera</i>						2000	2
Red Wattlebird	<i>Anthochaera carunculata</i>						2005	57
Australian Pipit	<i>Anthus novaeseelandiae</i>	M					2006	27
Red-browed Finch	<i>Neochmia temporalis</i>						2001	15
Olive-backed Oriole	<i>Oriolus sagittatus</i>						1999	1
White-winged Chough	<i>Corcorax melanorhamphos</i>						2006	1
Pied Currawong	<i>Strepera graculina</i>						1984	1
Grey Currawong	<i>Strepera versicolor</i>						2001	16
Australian Magpie	<i>Gymnorhina tibicen</i>						2006	121
Bassian Thrush	<i>Zoothera lunulata</i>	Mi					1995	1
Forest Raven	<i>Corvus tasmanicus</i>	M					2001	5
Australian Raven	<i>Corvus coronoides</i>						2001	31
Little Raven	<i>Corvus mellori</i>	M					2006	53
Striated Pardalote	<i>Pardalotus striatus</i>						2001	13
Cattle Egret	<i>Ardea ibis</i>	Mi, M					2001	3
Common Blackbird*	<i>Turdus merula</i>						2001	42
Skylark*	<i>Alauda arvensis</i>						2006	18

House Sparrow*	<i>Passer domesticus</i>					2006	49
European Goldfinch*	<i>Carduelis carduelis</i>					2006	62
European Greenfinch*	<i>Carduelis chloris</i>					2000	2
Common Starling*	<i>Sturnus vulgaris</i>					2005	59
Mammals							
Short-beaked Echidna	<i>Tachyglossus aculeatus</i>					2005	9
Yellow-footed Antechinus	<i>Antechinus flavipes</i>					1977	2
Agile Antechinus	<i>Antechinus stuartii</i>					1999	7
Dusky Antechinus (mainland)	<i>Antechinus swainsonii mimetes</i>					1980	42
Dusky Antechinus (Grampians)	<i>Antechinus swainsonii insulanus</i>		NT			1980	42
Common Dunnart	<i>Sminthopsis murina murina</i>				VU	1963	1
Fat-tailed Dunnart	<i>Sminthopsis crassicaudata</i>				NT	2005	9
Eastern Barred Bandicoot	<i>Perameles gunnii</i>	EN	CE	L	CE	1989	165
Common Brushtail Possum	<i>Trichosurus vulpecula</i>					2004	27
Common Ringtail Possum	<i>Pseudocheirus peregrinus</i>					2004	8
Yellow-bellied Glider	<i>Petaurus australis</i>		NT			1999	3
Sugar Glider	<i>Petaurus breviceps</i>					1999	6
Eastern Pygmy-possum	<i>Cercartetus nanus</i>						1
Koala	<i>Phascolarctos cinereus</i>		NT			2004	58
Common Wombat	<i>Vombatus ursinus</i>						1
Swamp Wallaby	<i>Wallabia bicolor</i>					2006	9
Red-necked Wallaby	<i>Macropus rufogriseus</i>					2005	5
Eastern Grey Kangaroo	<i>Macropus giganteus</i>					1999	11
White-striped Freetail-bat	<i>Tadarida australis</i>					1999	2
Gould's Long-eared Bat	<i>Nyctophilus gouldi</i>					1980	2
Lesser Long-eared Bat	<i>Nyctophilus geoffroyi</i>					1999	17
Gould's Wattled Bat	<i>Chalinolobus gouldii</i>					1979	1
Chocolate Wattled Bat	<i>Chalinolobus morio</i>					1999	8
Southern Forest Bat	<i>Vespadelus regulus</i>					1999	4
Little Forest Bat	<i>Vespadelus vulturnus</i>					1999	3
Large Forest Bat	<i>Vespadelus darlingtoni</i>					1999	3
Bush Rat	<i>Rattus fuscipes</i>					1980	15
Swamp Rat	<i>Rattus lutreolus</i>					2005	31
Black Rat*	<i>Rattus rattus</i>					1998	14
Brown Rat*	<i>Rattus norvegicus</i>					1980	1
House Mouse*	<i>Mus musculus</i>					2006	64
Rabbit*	<i>Oryctolagus cuniculus</i>					2005	13
Brown Hare*	<i>Lepus capensis</i>					2005	10
Red Deer*	<i>Cervus elaphus</i>					1998	1
Fox*	<i>Vulpes vulpes</i>					2006	14
Cat*	<i>Felis catus</i>					2002	9
Reptiles							
Eastern Snake-necked Turtle	<i>Chelodina longicollis</i>					2004	1

Striated Worm-lizard	<i>Aprasia striolata</i>			L	NT	1974	1
Striped Legless Lizard	<i>Delma impar</i>	VU	VU	L	EN	2006	26
White's Skink	<i>Egernia whitii</i>					2006	90
Highlands Forest-skink	<i>Nannoscincus maccoyi</i>					2006	1
Pale-flecked Garden Sunskink	<i>Lampropholis guichenoti</i>					2003	18
Blotched Blue-tongued Lizard	<i>Tiliqua nigrolutea</i>					2006	5
Eastern Blue-tongued Lizard	<i>Tiliqua scincoides</i>					1995	3
Shingle-back	<i>Trachydosaurus rugosus</i>					2005	5
White-lipped Snake	<i>Drysdalia coronoides</i>					1976	2
Eastern Tiger Snake	<i>Notechis scutatus</i>					1998	5
Bold-striped Cool-skink	<i>Bassiana duperryi</i>					2006	21
Swampland Cool-skink	<i>Pseudemoia rawlinsoni</i>		RIK		NT	2003	2
Eastern Brown Snake	<i>Pseudonaja textilis</i>					2001	1
Southern Water-skink	<i>Eulamprus tympanum tympanum</i>					2006	13
Striped Tussock Skink	<i>Pseudemoia pagenscheri</i>					2006	58
Frogs							
Smooth Frog	<i>Geocrinia laevis</i>					1987	23
Eastern Banjo Frog	<i>Limnodynastes dumerilii</i>					2001	10
Brown-striped Frog	<i>Limnodynastes peronii</i>					2001	9
Spotted Grass Frog	<i>Limnodynastes tasmaniensis</i>					2006	33
Sudell's Frog	<i>Neobatrachus sudelli</i>					2006	3
Brown Toadlet	<i>Pseudophryne bibronii</i>		IK		EN	1976	3
Southern Toadlet	<i>Pseudophryne semimarmorata</i>				VU	1965	10
Common Eastern Froglet	<i>Crinia signifera</i>					2006	50
Brown Tree Frog	<i>Litoria ewingii</i>					2006	46
Growling Grass Frog	<i>Litoria raniformis</i>	VU	VU	L	EN	2000	1
Fish							
Short-finned Eel	<i>Anguilla australis</i>					1996	7
Rainbow Trout*	<i>Onchorhynchus mykiss</i>					1981	1
Australian Smelt	<i>Retropinna semoni</i>					1996	2
Common Jollytail	<i>Galaxias maculatus</i>					1996	3
Mountain Galaxias	<i>Galaxias olidus</i>					1996	6
Mountain Galaxias (Glenelg River)	<i>Galaxias olidus Lower Glenelg</i>				DD	1996	6
Mountain Galaxias (NE Victoria)	<i>Galaxias olidus NE Victoria</i>				DD	1996	6
Eastern Little Galaxias	<i>Galaxiella pusilla</i>	VU	VU	L	VU	1971	2
Yarra Pygmy Perch	<i>Nannoperca obscura</i>	VU	VU	L	NT	1996	5
Southern Pygmy Perch	<i>Nannoperca australis</i>					2001	9
Redfin Perch*	<i>Perca fluviatilis</i>					1990	2
Flathead Gudgeon	<i>Philypnodon grandiceps</i>					1998	1

Appendix 3 Proposed Penshurst Wind Farm: Terrestrial Fauna species listed as threatened and/or under the Migratory or Marine-Overfly Schedules of the EPBC Act, threatened under the FFG Act, or classified as threatened in Victoria (DSE 2007a) and previously recorded for the DRA and their Likelihood of Occurrence (LRO) in the study area

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 (2007c): Advisory List of Threatened Vertebrate Fauna in Victoria – 2007.

CE – Critically Endangered; EN – Endangered; VU – Vulnerable; NT – Near Threatened

L – Listed 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

LRO – Likelihood of Regular Occurrence

◆ – Species identified in the EPBC Protected Matters Search but not in the DRA

Common Name	Scientific Name	EPBC	NAP	FFG	DSE	Last	Recs	LRO
Birds								
Stubble Quail	<i>Coturnix pectoralis</i>	M				2000	5	Moderate
Buff-banded Rail	<i>Gallirallus philippensis</i>	M				1999	2	Moderate
Baillon's Crake	<i>Porzana pusilla palustris</i>	M		L	VU	2000	1	Moderate
Purple Swamphen	<i>Porphyrio porphyrio</i>	M				2006	56	High
Pied Cormorant	<i>Phalacrocorax varius</i>				NT	2000	2	Low-moderate
Australian Pelican	<i>Pelecanus conspicillatus</i>	M				2004	22	Moderate
Whiskered Tern	<i>Chlidonias hybridus</i>	Mi,M			NT	2004	39	Moderate
Caspian Tern	<i>Sterna caspia</i>	Mi,M		L	NT	1997	1	Low-moderate
Silver Gull	<i>Larus novaehollandiae</i>	Mi,M				2004	98	High
Red-kneed Dotterel	<i>Erythronyx cinctus</i>	Mi				1990	1	Moderate
Masked Lapwing	<i>Vanellus miles</i>	Mi				2006	189	High
Banded Lapwing	<i>Vanellus tricolor</i>	Mi				2000	18	moderate
Double-banded Plover	<i>Charadrius bicinctus</i>	Mi,M				1993	2	Low-moderate
Red-capped Plover	<i>Charadrius ruficapillus</i>	Mi,M				2004	20	Low
Black-fronted Dotterel	<i>Elsyornis melanops</i>	Mi				1993	18	High
Black-winged Stilt	<i>Himantopus himantopus leucocephalus</i>	Mi,M				2004	28	High
Banded Stilt	<i>Cladorhynchus leucocephalus</i>	Mi				2003	6	Moderate
Red-necked Avocet	<i>Recurvirostra novaehollandiae</i>	Mi				2004	12	Moderate
Common Sandpiper	<i>Actitis hypoleucos</i>	Mi,M			VU	1993	2	Low
Curlew Sandpiper	<i>Calidris ferruginea</i>	Mi,M				1993	2	Low-moderate

Red-necked Stint	<i>Calidris ruficollis</i>	Mi,M				2004	9	Low-moderate
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	Mi,M				2004	8	Moderate
Latham's Snipe	<i>Gallinago hardwickii</i>	Mi,M			NT	2004	4	Moderate-high
Brolga	<i>Grus rubicunda</i>			L	VU	2006	49	High
Australian White Ibis	<i>Threskiornis molucca</i>	M				2006	51	High
Straw-necked Ibis	<i>Threskiornis spinicollis</i>	M				2006	54	High
Royal Spoonbill	<i>Platalea regia</i>				VU	1990	2	Low
Great Egret	<i>Ardea alba</i>	Mi,M		L	VU	2006	9	High
Nankeen Night-Heron	<i>Nycticorax caledonicus hilli</i>	M			NT	2001	4	Low-moderate
Cape Barren Goose	<i>Cereopsis novaehollandiae</i>	Mi,M			NT	1988	16	Low-moderate
Magpie Goose	<i>Anseranas semipalmata</i>	Mi,M		N	VU	2004	2	Low-moderate
Australian Wood Duck	<i>Chenonetta jubata</i>	Mi				2004	31	High
Black Swan	<i>Cygnus atratus</i>	Mi				2006	306	High
Australian Shelduck	<i>Tadorna tadornoides</i>	Mi				2006	314	High
Pacific Black Duck	<i>Anas superciliosa</i>	Mi				2006	171	High
Chestnut Teal	<i>Anas castanea</i>	Mi				2006	38	High
Grey Teal	<i>Anas gracilis</i>	Mi				2006	133	High
Australasian Shoveler	<i>Anas rhynchotis</i>	Mi			VU	2004	74	High
Pink-eared Duck	<i>Malacorhynchus membranaceus</i>	Mi				2006	65	High
Freckled Duck	<i>Stictonetta naevosa</i>	Mi		L	EN	2004	12	Moderate
Hardhead	<i>Aythya australis</i>	Mi			VU	2006	56	Low - moderate
Blue-billed Duck	<i>Oxyura australis</i>	Mi		L	EN	2004	20	Moderate-high
Musk Duck	<i>Biziura lobata</i>	Mi,M			VU	2004	67	Low - moderate
Spotted Harrier	<i>Circus assimilis</i>	Mi			NT	2002	2	Low-moderate
Swamp Harrier	<i>Circus approximans</i>	Mi,M				2005	29	High
Brown Goshawk	<i>Accipiter fasciatus</i>	Mi,M				2005	5	Moderate
Collared Sparrowhawk	<i>Accipiter cirrhocephalus</i>	Mi				1988	1	Low
Wedge-tailed Eagle	<i>Aquila audax</i>	Mi				2006	15	High
Little Eagle	<i>Hieraaetus morphnoides</i>	Mi				2001	1	Moderate
Whistling Kite	<i>Haliastur sphenurus</i>	Mi,M				2001	10	Moderate
Black-shouldered Kite	<i>Elanus axillaris</i>	Mi				2003	19	High
Australian Hobby	<i>Falco longipennis</i>	Mi				1992	4	Moderate
Peregrine Falcon	<i>Falco peregrinus</i>	Mi				1999	5	Moderate
Brown Falcon	<i>Falco berigora</i>	Mi				2006	31	High
Nankeen Kestrel	<i>Falco cenchroides</i>	Mi,M				2006	21	High
Southern Boobook	<i>Ninox novaeseelandiae</i>	M				2001	23	Low-moderate
Red-tailed Black-Cockatoo	<i>Calyptorhynchus banksii graptogyne</i>	EN,M i	EN	L	EN	1993	2	Low

Blue-winged Parrot	<i>Neophema chrysostoma</i>	M				2006	9	Moderate
Elegant Parrot	<i>Neophema elegans</i>				VU	1990	1	Low
Sacred Kingfisher	<i>Todiramphus sanctus</i>	M				2001	5	Low
Rainbow Bee-eater	<i>Merops ornatus</i>	Mi,M				1986	1	Low
White-throated Needle-tail	<i>Hirundapus caudacutus</i>	Mi,M				1986	2	Low
Fork-tailed Swift	<i>Apus pacificus</i>	Mi,M				1986	1	Low
Pallid Cuckoo	<i>Cuculus pallidus</i>	M				1985	1	Low
Fan-tailed Cuckoo	<i>Cacomantis flabelliformis</i>	M				2001	8	Low
Horsfield's Bronze-Cuckoo	<i>Chrysococcyx basalis</i>	M				2001	7	Low
Shining Bronze-Cuckoo	<i>Chrysococcyx lucidus</i>	M				2001	7	Low
Welcome Swallow	<i>Hirundo neoxena</i>	M				2005	61	High
Tree Martin	<i>Hirundo nigricans</i>	M				2001	6	Moderate
Rufous Fantail	<i>Rhipidura rufifrons</i>	M				1999	2	Low
Flame Robin	<i>Petroica phoenicea</i>	M				1999	3	Low
Pink Robin	<i>Petroica rodinogaster</i>	M				2001	3	Low
Hooded Robin	<i>Melanodryas cucullata</i>		NT	L	NT	1984	1	Low
Magpie-lark	<i>Grallina cyanoleuca</i>	M				2005	69	High
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	M				2005	16	Moderate
Brown Songlark	<i>Cincloramphus cruralis</i>	Mi				2001	9	High
Little Grassbird	<i>Megalurus gramineus</i>	Mi				2005	5	Moderate
Australian Reed-Warbler	<i>Acrocephalus stentoreus</i>	Mi				1999	1	Moderate
Brown Treecreeper	<i>Climacteris picumnus victoriae</i>		NT		NT	1984	1	Low
Silvereye	<i>Zosterops lateralis</i>	M				2001	22	Low
Regent Honeyeater	<i>Xanthomyza phrygia</i>	EN, Mi	EN	L	CE	1961	1	Low
Australian Pipit	<i>Anthus novaeseelandiae</i>	M				2006	27	High
Bassian Thrush	<i>Zoothera lunulata</i>	Mi				1995	1	Low
Forest Raven	<i>Corvus tasmanicus</i>	M				2001	5	Low
Little Raven	<i>Corvus mellori</i>	M				2006	53	High
Cattle Egret	<i>Ardea ibis</i>	Mi,M				2001	3	High
Swift Parrot ♦	<i>Lathamus discolor</i>	EN, Mi, M				♦		Low
Australian Painted Snipe ♦	<i>Rostratula australis</i>	VU, Mi, M				♦		Low-moderate
White-bellied Sea-Eagle ♦	<i>Haliaeetus leucogaster</i>	Mi, M				♦		Low - moderate
Satin Flycatcher ♦	<i>Myiagra cyanoleuca</i>	Mi, M				♦		Low
Mammals								
Fat-tailed Dunnart	<i>Sminthopsis crassicaudata</i>				NT	2005	9	High
Eastern Barred Bandicoot	<i>Perameles gunnii</i>	EN	CE	L	CE	1989	165	Negligible
Yellow-bellied Glider	<i>Petaurus australis</i>		NT			1999	3	Negligible

Koala	<i>Phascolarctos cinereus</i>		NT			2004	58	Low
Spot-tailed Quoll (southeastern mainland population) ♦	<i>Dasyurus maculatus maculatus (SE mainland population)</i>	EN		L		♦		Low
Southern Bent-wing Bat ♦	<i>Miniopterus schreibersii bassanii</i>	CE		L		♦		High
Long-nosed Potoroo (SE mainland) ♦	<i>Potorous tridactylus tridactylus</i>	VU		L	EN	♦		Low
Smoky Mouse ♦	<i>Pseudomys fumeus</i>	EN		L	CE	♦		Negligible
Heath Rat ♦	<i>Pseudomys shortridgei</i>	VU		L	NT	♦		Negligible
Grey-headed Flying-fox ♦	<i>Pteropus poliocephalus</i>	VU		L	VU	♦		Low
Reptiles								
Striated Worm-lizard	<i>Aprasia striolata</i>			L	NT	1974	1	Low
Striped Legless Lizard	<i>Delma impar</i>	VU	VU	L	EN	2006	26	Moderate
Swampland Cool-skink	<i>Pseudemoia rawlinsoni</i>		RIK		NT	2003	2	Moderate
Frogs								
Brown Toadlet	<i>Pseudophryne bibronii</i>		IK		EN	1976	3	Low-moderate
Growling Grass Frog	<i>Litoria raniformis</i>	VU	VU	L	EN	2000	1	Moderate-high
Fish								
Mountain Galaxias (Glenelg River)	<i>Galaxias olidus Lower Glenelg</i>				DD	1996	6	Moderate
Mountain Galaxias (NE Victoria)	<i>Galaxias olidus NE Victoria</i>				DD	1996	6	Moderate
Yarra Pygmy Perch	<i>Nannoperca obscura</i>	VU	VU	L	NT	1996	5	Moderate
Dwarf Galaxias ♦	<i>Galaxiella pusilla</i>	VU		L	VU	♦		Moderate
Australian Grayling ♦	<i>Prototroctes maraena</i>	VU		L	VU	♦		Low - Moderate
Insects								
Golden Sun Moth ♦	<i>Synemon plana</i>	CE		L		♦		Moderate