ecology & heritage partners

Final Report

Biodiversity Assessment, Maroona Wind Farm, Maroona, Victoria

Prepared for

Future Energy Pty Ltd

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GLOSSARY

Acronym	Description
AVW	Atlas of Victorian Wildlife
CaLP Act	*Catchment and Land Protection Act 1994*
CBD	Central Business District
CEMP	Construction Environmental Management Plan
CMA	Catchment Management Authority
DBH	Diameter at Breast Height
DELWP	Victorian Department of Environment, Land, Water and Planning
DoE	Federal Department of the Environment
DTPLI	Victorian Department of Transport, Planning and Local Infrastructure
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EVC	Ecological Vegetation Class
FFG Act	*Flora and Fauna Guarantee Act 1988*
FIS	Flora Information System
Habitat Hectare	A unit of measurement which combines the condition and extent of native vegetation
LOT	Large Old Tree
MOT	Medium Old Tree
NES	National Environmental Significance
NVIM Tool	Native Vegetation Information Management Tool (DELWP)
PMST	Protected Matters Search Tool (DoE)
ST	Small Tree
TRZ	Tree Retention Zone
VBA	Victorian Biodiversity Atlas (managed by DELWP)
VLOT	Very Large Old Tree

SUMMARY

Introduction

Ecology and Heritage Partners Pty Ltd was commissioned by Future Energy Pty Ltd to conduct a Biodiversity Assessment at Maroona Wind Farm, Maroona, Victoria. This assessment was undertaken to identify and characterise the vegetation on-site, determine the presence (or likelihood thereof) of any significant flora and fauna species and/or ecological communities and address any implications under Commonwealth and State environmental legislation.

Methods

A field assessment was undertaken on 2 July 2015 to obtain information on terrestrial flora and fauna values within the study area. A habitat hectare assessment was undertaken in conjunction with the flora survey. Vegetation within the study area was assessed according to the habitat hectare methodology, which is described in the Vegetation Quality Assessment Manual.

Results

Flora

Thirty five flora species (14 indigenous and 21 non-indigenous) were recorded within the study area during the field assessment. Based on habitat present within the study area, landscape context and the proximity of previous records, significant flora species are considered unlikely to occur within the study area.

Fauna

Twenty-nine fauna species were recorded within the study area during the field assessment, including: one native mammal, 27 birds (26 native, one introduced) and one native reptile. Brown Treecreeper (State significant fauna species) was recorded outside the study area to the east during the site assessment. There is suitable habitat within the study area for fauna species of national (Striped Legless Lizard), State (Tussock Skink) and regional (Fat-tailed Dunnart) conservation significance.

A level one assessment of impacts to Brolga was undertaken, which concluded that the proposed wind farm presents a low risk to the local Brolga population.

Communities

No significant ecological communities occur within the study area.

Permitted Clearing Assessment (the Guidelines)

The entire study area is modelled as Location Risk A. The proposed development plan for the Maroona Wind Farm will not impact any native vegetation within the study area and will, therefore, not require biodiversity offsets to be secured.

Legislative and Policy Implications

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act - Federal)

There is suitable habitat within the study area for one fauna species (Striped Legless Lizard) listed under the EPBC Act in Grassy Woodland in the north of the study area (Figure 2). Impacts to Striped Legless Lizard

habitat have been actively avoided during the planning process and will not occur. No significant impacts to other matters of national environmental significance are likely. Therefore, there is no requirement to submit a referral to DoE.

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

There is suitable habitat within the study area for several species listed or protected under the FFG Act. However, the study area is privately owned and as such, a permit under the FFG Act is not required. No impacts to native vegetation on roadsides along Andrews Lane are likely under the revised development plan (received 27 July 2015) and, therefore, a permit under the FFG Act will not be required.

Planning and Environment Act 1987

No native vegetation is proposed to be removed under the revised development plan (received 27 July 2015) and therefore there is no requirement to seek a Planning Permit under clause 52.17 of the Ararat Rural City Planning Scheme.

Other Legislation and Policy

Implications relating to other local and State policy (*Wildlife Act 1975*, *Catchment and Land Protection Act 1994*, local government authorities) as well as additional studies or reporting that may be required (targeted surveys, Conservation Management Plan, Weed Management Plan, Construction Environment Managements Plan) are provided in Section 6.

CONTENTS

1 INTRODUCTION

1.1 Background

Ecology and Heritage Partners Pty Ltd was commissioned by Future Energy Pty Ltd to conduct a Biodiversity Assessment at Maroona Wind Farm, Maroona, Victoria. This assessment was undertaken to determine ecological implications associated with the proposed action.

The purpose of the assessment was to identify the extent and type of remnant native vegetation present within the study area and to determine the presence of significant flora and fauna species and/or ecological communities. This report presents the results of the assessment and discusses the potential ecological and legislative implications associated with the proposed action. The report also provides recommendations to address or reduce impacts and, where necessary, highlights components that require further investigation, such as targeted surveys.

1.2 Objectives

The objectives of the biodiversity assessment were to:

- Review the relevant flora and fauna databases and available literature;
- Conduct a site assessment to identify flora and fauna values within the study area;
- Provide maps showing any areas of remnant native vegetation and locations of any significant flora and fauna species, and/or fauna habitat (if present);
- Classify any flora and fauna species and vegetation communities identified or considered likely to occur within the study area in accordance with Commonwealth and State legislation;
- Document relevant environmental legislation and policy;
- Document any opportunities and constraints associated with the proposed development; and,
- Advise whether any additional flora and/or fauna surveys are required prior to works commencing (e.g. targeted surveys for significant flora and fauna species).

Where areas of remnant vegetation were present, the following tasks were completed to address requirements under the '*Permitted Clearing of Native Vegetation - Biodiversity Assessment Guidelines*' (the Guidelines) (DEPI 2013a):

- A habitat hectare assessment of any areas of remnant native vegetation within the study area; and,
- Recommendations to address requirements under the Guidelines to avoid and/or minimise impacts to remnant vegetation.

1.3 Study Area

The study area is located at Maroona Wind Farm, Maroona, Victoria, approximately 200 kilometres west of Melbourne (Figure 1). The proposed location of access roads and wind turbines were assessed with a buffer

of approximately 20 metres for access roads and 50 metres for turbine locations. Turbines are proposed to be located on top of a ridge, with the proposed access road following the ridge line to Andrews Lane (Figure 1). The study area is bound by Andrews Lane to the north and farmland to the south, east and west.

According to the DELWP Biodiversity Interactive Map (DELWP 2015a), the study area occurs within the Central Victorian Uplands and Victorian Volcanic Plain bioregions. It is located within the jurisdiction of the Glenelg Hopkins Catchment Management Authority (CMA) and the Ararat Rural City Council municipality. Section 6.3.1 discusses zoning and overlays relevant to the study area.

2 METHODS

2.1 Nomenclature

Common and scientific names of vascular plants follow the Victorian Biodiversity Atlas (VBA) (DEPI 2014) and the Census of Vascular Plants of Victoria (Walsh and Stajsic 2007). Vegetation community names follow DELWP's Ecological Vegetation Classes (EVC) benchmarks (DELWP 2015b). The names of aquatic and terrestrial vertebrate and invertebrate fauna follow the VBA (DELWP 2015d).

2.2 Desktop Assessment

Relevant literature, online-resources and numerous databases were reviewed to provide an assessment of flora and fauna values associated with the study area. The following information sources were reviewed:

- The DELWP Biodiversity Interactive Map (DELWP 2015a) for:
    - modelled data for location risk, remnant vegetation patches, scattered trees and habitat for rare or threatened species;
    - the extent of historic and current EVCs; and,
    - the location of sites of biological significance (BioSites) within the region.
- The VBA (DELWP 2015d), Flora Information System (FIS) (Viridans 2013a) and Atlas of Victorian Wildlife (AVW) (Viridans 2013b) for previously documented flora and fauna records within the project locality;
- The Federal Department of Environment (DoE) Protected Matters Search Tool (PMST) for matters of National Environmental Significance (NES) protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (DoE 2015);
- South West Brolga Flocking Database (Sheldon 2004);
- The Victorian Department of Transport, Planning and Linear Infrastructure Planning Maps Online to ascertain current zoning and environmental overlays (DTPLI 2015);
- Aerial photography of the study area;
- AusWEA (2005) Wind Farms and Birds: Interim Standards For Risk Assessment;
- Auswind (2006) Best Practice Guidelines for Implementation of Wind Energy projects in Australia;
- Interim Guidelines for the Assessment of Potential Windfarm Impacts on the Brolga (DSE 2012); and,
- Relevant environmental legislation and policies.

2.3 Flora Assessment

A flora assessment was undertaken on 2 July 2015 to obtain information on flora values within the study area. The study area was walked, with all observed flora species recorded, any significant records mapped and the overall condition of vegetation noted. Remnant vegetation in the local area was also investigated to

assist in determining the pre-European vegetation within the study area. EVCs were determined with reference to DELWP pre-1750 and extant EVC mapping and their published descriptions (DELWP 2015b). The significance assessment criteria of taxa and vegetation communities are presented in Appendix 1.

2.4 Fauna Assessment

A fauna assessment was undertaken on 2 July 2015 to obtain information on terrestrial fauna values within the study area. The study area was visually assessed and active searching under and around ground debris for reptiles, frogs and small mammals was undertaken. Binoculars were also used to scan the area for birds, and observers listened for calls and searched for other signs of fauna such as nests, remains of dead animals, droppings and footprints. Potential habitat for fauna was assessed, with a particular emphasis on habitats that may provide shelter, food or other resources for significant species.

2.4.1 Operational Impacts to Birds and Bats

The Australian Wind Energy Association (Auswind) has developed *Best Practice Guidelines for Implementation of Wind Energy Projects in Australia* (Auswind 2006). The guidelines suggest a hierarchical approach to assessing impacts on birds (Chart 1). The same approach is suggested for bats. This approach was followed for the assessment.

2.4.2 Brolga Assessment

Due to the perceived risk posed to Brolga *Grus rubicunda* by wind farms in Victoria, DELWP developed the Interim Guidelines for the Assessment, Avoidance, Mitigation and Offsetting of Potential Wind Farm Impacts on the Victorian Brolga Population (DSE 2012). These guidelines outline a conservative approach to assessing and managing the effects of both individual wind farms and the cumulative impacts of the wind industry on the Victoria Brolga population. The objective of the guidelines is to ensure that there is no 'net effect' of wind farms on the Brolga, with the goal of achieving a positive effect for the population as a whole. The guidelines identify key habitat features for Brolga which require consideration and protection – these being breeding sites and flocking sites (DSE 2012). An assessment of the potential impacts of the Maroona Wind Farm on the Brolga was undertaken in accordance with the guidelines.

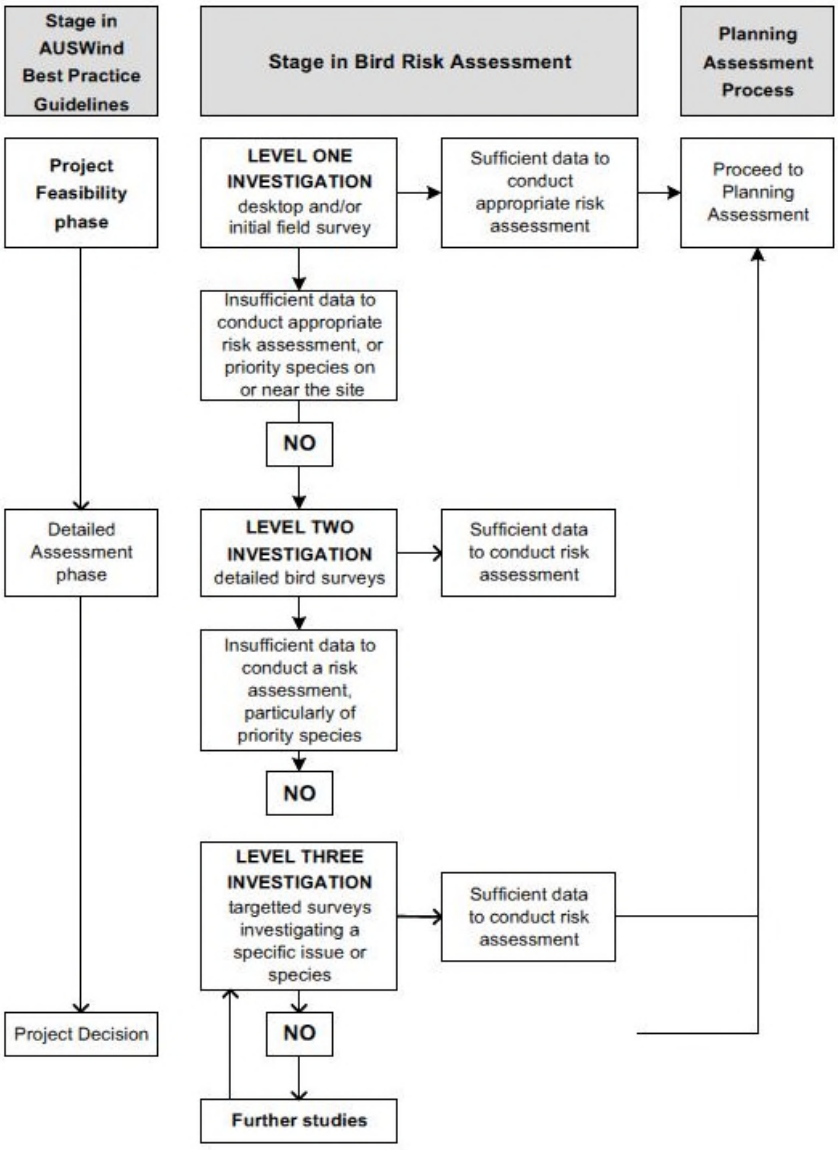

Chart 1. Assessing and documenting bird impact risk (Auswind 2006)

2.5 Permitted Clearing Assessment (the Guidelines)

The following describes the assessment process for the clearing of vegetation in accordance with the Guidelines (DEPI 2013a).

2.5.1 Risk-based Pathway

The Guidelines manage the impacts on biodiversity from native vegetation removal using a risk-based approach. Two factors – extent risk and location risk – are used to determine the risk associated with an application for a permit to remove native vegetation. The location risk (A, B or C) has been determined for all areas in Victoria and is available on DELWP's Native Vegetation Information Management (NVIM) Tool (DELWP 2015c). Determination of risk-based pathway is summarised in Table 1.

Table 1. Risk-based pathways for applications to remove native vegetation (DEPI 2013a)

Extent		Location		
		A	B	C
Native Vegetation	< 0.5 hectares	Low	Low	High
	≥ 0.5 hectares and < 1 hectare	Low	Moderate	High
	≥ 1 hectare	Moderate	High	High
Scattered Trees	< 15 scattered trees	Low	Moderate	High
	≥ 15 scattered trees	Moderate	High	High

Notes: For the purpose of determining the risk-based pathway of an application to remove native vegetation the extent includes any other native vegetation that was permitted to be removed on the same contiguous parcel of land with the same ownership as the native vegetation to be removed, where the removal occurred in the five year period before an application to remove native vegetation is lodged.

2.5.2 Vegetation Assessment

Native vegetation (as defined in Table 2) is assessed using two key parameters: extent (in hectares) and condition. Extent is determined through a site assessment. The condition score for Moderate and High Risk-based pathways must be assessed through a habitat hectare[1] assessment conducted by a qualified ecologist. The condition score for Low Risk-based pathways may be based on either modelled data available on the NVIM Tool (DELWP 2015c), or through a habitat hectare assessment (in this case a habitat hectare assessments of remnant native vegetation within the study area was undertaken).

The methodology for undertaking a habitat hectare assessment is described in the Vegetation Quality Assessment Manual (DSE 2004).

Table 2. Assessment of remnant native vegetation (DEPI 2013a)

Category	Definition	Extent	Condition
Remnant patch of native vegetation	An area of native vegetation where at least 25 per cent of the total perennial understorey plant cover is native plants. OR An area with three or more native canopy trees where the canopy foliage cover is at least 20 per cent of the area.	Measured in hectares. Based on hectare area of the remnant patch.	Vegetation Quality Assessment Manual (DSE 2004).
Scattered tree	A native canopy tree that does not form part of a patch.	Measured in hectares. Each scattered tree is assigned an extent of 0.071 hectares (30m diameter).	Scattered trees are assigned a default condition score of 0.2.

Notes: Native vegetation is defined in the Victoria Planning Provisions as 'plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses'.

[1] A 'habitat hectare' is a unit of measurement which combines the condition and extent of native vegetation.

2.5.3 Avoid and Minimise

Avoid and minimise requirements are summarised in Table 3. The impact avoidance and minimisation measures are discussed in Section 7.

Table 3. Avoid, minimise and offset requirements

Risk-based Pathway	Avoid	Minimise	Offset
Low	X	X	✓
Moderate	X	✓	✓
High	✓*	✓	✓

Notes: *Where native vegetation makes a significant contribution to Victoria's biodiversity

2.5.4 Offset

Offsets are divided into two categories: General and Specific. Specific offsets are required when the removal of native vegetation has a significant impact on habitat for a rare or threatened species[2]. Otherwise, a General offset is required. Offset obligations and offset site criteria are determined in accordance with the Guidelines (DEPI 2013a) and summarised in Appendix 1.5.1 and Appendix 1.5.2.

2.5.5 Biodiversity Impact and Offset Requirements (BIOR) Report

The offset requirements for native vegetation removal are calculated by DELWP, based on the vegetation condition scores determined during the biodiversity assessment. The resulting Biodiversity Impact and Offset Requirements report (BIOR) produced by DELWP is presented in Appendix 4.

2.6 Assessment Qualifications and Limitations

Data and information held within the ecological databases and mapping programs reviewed in the desktop assessment (e.g. VBA, PMST, Biodiversity Interactive Maps etc.) are unlikely to represent all flora and fauna observations within, and surrounding, the study area. It is therefore important to acknowledge that a lack of documented records does not necessarily indicate that a species or community is absent, but instead may reflect a lack of survey effort.

The 'snap shot' nature of a standard flora and fauna assessment reduces the likelihood of mobile, migratory, seasonal, cryptic, nocturnal or uncommon species being detected. Generally, targeted or repeated surveys, at specific times of the year, are required to detect such species.

Notwithstanding the above, terrestrial flora and fauna data collected during the field assessment, and information obtained from relevant sources (e.g. biological databases and relevant literature) are considered adequate to provide an accurate assessment of the ecological values within the study area.

[2] Only species listed as 'critically endangered', 'endangered', 'vulnerable' or 'rare' on DEPI's advisory lists (DSE 2005; DSE 2013) for flora and fauna are considered a rare or threatened species.

3 RESULTS

3.1 Flora and Fauna

Thirty five flora species (14 indigenous and 21 non-indigenous) were recorded within the study area during the field assessment. A consolidated list of flora species recorded is provided in Appendix 2.1.

Twenty-nine fauna species were recorded within the study area during the field assessment, including: one native mammal, 27 birds (26 native, one introduced) and one native reptile. A consolidated list of fauna species recorded is provided in Appendix 3.1.

3.2 Existing Conditions

The study area supports four broad vegetation and habitat types: Grassy Woodland (EVC 175_62), scattered trees, planted trees (including windbreaks) and exotic grassland. These are discussed in further detail below.

3.2.1 Grassy Woodland (EVC 175_62)

3.2.1.1 Vegetation Condition

Grassy Woodland (EVC 175_62) is present along the easement of the current driveway into 790 Andrews Lane, in the north of the study area (Figure 2). This is within the Central Victorian Uplands bioregion. The classification of this vegetation as Grassy Woodland differs to extant DELWP mapping (DELWP 2015a), which maps the vegetation in the vicinity of the study area as Grassy Dry Forest (EVC 22). However, the floristic composition of these patches combined with the presence of Manna Gum *Eucalyptus viminalis* subsp. *viminalis* scattered trees nearby indicates that Grassy Woodland is the more appropriate EVC for this vegetation.

Grassy Woodland within the Central Victorian Uplands is a variable eucalypt woodland over a medium shrub layer and diverse ground-layer of herbs and grasses. It occurs on sites with moderate fertility on plains and low hills (DELWP 2015b). Within the study area, Grassy Woodland occurs as a treeless patch containing understorey species only (ground and shrub layers). The ground layer is dominated by grasses, including Kangaroo Grass *Themeda triandra* and Kneed Spear-grass *Austrostipa bigeniculata*, while shrubs such as Golden Wattle *Acacia pycnantha* and Drooping Sheoak *Allocasuarina verticillata* are common. Several plantings of both indigenous and non-indigenous trees and shrubs are present within patches of Grassy Woodland.

Plate 1. Grassy Woodland within the study area

Plate 2. Grassy Woodland within the study area

3.2.1.2 Fauna Habitat

Grassy Woodland within the study area provides moderate to high quality habitat to native fauna. The grassy ground layer provides suitable habitat for reptiles and small-mammals including species of national (Striped Legless Lizard *Delma impar*), state (Tussock Skink *Pseudemoia pagenstecheri*), and regional significance (Fat-tailed Dunnart *Sminthopsis crassicaudata*).

Shrubs and small trees within the Grassy Woodland provide habitat for a variety of bird species such as Singing Honeyeater *Lichenostomus virescens*, Yellow Thornbill *Acanthiza nana* and Grey Shrike-Thrush *Colluricincla harmonica*, all recorded in this habitat type during the site assessment.

The lack of mature trees reduces the quality and suitability of this habitat for arboreal mammals and birds dependent on hollow-bearing trees as part of their lifecycle.

3.2.2 Scattered Trees

3.2.2.1 Vegetation Condition

A total of eight scattered trees are present within the study area (Plate 3; Figure 2; Appendix 2.4). Scattered trees in the study area would once have been canopy trees in Grassy Woodland. Grassy Woodland EVC has a large tree benchmark size of 70 centimetres.

3.2.2.2 Fauna Habitat

Scattered trees in the study area provide moderate quality habitat for native fauna. Many of the scattered trees are large, dead stags. These trees contain numerous hollows suitable as nesting habitat for arboreal mammals, hollow-dependent birds and microbats and live trees would also provide foraging resources during flowering periods. Species recorded utilising scattered trees during the site assessment include Musk Lorikeet *Glossopsitta concinna*, Little Corella *Cacatua sanguinea*, Little Raven *Corvus mellori* and Red Wattlebird.

Plate 3. Scattered tree (stag) within the study area.

3.2.3 Planted Vegetation

3.2.3.1 Vegetation Condition

Several areas of windbreaks and planted shelterbelts occur within the study area. These contain a range of native indigenous and non-indigenous trees and shrubs (e.g. Drooping Sheoak, Golden Wattle, Yellow Gum *Eucalyptus leucoxylon*, River Red-gum, Yellow Box *Eucalyptus melliodora*) and are approximately five to 15 years of age (Plates 4 and 5). All planted vegetation has been planted without the support of external funding (*pers. comm.,* Jack Tucker, landowner, 8 July 2015). A small amount of planted vegetation in the vicinity of the location of the T3 turbine (the most westerly turbine) is proposed to be removed. A Planning Permit is not required under clause 52.17 to remove this vegetation as it is covered by the exemption for Planted Vegetation (Appendix 1.5; Table A1 5.3). This vegetation consists of small, planted indigenous and native, non-indigenous trees and shrubs that are approximately five years of age over an exotic understorey dominated by Capeweed *Arctotheca calendula*.

3.2.3.2 Fauna Habitat

Planted vegetation in the study area provides low to moderate quality habitat for native fauna. This habitat type lacks mature trees with hollows and therefore does not provide suitable nesting habitat for arboreal mammals, hollow-dependent birds or hollow-dependent microbats. Planted vegetation in the study area is used by some birds, such as Yellow-faced Honeyeater *Lichenostomus chrysops* and Grey Fantail *Rhipidura albiscapa*, for foraging and nesting; as well as travelling between other areas of suitable habitat as many of these patches are planted as long windrows. Some smaller species of locally common microbats may roost in decorticating bark present on some dead or larger planted trees. However, due to the low quality habitat and the small number of turbines (three) impacts on microbats and other locally common fauna using the planted vegetation is likely to be low.

The ground layer in these areas is dominated by exotic species and provides limited suitable habitat for native species.

Plate 4. Windbreak within the study area.

Plate 5. Planted vegetation within the study area.

3.2.4 Exotic Grassland

3.2.4.1 Vegetation Condition

The majority of the study area contained exotic pasture, dominated by Perennial Rye-grass *Lolium perenne*, Annual Meadow-grass *Poa annua* and Capeweed *Arctotheca calendula* (Plate 6 and 7).

3.2.4.2 Fauna Habitat

Exotic Grassland within the study area provides low quality habitat for native fauna. These areas are characterised by historic disturbance and suffer ongoing pressure from grazing. Embedded rock occurs in some areas, however no other significant habitat features such as tussock grasses or fallen timber are present to provide suitable habitat for significant species. Common, widespread farmland bird species such as Australian Magpie *Cracticus tibicen* and Australasian Pipit *Anthus novaeseelandiae* were recorded from this habitat type during the site assessment.

Plate 6. Exotic grassland within the study area

Plate 7. Exotic grassland within the study area.

3.3 National Significance Assessment

National significance for flora and fauna is defined in Appendix 1.2.

3.3.1 Flora

No nationally significant flora species were recorded within the study area during the field assessment. The VBA and FIS contain records of four nationally listed flora species previously recorded within 10 kilometres of the study area (DELWP 2015d; Viridans 2013a) (Appendix 2.2; Figure 3). The PMST nominated an additional 11 nationally significant species which have not been recorded in the locality but have the potential to occur (DoE 2015).

Based on habitat present within the study area, landscape context and the proximity of previous records, nationally significant flora species are considered unlikely to occur within the study area (Appendix 2.2) .

3.3.2 Fauna

No nationally significant fauna species were recorded within the study area during the field assessment. The VBA and AVW contain records of three nationally listed fauna species previously recorded within 10 kilometres of the study area (DELWP 2015d; Viridans 2013b) (Appendix 3.2; Figure 4). The PMST nominated an additional 12 nationally significant species which have not been recorded in the locality but have the potential to occur (DoE 2015).

Of these species, there is suitable habitat within the study area for Striped Legless Lizard. The Striped Legless Lizard inhabits lowland native grasslands, typically dominated by native tussock-forming grass species. In Victorian populations, the species frequents habitats with exposed basalt rocks in grassland and areas of cracking clay soils, where the species can seek refuge under rocks and in earth cracks (Dorrough 1995). Striped Legless Lizards are generally reported from areas of native grasslands, with a dense cover of perennial tussock grasses (Kukolic 1991; Kukolic and Osborne 1993), although they are also known to inhabit areas of non-native tussock grassland (Smith and Robertson 1999). This has been shown at several sites throughout the Basalt Plains in western Victoria, which are currently grazed at various stock densities (Rohr and Peterson 2003).

Within the study area, the Grassy Woodland alongside the driveway as part of the west access option contains suitable habitat for Striped Legless Lizard, with patches of the ground layer dominated by the tussock forming Kangaroo Grass (Figure 2). Areas of exotic grassland do not have the characteristic tussock grass habitat required by Striped Legless Lizard and have a history of disturbance and it is unlikely that they would occur outside of the Grassy Woodland patches.

Forty-seven previous records of Striped Legless Lizard occur within 10 kilometres of the study area with the closest record approximately two kilometres north west of the study area from 1990 and the most recent record from 2009 in the Rossbridge Wildlife Reserve approximately seven kilometres to the south east (DELWP 2015d).

A new access track is proposed to be constructed east of the existing driveway entrance off Andrews Lane, within the paddock that contains heavily grazed exotic grassland and no suitable habitat for the Striped Legless Lizard. In this case no Grassy Woodland habitat within the study area is proposed to be impacted and targeted surveys for Striped Legless Lizard are not considered necessary.

3.3.3 Communities

No nationally listed ecological communities were recorded in the study area.

Five nationally listed ecological communities (Grassy Eucalypt Woodland of the Victorian Volcanic Plain; Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands; Natural Temperate Grassland of the Victorian Volcanic Plain; Seasonal Herbaceous Wetlands of the Temperate Lowland Plains; and, White Box-Yellow Box-Blakely's Red-gum Grassy Woodland and Derived Native Grassland) are predicted to occur within 10 kilometres of the study area (DoE 2015). No vegetation in the study area met the type or condition thresholds to classify as any of the listed communities.

3.4 State Significance Assessment

State significance for flora and fauna is defined in Appendix 1.2.

3.4.1 Flora

No State-significant flora species were recorded within the study area during the field assessment. The VBA and FIS contain records of 10 State-significant flora species within 10 kilometres of the study area (DELWP 2015d; Viridans 2013a) (Appendix 2.2; Figure 3).

Based on habitat present within the study area, landscape context and the proximity of previous records, State-significant flora species are considered unlikely to occur within the study area (Appendix 2.2).

3.4.2 Fauna

One State-significant fauna species (Brown Treecreeper *Climacteris picumnus*) was recorded outside the study area approximately one kilometre to the east in River Red-gum *Eucalyptus camaldulensis* Plains Grassy Woodland, during the field assessment. This species had not previously been recorded within 10 kilometres of the study area. The VBA and AVW contain records of 21 State-significant fauna species within 10 kilometres of the study area (DEPI 2014; Viridans 2013b) (Appendix 3.2; Figure 4).

Of these species, there is suitable habitat within the study area for Tussock Skink *Pseudemoia pagenstecheri* within the Grassy Woodland area. There are 79 previous records of this species within 10 kilometres of the study area, with the nearest and most recent coming from the Rossbridge Wildlife Reserve in 2009. Diamond Firetail *Stagonopleura guttata* inhabits open woodlands, farmlands and grasslands with scattered trees and may visit the Grassy Woodland habitats in the study area occasionally. The nearest record of Diamond Firetail is five kilometres south of the study area in 1990, while more recent records exist around Moyston, 15 kilometres northwest of the study area, from 2008.

Significant woodland bird species such as the Brown Treecreeper and Diamond Firetail are low-flying species generally restricted to high quality native woodland areas and are unlikely to occur in cleared ridgeline habitats or be at risk of collisions with turbines.

More mobile species such as Black Falcon *Falco subniger*, Eastern Great Egret *Ardea modesta* and waterfowl may visit or pass through the study area occasionally and potential impacts to these species are addressed in Section 5.2. Brolga may also pass through the study area occasionally and an assessment of potential impacts to this species is included in Section 3.6.

3.4.3 Communities

Vegetation within the study area did not meet the condition thresholds that define any State-significant communities. Therefore no ecological communities listed under the FFG Act were recorded within the study area.

3.5 Regional Significance Assessment

Regional significance for fauna is defined in Appendix 1.2.

The VBA and AVW contain records of nine regionally significant fauna species within 10 kilometres of the study area (DEPI 2014; Viridans 2013b) (Appendix 2.2; Figure 4).

Of these species, there is suitable habitat within the study area for Fat-tailed Dunnart *Sminthopsis crassicaudata*. The Fat-tailed Dunnart is a small carnivorous marsupial-mammal that inhabits open habitats such as grassland, woodland and shrubland. There are 27 records of the species within 10 kilometres of the study area and the nearest was in 1960 approximately five kilometres south east and the most recent is from the Rossbridge Wildlife Reserve in 2009 (Figure 4). Suitable habitat for the species in the study area is considered to be in the Grassy Woodland area. If Grassy Woodland habitats are not impacted the proposed development is considered unlikely to impact the Fat-tailed Dunnart.

3.6 Brolga Assessment

3.6.1 Level One Assessment

A level one assessment in line with the Brolga guidelines (DSE 2012) was undertaken as the Maroona Wind Farm is located within the range of the Brolga in Victoria and there are previous records of the species within 10 kilometres of the study area.

A level one assessment involves three steps; desktop studies, field inspection and site use assessment. A level one assessment is used to inform the qualitative risk assessment (AusWEA 2005) and to determine whether further studies (i.e. level two and three assessments) are required.

3.6.2 Desktop Assessment

Desktop studies identified the majority of Brolga records in the locality existing to the south of the study area (Figure 5). One record (from 1978) is six kilometres west of the study area however the location accuracy of this record is to within 9 kilometres, and therefore may also occur to the south nearer to the other records. The distribution of records matches the availability of suitable wetland habitats as viewed on aerial imagery.

Breeding Sites

The desktop investigation revealed four breeding records all within 10 kilometres of the study area, all from the same breeding site. The breeding site is approximately nine kilometres south east of the study area and nearest proposed turbine as part of the Maroona Wind Farm. The guidelines recommend a 3.2 kilometre buffer for breeding sites and therefore all turbines within the proposed Maroona Wind Farm are outside of the buffer area for Brolga breeding sites.

Flocking Sites

Flocking sites are defined in the guidelines (DSE 2012) as sites with having records of Brolga with:

- More than one year of recording;
- One or more records having a count greater than 10 birds; and,
- Records in more than one month.

Sheldon (2004) mapped flocking sites across south western Victoria. Figure 5 shows Brolga records from the VBA and flocking sites identified in Sheldon (2004) within 20 kilometres of the study area. Sheldon identified two flocking sites within five kilometres of the nearest proposed turbine (approximately 4.5 kilometres), which are both associated with Lake Buninjon.

The VBA contains five records of Brolga from Lake Buninjon, occurring between 1996 and 2005. One record of more than 10 birds occurred in 2001 when 18 birds were recorded. Based on the presence of only one record of more than 10 birds, Lake Buninjon does not appear to be a regularly used flocking site.

The guidelines (DSE 2012) recommend a five kilometre buffer between turbines and flocking sites, although a reduced buffer area may be acceptable. The flocking sites are considered to be between four and five kilometres from the nearest proposed turbine. The flocking site buffer is based on an estimated non-breeding season home range of five kilometres from the flocking site. The study area is on the limit of this range and as there is no suitable habitat for the Brolga in the study area or immediate surrounds. The distribution of Brolga records and flocking sites in the broader region (Figure 5) indicates the population is generally restricted to sites south of the study area. Therefore it is considered unlikely that the study area would be within the usual home range of Brolga from the flocking sites at Lake Buninjon.

3.6.3 Field Inspection

Field inspection confirmed that no suitable breeding habitat for Brolga is present in the study area. Records in the locality correspond to wetlands that are to the south of the study area.

3.6.4 Site Use and Risk Assessment

Based on the results of the desktop and site assessments, the study area is within the current distribution of the Brolga population; however suitable habitat and records within the locality suggest the usual area of occupancy for the species in the locality is limited to sites south of the study area (Figure 5). The distribution of records in the locality suggests that it is unlikely that Brolga would regularly fly over the study area, particularly as the study area is not located directly between wetlands containing previous Brolga records.

Three turbines and no new transmission lines are proposed, and therefore the proposed wind farm is unlikely to result in any barrier effects to avifauna, including Brolga. Transmission wiring is proposed to be located under-ground, which will reduce the likelihood of impacts on Brolga.

Risk assessment to determine the risk to Brolga associated with the development of the Maroona Wind Farm has been undertaken in line with AusWEA Standards (2005), where level of consequence means mortality or disturbance to Brolga. The risk assessment indicates a low risk to Brolga, with likelihood of incidents being considered very rare or rare, and consequence minor (limited to very low numbers).

The level one assessment indicates that development of the Maroona Wind Farm is likely to present a low risk to Brolga and level two and three assessments are not considered necessary for this project.

4 PERMITTED CLEARING ASSESSMENT

4.1 Risk-based Pathway

The entire study area is modelled as Location Risk A.

4.2 Offset Targets

The proposed development plan for the Maroona Wind Farm will not impact any native vegetation within the study area and will, therefore, not require biodiversity offsets to be secured.

5 POTENTIAL IMPACTS

5.1 Avoidance and Minimisation of Construction Related Impacts

Future Energy Pty Ltd refined their construction footprint after the draft report of this Biodiversity Assessment was supplied. The resulting construction footprint has avoided all native vegetation mapped in this report by redesigning the layout of the access road.

5.2 Construction Related Impacts

After finalisation of the construction footprint, the possible construction-related impacts include:

- Potential for bird and bat mortality as a result of turbine strike during operation of the wind farm;
- Potential for the spread of weeds and soil pathogens due to on-site activities;
- Disturbance to wildlife from increased human activity and noise during construction; and,
- Indirect impacts on adjacent areas if construction activities, erosion and drainage are not appropriately managed.

5.3 Operational Impacts

5.3.1 Birds

The impact of increased bird mortality as a result of collisions with wind turbines will affect different species in different ways. Species that are short-lived, with high annual reproduction rates, are likely to be able to absorb this additional mortality with little impact to their overall population size at a regional or national level (Chamberlain *et al*. 2006). By contrast, long-lived, slowly reproducing species are more vulnerable to this type of additive mortality and may be less able to maintain its population size when faced by such stresses (Sæther and Bakke 2000). Bird species recorded during the field assessment that fall into this latter category are raptors and corellas.

As raptors are long-lived, slowly reproducing species they are distributed in low densities compared to other birds, and are therefore exposed to increased risk of local population declines resulting from turbine collision. The loss of a single breeding individual of any of the raptor species could potentially adversely impact the local population.

However, it cannot be assumed that all the birds observed within the study area will collide with the wind turbines as birds are known to adapt their behaviour in the presence of wind turbines (Farfán *et al.* 2009), although detailed avoidance rates for most species worldwide is not known (Chamberlain *et al.* 2006). Brett Lane and Associates Pty Ltd (2006) identified particular raptor species being 'of concern' due to their proneness to collision with operational wind turbines, although also stated that these species appear to become conditioned to the presence of wind turbines after an extended period of time, and adjust their foraging behaviour to avoid wind turbines (i.e. up to 99% avoidance rates for most species).

Overall, the quality of habitat in the area, location of turbines (high on ridges away from most habitat), small size of the wind farm, and low proportion of birds recorded within rotor swept area (RSA) height during the field assessment (one Wedge-tailed Eagle *Aquila audax*, Appendix 3.1) suggest that the Maroona Wind Farm will have a low impact on local avifauna, although the impact may be slightly higher (low to moderate) for locally common raptor species such as the Wedge-tailed Eagle.

Significant Bird Species

Seventeen records of Brolga exist within 10 kilometres of the study area with the majority of these records occurring to the south. Records in the broader region reflect a distribution that is focused to the south of the study area. The distribution of records and lack of suitable habitat in the vicinity of the study area and to the north suggest fly over of the study area by Brolga is unlikely to occur on a regular basis. A level one Brolga assessment in accordance with the Brolga guidelines (DSE 2012) was completed (Section 3.6).

Other significant bird species that have been recorded in the locality and may fly over the study area at RSA height while moving among areas of more suitable habitat include Eastern Great Egret *Ardea modesta,* Musk Duck *Biziura lobata*, Australasian Shoveler *Anas rhynchotis*, Hardhead *Aythya australis*, Freckled Duck *Stictonetta naevosa* and Blue-billed Duck *Oxyura australis*. While suitable habitat for these species does not occur within the study area there is potential for mortality associated with turbine collisions during operation of the wind farm. It is unlikely that large numbers of these species would regularly fly over the study area, particularly as the study area is not located directly between wetlands containing suitable habitat for these species. In addition, due to the small number of turbines and position in the landscape away from suitable habitat for these species the potential impact to these species is low.

Black Falcon has two records within the locality and is likely to fly at RSA height if present in the study area. The species is unlikely to regularly use the study area but may occur occasionally. Due to low level of use of the study area by this species and the small number of turbines the potential impacts are expected to be low.

5.3.2 Bats

Bats are susceptible to collision with wind turbines (Arnett 2005; Kunz *et al.* 2007). In some habitats both a high number of individuals and species are struck by wind turbines, especially those bat species that undertake large scale annual migrations (Kunz *et al.* 2007; Kuvlesky *et al*. 2007; Cryan and Barclay 2009). Furthermore, bats may be attracted to wind turbines following vortices created by the blade tips and have been observed investigating all parts of the turbine (Horn *et al.* 2008; Cryan and Barclay 2009). There is also potential for bats to die as a result of barotrauma caused by changes in pressure produced by the rotating turbines (Cryan and Barclay 2009).

To date little scientific data has been published regarding the impact of existing wind farms on Australian bat species. Hull and Cawthen (2012) assessed the carcasses of microbats found within the Studland Bay and Bluff Point Wind Farms in Tasmania. The majority of the carcasses were Gould's Wattled Bats with the remaining being *Vespadelus* spp. (Hull and Cawthen 2012). Gould's Wattled Bat is a high-flying, open-air foraging species. A carcass survey within the small scale (2 turbines) Hepburn Wind Farm detected a White-Striped Freetail Bat mortality (Bennett, 2012). Both Gould's Wattled Bat and White-Striped Freetail Bat are high-flying, open-air foraging species.

Collisions with turbine blades are understood to be the most frequent interaction causing mortality or injury, but the cause(s) of these collisions are generally poorly known. General observations to date indicate that bats do not typically collide with turbine towers, transmission structures, guy wires, or meteorological towers (i.e. stationary structures), but current understanding of how and why bats come into contact with turbines is lacking. This is due to the limited ability to observe how bats behave at night around these structures as they pass through on migratory flights or forage for insects (MNR 2007, Horn *et al.* 2008).

There are four main factors that contribute to bat mortality at wind farm sites:

1. Bat species and abundance in the area;
2. Season (i.e. time of year) and weather conditions (e.g. clear, warm nights with low wind). Such factors are likely to influence the level of bat activity and thus mortality at wind power sites (MNR 2007);
3. Habitat/landscape features in the area (e.g., migration routes, forested ridges, and hibernacula/swarming sites may be important features). High levels of bat activity have been documented in forested ridge habitats, and areas where the woodland patches have been cleared for wind turbine placement also offer attractive foraging habitat for some species of bats. Edges of remnant woodlands and scattered remnant trees in paddocks provide favourable foraging areas where bats can easily capture airborne insect prey, creating areas of concentrated bat activity (Barclay 1985; Lumsden and Bennett 2000, 2005; Kunz *et al.* 2007, Horn *et al.* 2008a); and,
4. The number of turbines contained within the wind farm.

Bat Species in the Study Area

The single record in the VBA of a bats species within 10 kilometres of the study area is a Broad-nosed bat *Scotorepens* sp. from 1990. The lack of records is considered to reflect low survey effort in the area rather than low diversity or abundance of bats.

A BioBlitz intensive flora and fauna survey report (DELWP 2015e) includes details of Anabat surveys undertaken in the same property as the study area in November 2014. The survey used two Anabat recorders over 12 nights and the units were set up in Plains Grassy Woodland east of the study area. The survey recorded eight species of bat across the two sites, with up to four more species potentially recorded but unable to be positively identified. No significant species were recorded.

The majority of species recorded are likely to occur in the lowland woodland habitats surrounding the study area and most species are unlikely to regularly use the high ridgeline areas where turbines are proposed due to the lack of woodland areas for foraging and hollow-bearing trees for roosting habitat, although some low-flying smaller species may roost in decorticating bark in the planted vegetation. Bat species that typically fly high are at the highest risk of flying within the RSA and suffering mortality from barotrauma or collision. Of the species recorded, the Gould's Wattled Bat and White-striped Freetail Bat *Tadarida australis* are most likely to fly at height and be at risk of blade collisions and barotrauma. The potential impacts to bats during operation of the Maroona Wind Farm are expected to be low due to the small number of turbines (three) and location in highly cleared landscape high on ridges away from low lying higher quality woodland habitats.

Significant Bat Species

No records of significant Bat species exist within 10 kilometres of the study area, although the paucity of bat records in the VBA suggests there have been limited surveys undertaken.

Significant bat species with distributions that include the study area are the nationally significant Southern Bent-wing Bat *Miniopterus schreibersii bassanii* and the state significant Yellow-bellied Sheathtail Bat *Saccolaimus flaviventris*. The Southern Bent-wing Bat is a cave roosting species with fast direct flight that forages in open spaces (Dwyer 1965). There are no known roosts in the locality and the study area is at the northern limit of the species' predicted range and is not known or likely to be within a significant migration route for the species (Lumsden and Jamison 2015). The species is at risk of mortality from turbine strike and barotrauma, however the poor quality of habitat and location of the study area suggest it is unlikely that significant numbers of Southern Bent-wing Bats would fly-over or utilise the study area regularly and therefore the potential impact to the species is considered to be low.

Yellow-bellied Sheathtail Bat is a nomadic, largely solitary species which may occasionally occur within the study area at very low densities. Yellow-bellied Sheathtail Bat is known to be a high-flying species of microbat (Churchill 1998) and consequently may be at risk from collision and barotrauma from rotor blades. The species is a habitat generalist which has been previously recorded from almost all habitat types throughout Australia, although it is dependent on large tree hollows for roosting (Churchill 2008). Windrows, native vegetation and waterbodies are likely to have higher insect abundance than open paddocks and may represent higher quality foraging areas for Yellow-bellied Sheathtail Bat. Based on the low number of Victorian records and highly disturbed habitat in and around the study area it is considered unlikely significant numbers of the species occur regularly in the study area. The project may have a low impact on the local population of the species (if present). However, the species is widely dispersed across Australia, and as such significant impacts to the species as a whole from this small wind farm are unlikely.

5.3.3 Indirect Impacts: Displacement, Habitat Loss and Disturbance

The main focus of the impacts of wind farms on birds and bats is related to the risk of collision with wind turbines (Kuvlesky *et al.* 2007). However, wind farms have the potential to affect birds, among other taxa, in other indirect, yet potentially significant ways. In Europe, displacement through habitat loss is considered the primary detrimental effect of wind farms on avian abundance (Kuvlesky *et al.* 2007). This effect has been shown to manifest itself on both grassland birds that use habitat under the wind turbines (Leddy *et al.* 1999) as well as raptors that are frequently encountered at RSA (Farfán *et al.* 2009).

This effect is likely to occur because of the noise, movement and frequent human disturbance associated with wind turbines (Leddy *et al.* 1999). This type of research has not been conducted in Australia, therefore the impact that this will have on Australian woodland birds, including raptors, is largely unknown.

As there is likely to be only minor vegetation removal (e.g. of wind breaks, which does not require a Planning Permit) as part of the construction of Maroona Wind Farm, operational impacts to extant bird species due to displacement and habitat removal or disturbance are likely to be temporary and minimal.

6 LEGISLATIVE AND POLICY IMPLICATIONS

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

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Commonwealth);
- *Flora and Fauna Guarantee Act 1988* (FFG Act) (Victoria);
- *Planning and Environment Act 1987* (Victoria);
    - Local Planning Schemes;
    - Victoria's Native Vegetation Permitted Clearing Regulations.
- *Wildlife Act 1975* and Wildlife Regulations 2002 (Victoria);
- *Water Act 1989* (Victoria); and,
- *Catchment and Land Protection Act 1994* (CALP Act) (Victoria);

6.1 Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)

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

- World Heritage properties;
- National heritage places;
- Ramsar wetlands of international significance;
- Threatened species and ecological communities;
- Migratory and marine species;
- Commonwealth marine area;
- Nuclear actions (including uranium mining);
- Great Barrier Reef Marine Park; or,
- Water resources impacted by coal seam gas or mining development.

6.1.1 Ramsar Wetlands of International Significance

The study area occurs upstream of one Ramsar wetlands (DoE 2015):

- Lake Albacutya (200 kilometres);

The above wetland is unlikely to be impacted as it is situated a considerable distance from the proposed action. Provided management practices and construction techniques are consistent with Construction Techniques for Sediment Pollution Control (EPA 1991) and Environmental Guidelines for Major Construction Sites (EPA 1996), the project is unlikely to affect the ecological character of any Ramsar wetland.

6.1.2 Threatened Species and Ecological Communities

Flora: No flora species listed under the EPBC Act were recorded within the study area during the field assessment. There is no suitable habitat within the study area for flora species listed under the EPBC Act (Section 3.3.1).

Fauna: No fauna species listed under the EPBC Act were recorded within the study area during the field assessment. There is suitable habitat within the study area for one fauna species listed under the EPBC Act (Striped Legless Lizard) (Section 3.3.2).

Communities: No ecological communities listed under the EPBC Act were recorded within the study area (Section 3.3.3).

6.1.3 Migratory and Marine Species

6.1.3.1 Migratory Shorebirds

Migratory shorebirds are protected under the EPBC Act if they are listed under the:

- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention);
- China Australia Migratory Bird Agreement (CAMBA);
- Japan Australia Migratory Bird Agreement (JAMBA); or the
- Republic of Korea Australia Migratory Bird Agreement (ROKAMBA).

A referral to DoE is required if a project is likely to have a significant impact on migratory shorebirds listed under the above agreements. The *Draft Significant Impact Guidelines for 36 Migratory Shorebird Species* (DEWHA 2009) define a significant impact on migratory shorebirds as being:

- Loss of 'important habitat';
- Degradation of 'important habitat' leading to a substantial reduction in migratory shorebirds using the site;
- Increased disturbance leading to a substantial reduction in migratory shorebirds using important habitat; or,
- Direct mortality of birds leading to a substantial reduction in migratory shorebirds using important habitat.

'Important habitat' is defined in DEWHA (2009) as:

- A site identified as internationally important in Bamford *et al.* (2008);
- A site not identified as internationally important in Bamford et al. (2008), but which supports*:
    - At least 0.1 per cent of the flyway population of a single species (note: flyway populations are estimated in Bamford *et al.* (2008));
    - At least 2000 migratory shorebirds; or,
    - At least 15 shorebird species.
- Important habitat for Latham's Snipe *Gallinago hardwickii* occurs at sites that have previously been identified as internationally important for the species, or sites that:
    - Support at least 18 individuals of the species; and,
    - Are naturally occurring open freshwater wetland with vegetation cover nearby (for example, tussock grasslands, sedges, lignum or reeds within 100 m of the wetland).

* 'Support' is defined differently depending on whether the habitat is considered permanent or ephemeral.

- For permanent wetlands, support is defined as: migratory shorebirds are recorded during surveys and/or known to have occurred at the site within the previous five years.
- For ephemeral wetlands, support is defined as: habitat that migratory shorebirds have ever been recorded in, and where that habitat has not been lost permanently due to previous actions.

Eight migratory shorebird species have been recorded within 10 kilometres of the study area, most of which have been recorded at Lake Buninjon (Appendix 3.3). Lake Buninjon is the largest and most significant site (i.e. most likely to qualify as 'important habitat') near the study area and is a permanent wetland. The total number of migratory shorebirds recorded within 10 kilometres of the study area is approximately 500-600 birds, with the largest single count being 200 Sharp-tailed Sandpiper *Calidris acuminata* at Lake Buninjon in 2004. This is more than 0.1% of the estimated flyway population of Sharp-tailed Sandpiper (160 birds; Bamford *et al.* 2008). Although this record is more than five years old, the lack of more recent data may reflect a lack of survey effort, and Lake Buninjon may qualify as 'important habitat' for Sharp-tailed Sandpiper according to DEWHA (2009). No other species have had more than 0.1% of their estimated flyway population recorded at Lake Buninjon, or anywhere within 10 kilometres of the study area, and only single individuals of Latham's Snipe have been recorded within 10 kilometres of the study area (three records, Appendix 3.2).

It is important to note that the study area is approximately four kilometres from Lake Buninjon. While it is quite possible that small numbers of migratory shorebirds could fly over the site during migration, it has been well documented that shorebirds typically fly between 0.5 and 6 kilometres in elevation during migration, well above the tip of proposed turbines (Williams et al. 1981; Piersma et al. 1990; Tulp et al. 1994). The proposed wind farm is also not located between, or in close proximity to, either migratory shorebird feeding areas, or important, regularly used, feeding and roosting sites, so the likelihood of migratory shorebirds moving through the study area when moving between wetlands in the local area is low. Because of these factors, and also considering the small number of turbines (three), it is considered that the likelihood of turbine strike of migratory shorebirds from the proposed Maroona Wind Farm would be low and the wind farm will be unlikely to have a significant impact on any migratory shorebird species.

6.1.3.2 *Other migratory bird species*

A number of other migratory species have been previously recorded within 10 kilometres of the study area with Whistling Kite *Haliastur sphenurus* and Silvereye *Zosterops lateralis* recorded during the site assessment. However, the study area would not be classed as an 'important habitat' for these species as defined under the EPBC Act Policy Statement 1.1 Principal Significant Impact Guidelines (DoE 2013).

6.1.4 Implications

There is suitable habitat within the study area for one fauna species (Striped Legless Lizard) listed under the EPBC Act in Grassy Woodland in the north of the study area (Figure 2). Impacts to Striped Legless Lizard habitat have been actively avoided during the planning process and will not occur. No significant impacts to other matters of national environmental significance are likely. Therefore, there is no requirement to submit a referral to DoE.

6.2 Flora and Fauna Guarantee Act 1988 (Victoria)

The FFG Act is the primary Victorian legislation providing for the conservation of threatened species and ecological communities, and for the management of processes that are threatening to Victoria's native flora and fauna. The FFG Act contains protection procedures such as the listing of threatened species and/or communities, and the preparation of action statements to protect the long-term viability of these values.

Proponents are required to apply for an FFG Act Permit to 'take' listed and/or protected[3] flora species, listed vegetation communities and listed fish species in areas of public land (i.e. within road reserves, drainage lines and public reserves). An FFG Act permit is generally not required for removal of species or communities on private land, or for the removal of habitat for a listed terrestrial fauna species.

Flora: No 'listed' flora species, but two 'protected' flora species (Golden Wattle *Acacia pycnantha* and Lightwood *A. implexa*) were recorded within the study area during the field assessment. There is no suitable habitat within the study area for flora species listed under the FFG Act (Section 3.3.1 and 3.4.1).

Fauna: No fauna species listed under the FFG Act were recorded within the study area during the field assessment. There is suitable habitat within the study area for two additional fauna species listed under the FFG Act (Tussock Skink and Diamond Firetail), while Brolga, Black Falcon and Eastern Great Egret may occasionally fly through the study area when moving between areas of more suitable habitat (Section 3.3.2 and 3.4.2).

Communities: No ecological communities listed under the FFG Act were recorded within the study area (Section 3.4.3).

Threatening processes: The following threatening processes listed under the FFG Act should be considered in relation to the proposed development:

- Invasion of native vegetation by 'environmental weeds';

[3] In addition to 'listed' flora species, the FFG Act identifies 'protected' flora species. This includes any of the Asteraceae (Daisies), all orchids, ferns (excluding *Pteridium esculentum*) and Acacia species (excluding *Acacia dealbata*, *Acacia decurrens*, *Acacia implexa*, *Acacia melanoxylon* and *Acacia paradoxa*), as well as any taxa that may be a component of a listed ecological community. A species may be both listed and protected.

- Loss of coarse woody debris from Victorian native forests and woodlands;
- Loss of hollow-bearing trees from Victorian native forests; and,
- Use of Phytophthora-infected gravel in construction of roads, bridges and reservoirs.

6.2.1 Implications

The local planning authority may consider flora, fauna and communities listed under the FFG Act when making decisions regarding the use and development of land.

There is suitable habitat within the study area for several species listed or protected under the FFG Act. However, the study area is privately owned and as such, a permit under the FFG Act is not required. No impacts to native vegetation on roadsides along Andrews Lane are likely under the revised development plan (received 27 July 2015) and, therefore, a permit under the FFG Act will not be required.

6.3 Planning and Environment Act 1987 (Victoria)

The *Planning and Environment Act 1987* outlines the legislative framework for planning in Victoria and for the development and administration of planning schemes. All planning schemes contain native vegetation provisions at Clause 52.17 which require a planning permit from the relevant local Council to remove, destroy or lop native vegetation on a site of more than 0.4 hectares, unless an exemption under clause 52.17-7 of the Victorian Planning Schemes applies (Appendix 1.5.3) or a subdivision is proposed with lots less than 0.4 hectares[4]. Local planning schemes may contain other provisions in relation to the removal of native vegetation (Section 6.3.1).

Where the clearing of native vegetation is permitted, the quantity and type of vegetation to be offset is determined using methodology specified in the Guidelines (DEPI 2013a). In addition, a permit must be referred to DELWP if vegetation removal meets one or more of the below thresholds (Table 4).

Table 4. Permit to remove native vegetation – application referral triggers (Clause 66, Referral and Notice Provisions)

Native Vegetation	• Remove, destroy or lop native vegetation where the area to be cleared is 0.5 hectares or more
	• Remove, destroy or lop native vegetation which is to be considered under the High Risk-based pathway
Other Circumstances	• Remove, destroy or lop native vegetation if a property vegetation plan applies to the site
	• Remove, destroy or lop native vegetation on Crown land which is occupied or managed by the responsible authority

6.3.1 Local Planning Schemes

The study area is located within the Ararat Rural City Council municipality. The following zoning and overlays apply (DPCD 2013):

- Farming Zone (FZ);

[4] In accordance with the Victorian Civil and Administrative Tribunal's (VCAT) decision Villawood v Greater Bendigo CC (2005) VCAT 2703 (20 December 2005) all native vegetation is considered lost where proposed lots are less than 0.4 hectares in area and must be offset at the time of subdivision.

- Vegetation Protection Overlay – Schedule 1 (VPO1); and,
- Vegetation Protection Overlay – Schedule 2 (VPO2).

6.3.1.1 Implications

As no native vegetation is proposed to be removed under the revised development plan (received 27 July 2015), there is no requirement to seek a Planning Permit under clause 52.17 of the Ararat Rural City Planning Scheme.

Several small areas of planted vegetation, including windbreaks and shelter belts, are proposed to be impacted by the location of turbine infrastructure and associated access tracks. All planted vegetation was between approximately five and 15 years of age and had been planted without the support of external funding (pers. comm., Jack Tucker, landowner, 8 July 2015). Therefore, the removal of areas of planted vegetation will not require a Planning Permit under clause 52.17 as it is covered by the exemption for Planted Vegetation (Appendix 1.5; Table A1 5.3). In addition, the revised construction footprint has attempted to minimise the amount of impacted planted vegetation.

The VPO1 covers the area of remnant River Red-gum trees (including scattered trees and Plains Grassy Woodland mapped in this assessment) east of the study area. The VPO1 aims to protect sites of biological significance within the Shire and any application to remove native vegetation would be assessed with consideration to the objectives of the VPO1. The revised development plan (received 27 July 2015) will not result in impacts to native vegetation in the area covered by the VPO1.

The VPO2 protects sites of biological significance on roadsides within the Shire and covers sections of Andrews Lane. Any application to remove native vegetation from within areas covered by the VPO2 would be assessed with consideration to the objectives of the VPO2. The revised development plan (received 27 July 2015) will not result in impacts to native vegetation in the area covered by the VPO2 (along Andrews Lane).

6.3.2 The Guidelines

In December 2013 the Victorian Government integrated the Guidelines (DEPI 2013a) into the Victorian Planning Provisions, replacing the *Victoria's Native Vegetation Management – A Framework for Action* (The Framework) (NRE 2002). The primary objective of the regulations is "no net loss in the contribution made by native vegetation to Victoria's biodiversity". The State Planning Policy Framework and the decision guidelines at Clause 52.17 (Native Vegetation) of Particular Provisions and Clause 12.01 require Planning and Responsible Authorities to have regard for the Guidelines.

Areas of remnant native vegetation, Scattered Trees and habitat for rare or threatened species must be offset if they are proposed to be disturbed as part of the project.

6.3.2.1 Implications

The proposed development plan for the Maroona Wind Farm will not impact any native vegetation within the study area and will, therefore, not require biodiversity offsets to be secured.

6.4 Wildlife Act 1975 and Wildlife Regulations 2002 (Victoria)

The *Wildlife Act 1975* (and associated Wildlife Regulations 2002) is the primary legislation in Victoria providing for protection and management of wildlife. The Act requires people engaged in wildlife research (e.g. fauna surveys, salvage and translocation activities) to obtain a permit under the Act to ensure that these activities are undertaken in a manner consistent with the appropriate controls.

The *Wildlife Act 1975* has the following objectives:

- To establish procedures for the promotion of protection and conservation of wildlife, the prevention of species extinctions, and the sustainable use and access to wildlife; and,
- To prohibit and regulate the conduct of those involved in wildlife related activities.

6.4.1 Implications

Authorisation for habitat removal may be obtained under the *Wildlife Act 1975* through a licence granted under the *Forests Act 1958*, or under any other Act such as the *Planning and Environment Act 1987*. Any persons engaged to remove, salvage, hold or relocate native fauna during construction must hold a current Management Authorisation under the *Wildlife Act 1975*.

6.5 Water Act 1989 (Victoria)

The purposes of the *Water Act 1989* are manifold but (in part) relate to the orderly, equitable, efficient and sustainable use of water resources within Victoria. This includes the provision of a formal means of protecting and enhancing environmental qualities of waterways and their in-stream uses as well as catchment conditions that may affect water quality and the ecological environments within them.

6.5.1 Implications

A 'works on waterways' permit from the Glenelg Hopkins CMA is required where any action impacts on waterways. As no impacts to waterways are proposed within the study area, this permit is unlikely to be required.

6.6 Catchment and Land Protection Act 1994 (Victoria)

The *Catchment and Land Protection Act 1994* (CaLP Act) contains provisions relating to catchment planning, land management, noxious weeds and pest animals. The Act also provides a legislative framework for the management of private and public land and sets out the responsibilities of land managers, stating that they must take all reasonable steps to:

- Avoid causing or contributing to land degradation which causes or may cause damage to land of another land owner;
- Protect water resources;
- Conserve soil;
- Eradicate regionally prohibited weeds;

- Prevent the growth and spread of regionally controlled weeds; and,
- Prevent the spread of, and as far as possible eradicate, established pest animals.

6.6.1 Implications

A number of weeds (e.g. Spear Thistle *Cirsium vulgare*) listed as noxious under the CaLP Act were recorded during the assessment (Appendix 2.1). Similarly, there is evidence that the study area is currently occupied by several pest fauna species (e.g. European Rabbit *Oryctolagus cuniculus*) listed under the CaLP Act. Landowners are responsible for the control of any infestation of noxious weeds and pest fauna species. To meet CaLP Act requirements listed noxious weeds should be appropriately controlled throughout the study area to minimise their spread and impact on ecological values, and a Weed Management Plan may be required. A pest fauna eradication plan may also be required.

7 MITIGATION MEASURES

Any loss of ecological values should be viewed in the overall context of on-going loss, fragmentation, and deterioration in the quality of remnant vegetation throughout the greater Central Victorian Uplands and Victorian Volcanic Plain bioregion.

No impacts to native vegetation are proposed under the revised construction footprint (provided 27 July 2015).

7.1 Avoid Impacts

Under the High Risk-based pathway the Guidelines require the relevant authorities to consider whether reasonable steps have been taken to avoid impacts to 'native vegetation that makes a significant contribution to Victoria's biodiversity'. Although this is not a requirement for Low and Moderate Risk-based pathway applications, impact avoidance should regardless be considered, where possible. This includes considering:

- Impacts on important habitat for rare or threatened species, particularly highly localised habitat;
- Proportional impacts on remaining habitat for rare or threatened species;
- If the removal of the native vegetation will contribute to a cumulative impact that is a significant threat to the persistence of a rare or threatened species; and,
- The availability of, and potential for, gain from offsets.

Access track alignments have been chosen that avoid native vegetation. There is no native vegetation near the turbine locations, and areas of planted native trees have been avoided where possible.

7.2 Minimise Impacts

For the removal of vegetation that falls under the Moderate and High Risk-based pathways, the Guidelines require the relevant authorities to consider whether reasonable steps have been taken to ensure that impacts of the proposed removal of native vegetation on biodiversity have been minimised. Reasonable steps are considered to have been taken when one of the following applies:

- The site has been the subject of a comprehensive DELWP supported regional or landscape scale strategic planning process that has resulted in minimising adverse impacts on biodiversity from the removal of native vegetation; or,
- Opportunities have been taken to locate, design and manage the proposed use or development to minimise impacts on biodiversity from the removal of native vegetation, and there is sufficient evidence that any further actions to minimise impacts on biodiversity from the removal of native vegetation will undermine the key objectives of the proposal or materially increase the cost of the proposal.

Recommended measures to minimise impacts upon terrestrial values present within the study area include:

- Minimise impacts to native vegetation and habitats through construction and micro-siting techniques, including fencing retained areas of native vegetation and scattered trees with temporary fencing during construction. If indeed necessary, trees should be lopped or trimmed rather than removed. Similarly, soil disturbance and sedimentation on steep slopes should be avoided or kept to a minimum, to avoid, or minimise impacts to fauna habitats;
- All contractors should be aware of ecologically sensitive areas to minimise the likelihood of inadvertent disturbance to areas marked for retention. Habitat Zones (areas of sensitivity) should be included as a mapping overlay on any construction plans;
- Tree Retention Zones (TRZs) should be implemented to prevent indirect losses of native vegetation during construction activities (DSE 2010). See Appendix 1.6;
- If any habitat trees or shrubs are proposed to be removed, this should be undertaken under the supervision of an appropriately qualified zoologist to salvage and translocate any displaced fauna. A Fauna Management Plan may be required to guide the salvage and translocation process;
- Where possible, construction stockpiles, machinery, roads, and other infrastructure should be placed away from areas supporting native vegetation, scattered trees and/or wetlands;
- Ensure that best practice sedimentation and pollution control measures are undertaken at all times, in accordance with Environment Protection Agency guidelines (EPA 1991; EPA 1996; Victorian Stormwater Committee 1999) to prevent offsite impacts to waterways and wetlands; and,
- As indigenous flora provides valuable habitat for indigenous fauna, it is recommended that any landscape plantings that are undertaken as part of the proposed works are conducted using indigenous species sourced from a local provenance, rather than exotic deciduous trees and shrubs.

In addition to these measures, the following documents may need to be prepared and implemented prior to any construction activities as conditions of a planning permit:

- Construction Environmental Management Plan (CEMP). The CEMP should include specific species/vegetation conservation strategies, daily monitoring, sedimentation management, site specific rehabilitation plans, weed and pathogen management measures, etc.;
- Weed Management Plan. This plan should follow the guidelines set out in the CaLP Act, and clearly outline any obligations of the project team in relation to minimising the spread of weeds as a result of this project. This may include a pre-clearance weed survey undertaken prior to any construction activities to record and map the locations of all noxious and environmental weeds;
- Bat and Avian Management Plan. This may be required to monitor the impacts on bird and bat species once the project has been commissioned; and,
- Fauna Management Plan. This may be required if habitat for common fauna species (e.g. large hollow-bearing trees) is likely to be impacted and salvage and translocation must be undertaken to minimise the risk of injury or death to those species.

7.3 Offset Impacts

7.3.1 Federal (EPBC Act)

No impacts to matters of National Environmental Significance are likely (all suitable habitat for Striped Legless Lizard has been avoided) and therefore offsets under the EPBC Act will not be required.

7.3.2 State (The Guidelines)

7.3.2.1 Offset Criteria

The proposed development plan for the Maroona Wind Farm will not impact any native vegetation within the study area and will, therefore, not require biodiversity offsets to be secured.

8 FURTHER REQUIREMENTS

Further requirements associated with development of the study area, as well as additional studies or reporting that may be required, are provided in Table 5, below.

Table 5. Further requirements associated with development of the study area

Relevant Legislation	Implications	Further Action
Environment Protection and Biodiversity Conservation Act 1999	There is suitable habitat within the study area for one fauna species (Striped Legless Lizard) listed under the EPBC Act in Grassy Woodland in the north of the study area (Figure 2). Impacts to Striped Legless Lizard habitat have been actively avoided during the planning process and will not occur. No significant impacts to other matters of national environmental significance are likely. Therefore, there is no requirement to submit a referral to DoE.	No further action required.
Flora and Fauna Guarantee Act 1988	There is suitable habitat within the study area for several species listed or protected under the FFG Act. However, the study area is privately owned and as such, a permit under the FFG Act is not required. No impacts to native vegetation on roadsides along Andrews Lane are likely under the revised development plan (received 27 July 2015) and, therefore, a permit under the FFG Act will not be required.	No further action required.
Planning and Environment Act 1987	The entire study area is modelled as Location Risk A. The proposed development plan for the Maroona Wind Farm will not impact any native vegetation within the study area and will, therefore, not require biodiversity offsets to be secured. As no native vegetation is proposed to be removed under the revised development plan (received 27 July 2015), there is no requirement to seek a Planning Permit under clause 52.17 of the Ararat Rural City Planning Scheme. Several small areas of planted vegetation, including windbreaks and shelter belts, are proposed to be impacted by the location of turbine infrastructure and associated access tracks. All planted vegetation was between approximately five and 15 years of age and had been planted without the support of external funding (pers. comm., Jack Tucker, landowner, 8 July 2015). Therefore, the removal of areas of planted vegetation will not require a Planning Permit under clause 52.17 as it is covered by the exemption for Planted Vegetation (Appendix 1.5; Table A1 5.3). In addition, the revised construction footprint has attempted to minimise the amount of impacted planted vegetation. The VPO1 covers the area of remnant River Red-gum trees (including scattered trees and Plains Grassy Woodland mapped in this assessment) east of the study area. The VPO1 aims to protect sites of	As no native vegetation is proposed to be cleared, there is no requirement to seek a permit for native vegetation removal under clause 52.17. However, a Planning Permit may include a requirement for: • A Construction Environment Management Plan (CEMP); and, • Bat and Bird Management Plan.

Relevant Legislation	Implications	Further Action
	biological significance within the Shire and any application to remove native vegetation would be assessed with consideration to the objectives of the VPO1. The revised development plan (received 27 July 2015) will not result in impacts to native vegetation in the area covered by the VPO1. The VPO2 protects sites of biological significance on roadsides within the Shire and covers sections of Andrews Lane. Any application to remove native vegetation from within areas covered by the VPO2 would be assessed with consideration to the objectives of the VPO2. The revised development plan (received 27 July 2015) will not result in impacts to native vegetation in the area covered by the VPO2 (along Andrews Lane). The responsible authority may consider the biodiversity objectives of the Glenelg Hopkins Native Vegetation Plan. Any development within the study area should incorporate these objectives.	
Catchment and Land Protection Act 1994	Several weed species listed under the CaLP Act were recorded within the study area. To meet requirements under the CaLP Act, listed noxious weeds should be appropriately controlled throughout the study area.	Planning Permit conditions may include a requirement for a Weed Management Plan.
Water Act 1989	A 'works on waterways' permit is likely to be required from the Glenelg Hopkins CMA where any action impacts on waterways within the study area.	A 'works on waterways' permit is not likely to be required.
Wildlife Act 1975	Any persons engaged to conduct salvage and translocation or general handling of terrestrial fauna species must hold a current Management Authorisation.	If native vegetation is proposed to be removed, an authorised zoologist should be present during removal to salvage local fauna.

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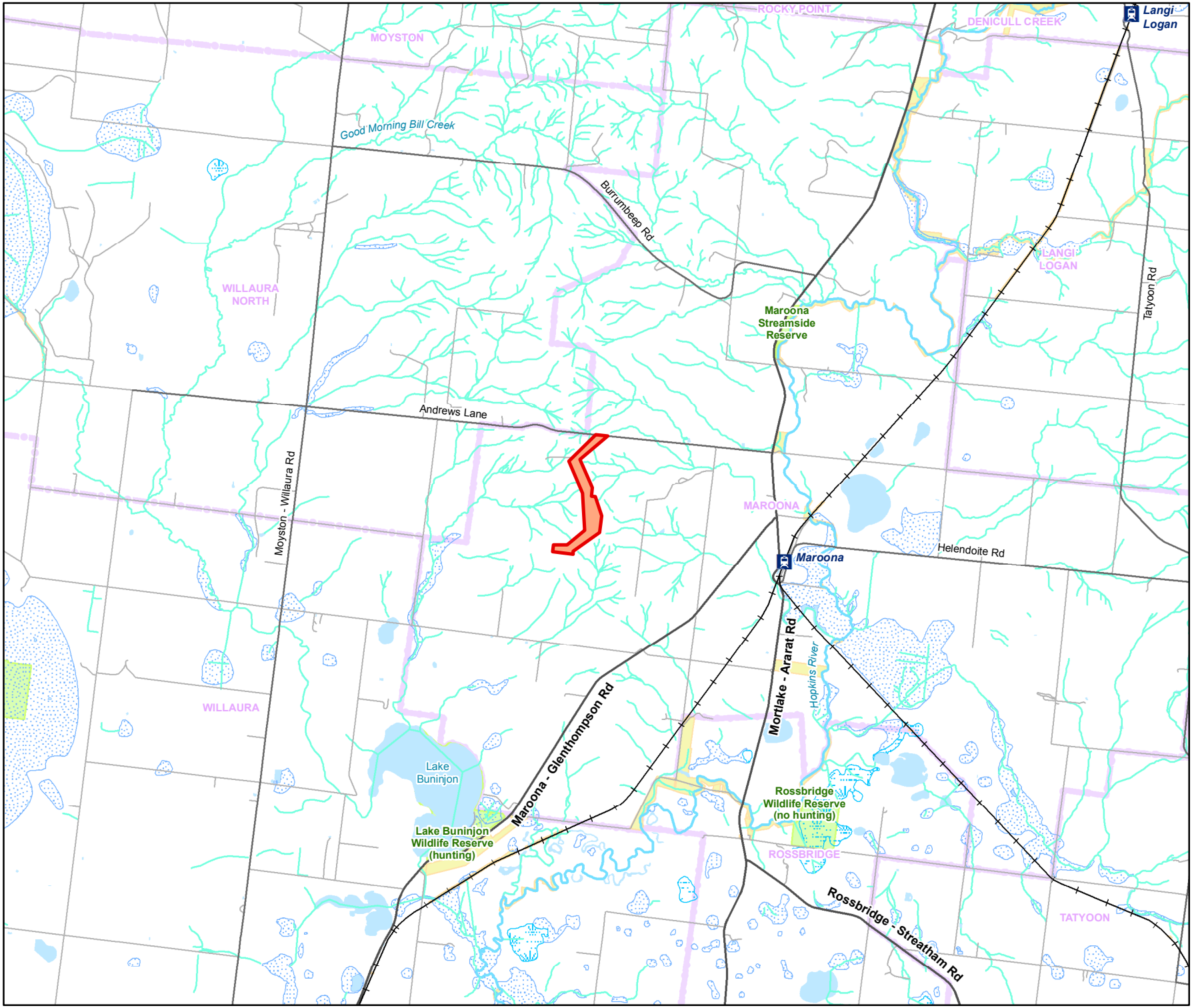
FIGURES



Legend

- Study area
- Railway
- Major Road
- Collector Road
- Minor Road
- Minor Watercourse
- Major Watercourse
- Permanent Waterbody
- Land Subject to Inundation
- Wetland/Swamp
- Parks and Reserves
- Crown Land
- Localities

Figure 1

Location of the study area

Biodiversity Assessment for Centenary Wind Farm, Maroona

N

0 900 1,800

Metres

ecology & heritage partners

7132_Fig01_StudyArea 3/09/2015 melsley

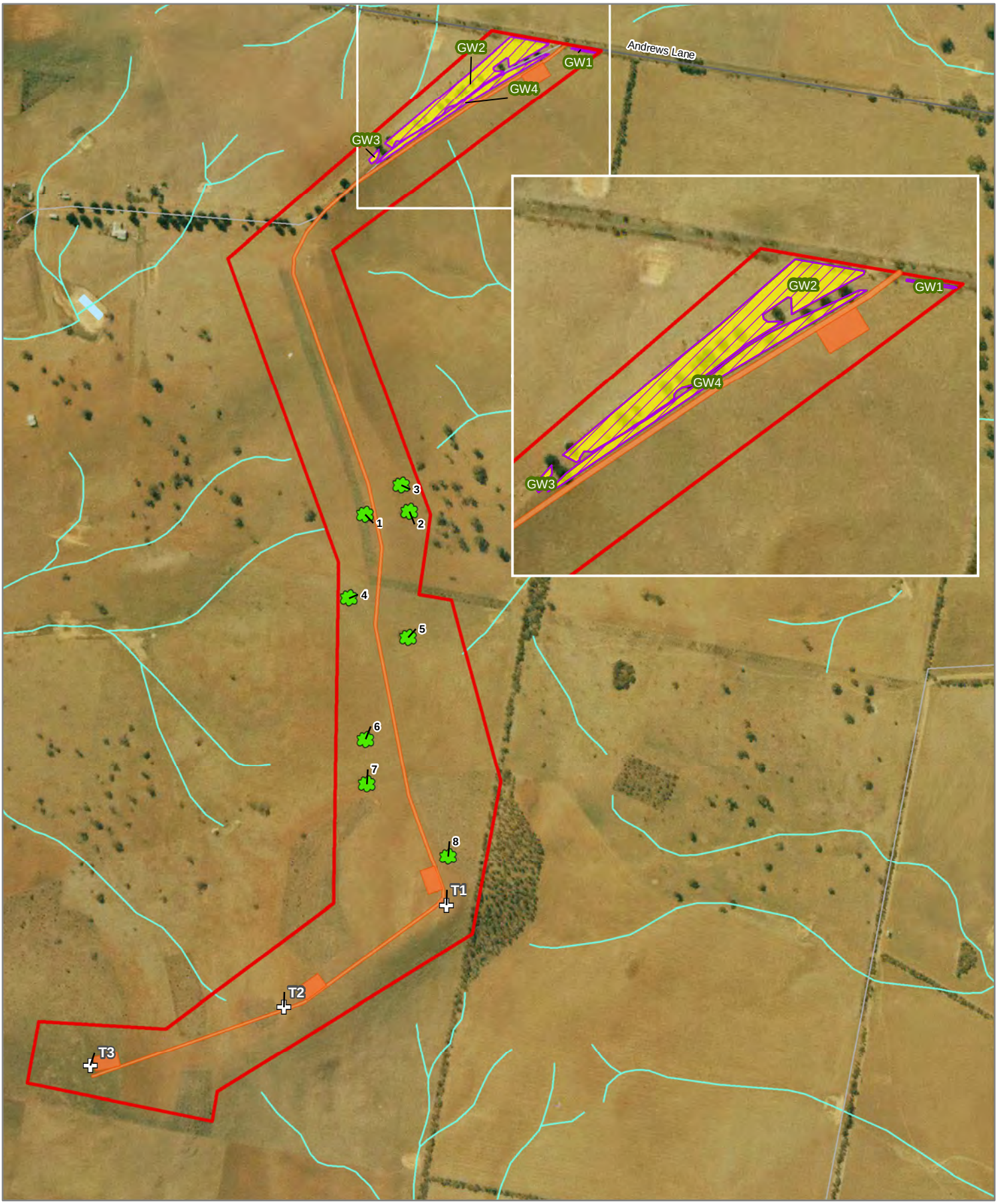


Figure 2

Ecological features

Biodiversity Assessment for Centenary Wind Farm, Maroona

Legend

- Study area
- Impact area
- Proposed Turbine Location
- Scattered Tree

Ecological Vegetation Classes

- Grassy Woodland (EVC 175_62)
- Potential Striped Legless Lizard habitat

N

0 100 200

Metres

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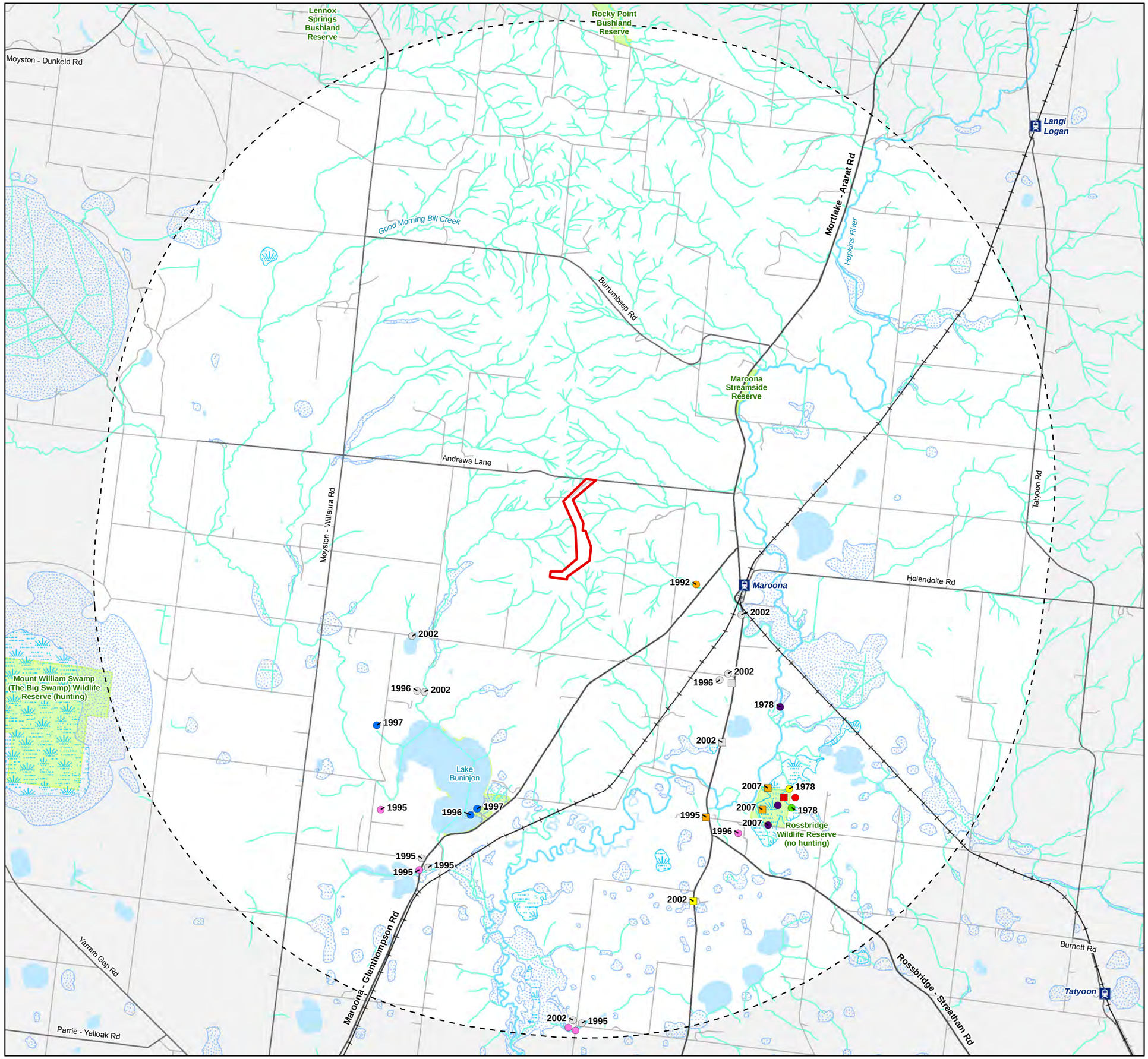


Legend

Study area

Significant flora

- Adamson's Blown-grass
- Fine-hairy Spear-grass
- Hairy Tails
- Large River Buttercup
- Prickly Arrowgrass
- Purple Blown-grass
- Salt Blown-grass
- Salt Lawrencia
- Slender Bindweed
- Small-flower Wallaby-grass
- Spiny Peppercress
- White Sunray

Figure 3

Previously documented significant flora within 10km of the study area

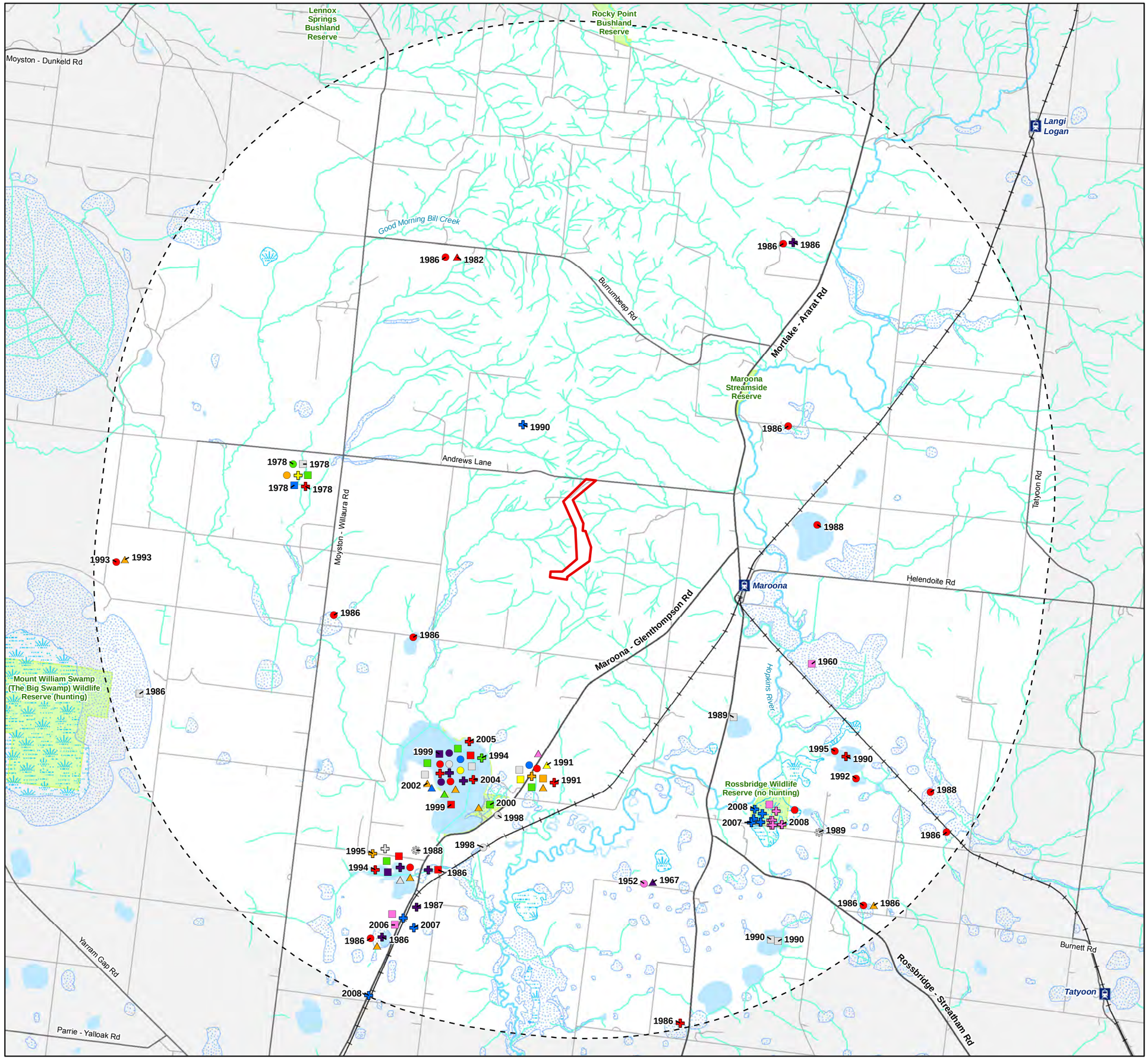
Biodiversity Assessment for Centenary Wind Farm, Maroona

N

0 1.5 3

Kilometres

ecology & heritage partners



Legend

Study area

Significant fauna

- Australasian Bittern
- Australasian Shoveler
- Azure Kingfisher
- Baillon's Crake
- Barking Owl
- Black Falcon
- Black-tailed Godwit
- Blue-billed Duck
- Brolga
- Common Greenshank
- Common Long-necked Turtle
- Diamond Firetail
- Eastern Great Egret
- Emu
- Fat-tailed Dunnart
- Freckled Duck
- Glossy Ibis
- Growling Grass Frog
- Hardhead
- Intermediate Egret
- Latham's Snipe
- Lewin's Rail
- Little Egret
- Long-toed Stint
- Magpie Goose
- Musk Duck
- Pied Cormorant
- Powerful Owl
- Royal Spoonbill
- Striped Legless Lizard
- Tussock Skink
- Whiskered Tern
- Yellow Sedge-skipper

Figure 4

Previously documented significant fauna within 10km of the study area

Biodiversity Assessment for Centenary Wind Farm, Maroona

N

0 1.5 3

Kilometres

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Legend

- Study area
- 5km buffer
- 10km buffer
- 20km buffer

Brolga records

- Non-breeding
- Breeding
- Flocking

Figure 5

Previously documented Brolga records within 20km of the study area

Biodiversity Assessment for Centenary Wind Farm, Maroona

N

0 3.5 7

Kilometres

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APPENDICES

APPENDIX 1

Appendix 1.1 – Rare or Threatened Categories for Listed Victorian Taxa

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

Rare or Threatened Categories
Conservation Status in Australia (Based on the EPBC Act 1999)
EX - Extinct: Extinct is when there is no reasonable doubt that the last individual of the species has died.
CR - Critically Endangered: A species is critically endangered when it is facing an extremely high risk of extinction in the wild in the immediate future.
EN - Endangered: A species is endangered when it is not critically endangered but is facing a very high risk of extinction in the wild in the near future.
VU - Vulnerable: A species is vulnerable when it is not critically endangered or endangered but is facing a high risk of extinction in the wild in the medium-term future.
R* - Rare: A species is rare but overall is not currently considered critically endangered, endangered or vulnerable.
K* - Poorly Known: A species is suspected, but not definitely known, to belong to any of the categories extinct, critically endangered, endangered, vulnerable or rare.
Conservation Status in Victoria (Based on DSE 2005, DSE 2009, DSE 2013)
x - Presumed Extinct in Victoria: not recorded from Victoria during the past 50 years despite field searches specifically for the plant, or, alternatively, intensive field searches (since 1950) at all previously known sites have failed to record the plant.
e - Endangered in Victoria: at risk of disappearing from the wild state if present land use and other causal factors continue to operate.
v - Vulnerable in Victoria: not presently endangered but likely to become so soon due to continued depletion; occurring mainly on sites likely to experience changes in land-use which would threaten the survival of the plant in the wild; or, taxa whose total population is so small that the likelihood of recovery from disturbance, including localised natural events such as drought, fire or landslip, is doubtful.
r - Rare in Victoria: rare but not considered otherwise threatened - there are relatively few known populations or the taxon is restricted to a relatively small area.
k - Poorly Known in Victoria: poorly known and suspected, but not definitely known, to belong to one of the above categories (x, e, v or r) within Victoria. At present, accurate distribution information is inadequate.

Appendix 1.2 – Defining Ecological Significance

Table A1.2. Criteria for defining Ecological Significance ratings for significant flora, fauna and communities.

National Significance
Flora: National conservation status is based on the EPBC Act list of taxa considered threatened in Australia (i.e. extinct, critically endangered, endangered, vulnerable).
Fauna: National conservation status is based on the EPBC Act list of taxa considered threatened in Australia (i.e. Extinct, Critically Endangered, Endangered, Vulnerable). Fauna listed as Extinct, Critically Endangered, Endangered, Vulnerable, or Rare under National Action Plans for terrestrial taxon prepared for DoE: threatened marsupials and monotremes (Maxwell et al. 1996), rodents (Lee 1995), bats (Duncan et al. 1999), birds (Garnett and Crowley 2000), reptiles (Cogger et al. 1993), amphibians (Tyler 1997) and butterflies (Sands and New 2002).
Communities: Vegetation communities considered critically endangered, endangered or vulnerable under the EPBC Act and considering vegetation condition.
State Significance
Flora: Threatened taxa listed under the provisions of the FFG Act. Flora listed in the State Government's Advisory List of Rare or Threatened Plants in Victoria (DSE 2005).
Fauna: Threatened taxon listed under Schedule 2 of the FFG Act. Fauna listed as Extinct, Critically Endangered, Endangered and Vulnerable on the State Government's Advisory List of Threatened Vertebrate Fauna in Victoria (DSE 2013). Listed as Lower Risk (Near Threatened, Conservation Dependent or Least concern) or Data Deficient under National Action Plans for terrestrial species prepared for the DoE: threatened marsupials and monotremes (Maxwell et al. 1996), rodents (Lee 1995), bats (Duncan et al. 1999), birds (Garnett and Crowley 2000), reptiles (Cogger et al. 1993), amphibians (Tyler 1997) and butterflies (Sands and New 2002).
Communities: Ecological communities listed as threatened under the FFG Act. EVC listed as threatened (i.e. endangered, vulnerable) or rare in a Native Vegetation Plan for a particular bioregion (DSE 2013c) and considering vegetation condition.
Regional Significance
Fauna: Fauna with a disjunct distribution, or a small number of documented recorded or naturally rare in the particular Bioregion in which the study area is located. A particular taxon that is has an unusual ecological or biogeographical occurrence or listed as Lower Risk – Near Threatened, Data Deficient or Insufficiently Known on the State Government's Advisory List of Threatened Vertebrate Fauna in Victoria (DSE 2013).
Communities: EVC listed as depleted or least concern in a Native Vegetation Plan for a particular bioregion (DSE 2013c) and considering vegetation condition. EVC considered rare by the author for a particular bioregion.
Local Significance
Local significance is defined as flora, fauna and ecological communities indigenous to a particular area, which are not considered rare or threatened on a national, state or regional level.

Appendix 1.3 – Defining Site Significance

Table A1.3. Criteria for defining Site Significance ratings.

National Significance
A site is of National significance if: • It regularly supports, or has a high probability of regularly supporting individuals of a taxon listed as 'Critically Endangered' or 'Endangered' under the EPBC Act and/or under National Action Plans for terrestrial taxon prepared for the DoE. • It regularly supports, or has a high probability of supporting, an 'important population' as defined under the EPBC Act of one or more nationally 'vulnerable' flora and fauna taxon. • It is known to support, or has a high probability of supporting taxon listed as 'Vulnerable' under National Action Plans. • It is known to regularly support a large proportion (i.e. greater than 1%) of a population of a taxon listed as 'Conservation Dependent' under the EPBC Act and/or listed as Rare or Lower Risk (near threatened, conservation dependent or least concern) under National Action Plans. • It contains an area, or part thereof designated as 'critical habitat' under the EPBC Act, or if the site is listed under the Register of National Estate compiled by the Australian Heritage Commission. • It is a site which forms part of, or is connected to a larger area(s) of remnant native vegetation or habitat of national conservation significance such as most National Park, and/or a Ramsar Wetland(s).
State Significance
A site is of State significance if: • It occasionally (i.e. every 1 to 5 years) supports, or has suitable habitat to support taxon listed as 'Critically Endangered' or 'Endangered' under the EPBC Act and/or under National Action Plans. • It regularly supports, or has a high probability of regularly supporting (i.e. high habitat quality) taxon listed as 'Vulnerable', 'Near threatened', 'Data Deficient' or 'Insufficiently Known' in Victoria (DSE 2005, 2013), or species listed as 'Data Deficient' or 'Insufficiently Known' under National Action Plans. • It contains an area, or part thereof designated as 'critical habitat' under the FFG Act. • It supports, or likely to support a high proportion of any Victorian flora and fauna taxa. • It contains high quality, intact vegetation/habitat supporting a high species richness and diversity in a particular bioregion. • It is a site which forms part of, or connected to a larger area(s) of remnant native vegetation or habitat of state conservation significance such as most State Parks and/or Flora and Fauna Reserves.
Regional Significance
A site is of Regional significance if: • It regularly supports, or has a high probability of regularly supporting regionally significant fauna as defined in Table 1.2. • Is contains a large population (i.e. greater than 1% or 5%) of flora considered rare in any regional native vegetation plan for a particular bioregion. • It supports a fauna population with a disjunct distribution, or a particular taxon that has an unusual ecological or biogeographical occurrence. • It is a site which forms part of, or is connected to a larger area(s) of remnant native vegetation or habitat of regional conservation significance such as most Regional Parks and/or Flora and Fauna Reserves.
Local Significance
Most sites are considered to be of at least local significant for conservation, and in general a site of local significance can be defined as: • An area which supports indigenous flora species and/or a remnant EVC, and habitats used by locally significant fauna species. • An area which currently acts, or has the potential to act as a wildlife corridor linking other areas of higher conservation significance and facilitating fauna movement throughout the landscape.

Appendix 1.4 – Vegetation Condition and Habitat Quality

Table A1.4.1 Defining Vegetation Condition ratings.

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

Table A1.4.2 Defining Habitat Quality.

Criteria for defining Habitat Quality
High Quality: • High degree of intactness (i.e. floristically and structurally diverse), containing several important habitat features such as ground debris (logs, rocks, vegetation), mature hollow-bearing trees, and a dense understorey component. • High species richness and diversity (i.e. represented by a large number of species from a range of fauna groups). • High level of foraging and breeding activity, with the site regularly used by native fauna for refuge and cover. • Habitat that has experienced, or is experiencing low levels of disturbance and/or threatening processes (i.e. weed invasion, introduced animals, soil erosion, salinity). • High contribution to a wildlife corridor, and/or connected to a larger area(s) of high quality habitat. • Provides known, or likely habitat for one or more rare or threatened species listed under the EPBC Act, FFG Act, or species considered rare or threatened according to DSE 2005; 2009 or 2013.
Moderate Quality: • Moderate degree of intactness, containing one or more important habitat features such as ground debris (logs, rocks, vegetation), mature hollow-bearing trees, and a dense understorey component. • Moderate species richness and diversity - represented by a moderate number of species from a range of fauna groups. • Moderate levels of foraging and breeding activity, with the site used by native fauna for refuge and cover. • Habitat that has experienced, or is experiencing moderate levels of disturbance and/or threatening processes. • Moderate contribution to a wildlife corridor, or is connected to area(s) of moderate quality habitat. • Provides potential habitat for a small number of threatened species listed under the EPBC Act, FFG Act, or species considered rare or threatened according to DSE 2005; 2009 or 2013.
Low Quality: • Low degree of intactness, containing few important habitat features such as ground debris (logs, rocks, vegetation), mature hollow-bearing trees, and a dense understorey component. • Low species richness and diversity (i.e. represented by a small number of species from a range of fauna groups). • Low levels of foraging and breeding activity, with the site used by native fauna for refuge and cover. • Habitat that has experienced, or is experiencing high levels of disturbance and/or threatening processes. • Unlikely to form part of a wildlife corridor, and is not connected to another area(s) of habitat. • Unlikely to provide habitat for rare or threatened species listed under the EPBC Act, FFG Act, or considered rare or threatened according to DSE 2005; 2009 or 2013.

Appendix 1.5 – Offsets and Exemptions

Table A1.5.1. Calculation of Biodiversity Equivalence Scores and General or Specific Offsets (DEPI 2013a)

Pathway	Biodiversity Assessment Tools	Information Source
Low Risk-based pathway	Condition Score	Modelled data, NVIM Tool (DELWP 2015c)
	Habitat Hectares	= Condition Score x Extent (ha)
	Strategic Biodiversity Score	Modelled data, NVIM Tool (DELWP 2015c)
	General Biodiversity Equivalence Score	= Habitat Hectares x Strategic Biodiversity Score
Moderate or High Risk-based pathway	Condition Score	Habitat hectare assessment
	Habitat Hectares	= Condition Score x Extent (ha)
	Strategic Biodiversity Score and Habitat Importance Score	Modelled data, determined by DEPI
	Specific Biodiversity Equivalence Score **(A)**	= Habitat Hectares x Habitat Importance Score
	Sum of Specific Biodiversity Equivalence Scores of remaining habitat **(B)**	Data gathered during the site assessment is provided to DEPI for analysis and a resulting assessment offset report is provided by the Department.
	Specific Offset Threshold **(C)**	
	General/Specific Threshold Test: If **A ÷ B > C** a **Specific** offset is required If **A ÷ B < C** a **General** offset required	

Table A1.5.2. Summary of offset requirements (DEPI 2013a)

Risk –based Pathway	Offset Type	Offset Amount (Risk adjusted biodiversity equivalence score)	Offset Attributes		
			Habitat for Species	Vicinity	Strategic Biodiversity Score
Low Risk	General offset	1.5 times the general biodiversity equivalence score of the native vegetation to be removed.	No restrictions	In the same Catchment Management Authority or Local Government Area boundary as the native vegetation to be removed.	At least 80 per cent of the strategic biodiversity score of the native vegetation to be removed.
Moderate or High Risk	General offset	1.5 times the general biodiversity equivalence score of the native vegetation to be removed.	No restrictions	In the same Catchment Management Authority or Local Government Area boundary as the native vegetation to be removed.	At least 80 per cent of the strategic biodiversity score of the native vegetation to be removed.
Moderate or High Risk	Specific offset	For each species impacted, 2 times the specific biodiversity equivalence score of the native vegetation to be removed.	Likely habitat for each rare or threatened species that a specific offset is required for, according to the specific-general offset test.	No restrictions	No restrictions

Table A1.5.3. Permit exemptions (from *Victorian Planning Provisions* Clause 52.17 -7)

No permit is required to remove, destroy or lop native vegetation to the minimum extent necessary if any of the following apply:	
Property size	A permit is not required for removal of native vegetation if the native vegetation is on land which, together with all contiguous land in one ownership, has an area of less than 0.4 hectares. This exemption does not apply to native vegetation within a road reservation, or where a subdivision is proposed with lots less than 0.4 hectares[5].
Lopping or pruning	Generally, minor lopping or pruning of up to a third of the foliage (not including the trunk) that does not affect the continued health of the tree does not require a permit or attract an offset requirement.
Regrowth	A permit is not generally not required for removal of native vegetation that is For regrowth which has naturally established or regenerated on land lawfully cleared of naturally established native vegetation and is: a) Less than 10 years old; or, b) Bracken (*Pteridium esculentum*); or, c) Less than ten years old at the time of a Property Vegetation Plan being signed by the Secretary of the Department of Sustainability and Environment (as constituted under Part 2 of the *Conservation, Forest and Lands Act 1987*), and is shown on that Plan as being 'certified regrowth', and is on land that is to be used or maintained for cultivation or pasture during the term of that Plan; or, d) Within the boundary of a timber production plantation, as indicated on a Plantation Development Notice or other documented record, and has established after the plantation. This exemption does not apply to land on which native vegetation has been cleared or otherwise destroyed or damaged as a result of flood, fire or other natural disaster.
Weeds	A permit is not required for removal of native vegetation to enable the removal or destruction of a weed listed in the schedule to the clause. The maximum extent of native vegetation removed, destroyed or lopped under this exemption on contiguous land in the same ownership in a five year period must not exceed any of the following: a) 1 hectare of native vegetation which does not include a tree; or, b) 15 native trees if each tree has a DBH of less than 20.
Planted vegetation	The removal of planted trees does not require a permit or attract an offset requirement, except if public funding was provided to assist in planting or managing the native vegetation and the terms of the funding did not anticipate removal or harvesting of the vegetation.
Other	Numerous additional exemptions apply to works relating to approvals granted prior to 15 September 2008, fencing, mowing, stone exploration / extraction, utility maintenance, crown land, emergency works, works in Farming Zone and Rural Activity Zone, fire protection, geothermal energy exploration, grazing, greenhouse gas sequestration, harvesting timber, mineral exploration / extraction, pest animal burrow removal, road safety, stock movement on roads and surveying. See Clause 52.17 -6 for details.

[5] In accordance with the Victorian Civil and Administrative Tribunal's (VCAT) decision Villawood v Greater Bendigo CC (2005) VCAT 2703 (20 December 2005) all native vegetation is considered lost where proposed lots are less than 0.4 hectares in area and must be offset at the time of subdivision.

Appendix 1.6 – Tree Retention Zones

Tree Retention Zones (TRZs) should be implemented to prevent indirect losses of native vegetation during construction activities (DSE 2010). A TRZ applies to a tree and is a specific area above and below the ground, with a radius 12 x the DBH. At a minimum standard a TRZ should consider the following:

- A TRZ of trees should be a radius no less than two metres or greater than 15 metres;
- Construction, related activities and encroachment (i.e. earthworks such as trenching that disturb the root zone) should be excluded from the TRZ;
- Where encroachment exceeds 10% of the total area of the TRZ, the tree should be considered as lost and offset accordingly;
- Directional drilling may be used for works within the TRZ without being considered encroachment. The directional bore should be at least 600 millimetres deep;
- The above guidelines may be varied if a qualified arborist confirms the works will not significantly damage the tree (including stags / dead trees). In this case the tree would be retained and no offset would be required; and,
- Where the minimum standard for a TRZ has not been met an offset may be required.

APPENDIX 2 - FLORA

Appendix 2.1 – Flora Results

Table A2.1. Flora recorded within the study area.

Scientific name	Common name
Indigenous Species	
Acacia implexa	Lightwood
Acacia pycnantha	Golden Wattle
Allocasuarina verticillata	Drooping Sheoak
Anthosachne scabra	Common Wheat-grass
Asperula conferta	Common Woodruff
Austrostipa bigeniculata	Kneed Spear-grass
Crassula sieberiana s.l.	Sieber Crassula
Eucalyptus melliodora	Yellow Box
Epilobium hirtigerum	Hairy Willow-herb
Lomandra filiformis	Wattle Mat-rush
Poa sieberiana	Grey Tussock-grass
Rytidosperma erianthum	Hill Wallaby-grass
Rytidosperma setaceum var. setaceum	Bristly Wallaby-grass
Themeda triandra	Kangaroo Grass
Non-indigenous Species	
Acetosella vulgaris	Sheep Sorrel
Anagallis arvensis	Pimpernell
Arctotheca calendula	Capeweed
Avena spp.	Wild Oat
Bromus catharticus	Prarie Grass
Cirsium vulgare W	Spear Thistle
Dactylis glomerata	Cocksfoot
Erodium botrys	Big Heron's-bill
Hypochaeris radicata	Flatweed
Lolium perenne	Perennial Rye-grass
Malva parviflora	Small-flower Mallow
Phalaris aquatica	Toowoomba Canary-grass
Phalaris minor	Lesser Canary-grass
Plantago lanceolata	Ribwort
Poa annua	Annual Meadow-grass
Romulea rosea	Onion Grass

Scientific name	Common name
Silybum marinum	Variegated Thistle
Solanum nigrum s.s.	Black Nightshade
Sonchus asper	Rough Sow-thistle
Urtica incisa	Scrub Nettle
Vulpia spp.	Fescue

Notes: W = Noxious weed; only species observed to be naturally recruiting within the study area were recorded.

Appendix 2.2 – Significant Flora Species

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

Scientific name	Common name	Total # of documented records	Last documented record	EPBC	FFG	DSE	Likely occurrence in study area
NATIONAL SIGNIFICANCE							
Caladenia tensa #	Greencomb Spider-orchid	-	-	EN	-	v	5
Caladenia versicolor #	Candy Spider-orchid	-	-	VU	L	e	5
Carex tasmanica #	Curly Sedge	-	-	VU	L	v	5
Dodonaea procumbens #	Trailing Hop-bush	-	-	VU	-	v	5
Glycine latrobeana #	Clover Glycine	-	-	VU	L	v	5
Ixodia achillaeoides subsp. *arenicola* *	Coast Ixodia	1	1894	VU	-	v	5
Lachnagrostis adamsonii	Adamson's Blown-grass	10	2002	EN	L	v	5
Lepidium aschersonii	Spiny Peppercress	5	2007	VU	L	e	5
Leucochrysum albicans var. *tricolor*	White Sunray	1	2002	EN	L	e	5
Pimelea spinescens subsp. *spinescens* #	Spiny Rice-flower	-	-	CR	L	e	5
Poa sallacustris #	Salt-lake Tussock-grass	-	-	VU	L	v	5
Prasophyllum suaveolens #	Fragrant Leek-orchid	-	-	EN	L	e	5
Rutidosis leptorhynchoides #	Button Wrinklewort	-	-	EN	L	e	5
Senecio macrocarpus #	Large-headed Fireweed	-	-	VU	L	e	5
Thelymitra matthewsii #	Spiral Sun-orchid	-	-	VU	L	v	5
STATE SIGNIFICANCE							
Austrostipa puberula	Fine-hairy Spear-grass	1	1978	-	-	r	4
Convolvulus angustissimus subsp. *omnigracilis*	Slender Bindweed	2	2002	-	-	k	3

Scientific name	Common name	Total # of documented records	Last documented record	EPBC	FFG	DSE	Likely occurrence in study area
Lachnagrostis punicea subsp. *filifolia*	Purple Blown-grass	3	1997	-	L	r	5
Lachnagrostis robusta	Salt Blown-grass	5	2002	-	-	r	5
Lawrencia spicata	Salt Lawrencia	3	2007	-	-	r	5
Ptilotus erubescens	Hairy Tails	1	1992	-	L	v	4
Ranunculus diminutus *	Brackish Plains Buttercup	1	1978	-	-	r	5
Ranunculus papulentus	Large River Buttercup	1	1978	-	-	k	5
Rytidosperma monticola	Small-flower Wallaby-grass	1	1978	-	-	r	5
Triglochin mucronata	Prickly Arrowgrass	1	1978	-	-	r	5

Notes: EPBC = Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), FFG = Flora and Fauna Guarantee Act 1988 (FFG Act), DSE = Advisory List of Threatened Flora in Victoria (DSE 2005), EX = Extinct, CR = Critically endangered, EN = Endangered, VU = Vulnerable, K = Poorly Known (Briggs and Leigh 1996), X = Extinct, e = Endangered, v = Vulnerable, r = Rare, k = Poorly Known, L = Listed, # Records identified from EPBC Act Protected Matters Search Tool, * = Records identified from the FIS.

Data source: Victorian Biodiversity Atlas (DEPI 2014); Protected Matters Search Tool (DoE 2015).

Order: Alphabetical.

Likelihood: Habitat characteristics of significant flora species previously recorded within 10 kilometres of the study area, or that may potentially occur within the study area were assessed to determine their likelihood of occurrence. The likelihood of occurrence rankings are defined below.

1 - Known occurrence

- Recorded within the study area recently (i.e. within ten years)

2 - High Likelihood

- Previous records of the species in the local vicinity; and/or,
- The study area contains areas of high quality habitat.

3 - Moderate Likelihood

- Limited previous records of the species in the local vicinity; and/or,
- The study area contains poor or limited habitat.

4 - Low Likelihood

- Poor or limited habitat for the species however other evidence (such as a lack of records or environmental factors) indicates there is a very low likelihood of presence.

5 – Unlikely

- No suitable habitat and/or outside the species range.

Appendix 2.3 – Habitat Hectares

Table A2.3. Habitat Hectares results for remnant vegetation recorded within the study area.

EVC		Grassy Woodland
EVC Number		175_62
Patch ID		GW 1,2,3,4
Bioregion		Central Victorian Uplands
EVC Conservation Status		Endangered
Patch Condition	Large Old Trees /10	0
	Canopy Cover /5	0
	Under storey /25	15
	Lack of Weeds /15	6
	Recruitment /10	5
	Organic Matter /5	5
	Logs /5	0
	Treeless EVC Multiplier	NA
	Subtotal =	31
Landscape Value /25		8
Habitat Points /100		39
Habitat Score		0.39
Area		1.51
Habitat Hectares		0.59

Appendix 2.4 – Scattered Trees

Table A2.4. Remnant scattered trees recorded within the study area.

ID	Common name	Scientific name	DBH (cm)	Size Class	Latitude	Longitude
1	Stag	-	50	ST	-37.4271	142.8198
2	Yellow Box	*Eucalyptus melliodora*	55	ST	-37.4271	142.8208
3	Yellow Box	*Eucalyptus melliodora*	130	VLOT	-37.4266	142.8206
4	Stag	-	90	LOT	-37.4286	142.8195
5	Yellow Box	*Eucalyptus melliodora*	70	LOT	-37.4293	142.8208
6	Stag	-	60	MOT	-37.4312	142.8199
7	Stag	-	50	ST	-37.4320	142.8200
8	Stag	-	45	ST	-37.4332	142.8218

APPENDIX 3 - FAUNA

Appendix 3.1 – Fauna Results

Table A3.1. Fauna recorded within the study area during site assessment (2 July 2015).

Common Name	Scientific Name	Last Documented Record (VBA)	# Records (VBA)	Hollow Use	Mi/ Ma	Observation Type	Flying at Rotor Swept Area Height
MAMMALS							
Eastern Grey Kangaroo	*Macropus giganteus*	2001	1	-	-	SC	N/A
BIRDS							
Australasian Pipit	*Anthus novaeseelandiae*	2001	12	-	Ma	S	NO
Australian Magpie	*Gymnorhina tibicen*	2012	17	-	-	S	NO
Australian Shelduck	*Tadorna tadornoides*	2012	133	Total	-	S	NO
Australian Wood Duck	*Chenonetta jubata*	2000	13	Total	-	S	NO
Brown Treecreeper (south-eastern ssp.)	*Climacteris picumnus victoriae*	-	-	Total	-	S	NO
Brown-headed Honeyeater	*Melithreptus brevirostris*	-	-	-	-	S	NO
Common Starling*	*Sturnus vulgaris*	2001	12	Partial	-	S	NO
Eastern Rosella	*Platycercus eximius*	1995	6	Total	-	S	NO
Grey Fantail	*Rhipidura albiscarpa*	1990	2	-	-	S	NO
Grey Shrike-thrush	*Colluricincla harmonica*	-	-	-	-	S	NO
Little Corella	*Cacatua sanguinea*	-	-	Total	-	S	NO
Little Raven	*Corvus mellori*	2000	1	-	Ma	S	NO
Musk Lorikeet	*Glossopsitta concinna*	1977	1	-	-	S	NO

Common Name	Scientific Name	Last Documented Record (VBA)	# Records (VBA)	Hollow Use	Mi/ Ma	Observation Type	Flying at Rotor Swept Area Height
Purple-crowned Lorikeet	*Glossopsitta porphyrocephala*	1977	1	Total	-	S	NO
Red Wattlebird	*Anthochaera carunculata*	2000	6	-	-	S	NO
Scarlet Robin	*Petroica boodang*	1978	2	-	-	S	NO
Silvereye	*Zosterops lateralis*	1990	2	-	Ma	S	NO
Singing Honeyeater	*Lichenostomus virescens*	1990	1	-	-	S	NO
Superb Fairy-wren	*Malurus cyaneus*	2001	4	-	-	S	NO
Wedge-tailed Eagle	*Aquila audax*	2001	6	-	-	S	YES
Welcome Swallow	*Petrochelidon neoxena*	2012	15	Partial	-	S	NO
Whistling Kite	*Haliastur sphenurus*	1990	5	-	Ma	S	NO
White-plumed Honeyeater	*Lichenostomus penicillatus*	2000	9	-	-	S	NO
Willie Wagtail	*Rhipidura leucophrys*	2000	12	-	-	S	NO
Yellow Thornbill	*Acanthiza nana*	-	-	-	-	S	NO
Yellow-faced Honeyeater	*Lichenostomus chrysops*	-	-	-	-	S	NO
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	2000	9	-	-	S	NO
REPTILES							
Stumpy-tailed Lizard	*Tiliqua rugosa*	1990	1	-	-	S	N/A

Notes: * = Introduced Species, H=Heard, S = Seen, SC = Identified from scats; I = Incidental, T = Trapped / handheld, Mi = Migratory, Ma = Marine

Data Sources: Number and Date of records = Victorian Biodiversity Atlas (DEPI 2014), Hollow Use: Victorian Fauna Database (Viridans 2014b), Migratory and Marine: *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

Taxonomic order: Mammals (Strahan 1995 in Menkhorst & Knight 2004); Birds (Alphabetical); Reptiles and Amphibians (Cogger et al. 1983 in Cogger 1996).

Appendix 3.2 – Significant Fauna Species

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

Common Name	Scientific Name	Last Documented Record (VBA)	# Records (VBA)	EPBC Act	FFG ACT	DSE (2013)	National Action Plan	Likelihood of occurrence
NATIONAL SIGNIFICANCE								
Southern Brown Bandicoot	*Isoodon obesulus obesulus*	#	-	EN	L	NT	NT	4
Long-nosed Potoroo	*Potorous tridactylus tridactylus*	#	-	VU	L	NT	EN	4
Smoky Mouse	*Pseudomys fumeus*	#	-	EN	L	EN	RA	4
Australasian Bittern	*Botaurus poiciloptilus*	1998	5	EN	L	EN	VU	4
Plains-wanderer	*Pedionomus torquatus*	#	-	VU	L	CR	EN	4
Australian Painted Snipe	*Rostratula australis*	#	-	VU	L	CR	VU	4
Swift Parrot	*Lathamus discolor*	#	-	EN	L	EN	EN	4
Regent Honeyeater	*Anthochaera phrygia*	#	-	EN	L	CR	EN	4
Striped Legless Lizard	*Delma impar*	2009	47	VU	L	EN	VU	2
Corangamite Water Skink	*Eulamprus tympanum marnieae*	#	-	EN	L	CR	-	4
Growling Grass Frog	*Litoria raniformis*	1982	1	VU	L	EN	VU	4
Dwarf Galaxias	*Galaxiella pusilla*	#	-	VU	L	EN	VU	4
Australian Grayling	*Prototroctes maraena*	#	-	VU	L	VU	VU	4
Murray Cod	*Maccullochella peelii*	#	-	VU	L	VU	-	4
Golden Sun Moth	*Synemon plana*	#	-	CR	L	CR	-	4
STATE SIGNIFICANCE								
Brown Treecreeper (south-eastern ssp.)	Climacteris picumnus victoriae	2015	1	-	-	NT	NT	1
Magpie Goose	*Anseranas semipalmata*	1994	1	-	L	NT	-	4
Musk Duck	*Biziura lobata*	2005	37	-	-	VU	-	4

Common Name	Scientific Name	Last Documented Record (VBA)	# Records (VBA)	EPBC Act	FFG ACT	DSE (2013)	National Action Plan	Likelihood of occurrence
Freckled Duck	*Stictonetta naevosa*	1999	3	-	L	EN	-	4
Australasian Shoveler	*Anas rhynchotis*	2005	56	-	-	VU	-	4
Hardhead	*Aythya australis*	2003	23	-	-	VU	-	4
Blue-billed Duck	*Oxyura australis*	2002	15	-	L	EN	-	4
Eastern Great Egret	*Ardea modesta*	2002	21	-	L	VU	-	4
Intermediate Egret	*Ardea intermedia*	1990	1	-	L	EN	-	4
Little Egret	*Egretta garzetta nigripes*	1990	2	-	L	EN	-	4
Black Falcon	*Falco subniger*	1990	2	-	-	VU	-	4
Brolga	*Grus rubicunda*	2005	17	-	L	VU	-	4
Lewin's Rail	*Lewinia pectoralis pectoralis*	1987	1	-	L	VU	NT	4
Baillon's Crake	*Porzana pusilla palustris*	2001	1	-	L	VU	-	4
Black-tailed Godwit	*Limosa limosa*	1952	1	-	-	VU	-	4
Common Greenshank	*Tringa nebularia*	1999	5	-	-	VU	-	4
Powerful Owl	*Ninox strenua*	1977	1	-	L	VU	-	4
Barking Owl	*Ninox connivens connivens*	1977	1	-	L	EN	NT	4
Diamond Firetail	*Stagonopleura guttata*	1990	1	-	L	NT	NT	3
Tussock Skink	*Pseudemoia pagenstecheri*	2009	79	-	-	VU	-	2
Southern Pygmy Perch	*Nannoperca australis*	2006	1	-	-	-	-	4
Yellow Sedge-skipper	*Hesperilla flavescens flavescens*	1989	2	-	L	VU	LC	4
REGIONAL SIGNIFICANCE								
Fat-tailed Dunnart	*Sminthopsis crassicaudata*	2009	27	-	-	NT	-	2
Pied Cormorant	*Phalacrocorax varius*	1995	2	-	-	NT	-	4
Glossy Ibis	*Plegadis falcinellus*	1994	1	-	-	NT	-	4

Common Name	Scientific Name	Last Documented Record (VBA)	# Records (VBA)	EPBC Act	FFG ACT	DSE (2013)	National Action Plan	Likelihood of occurrence
Royal Spoonbill	*Platalea regia*	1994	1	-	-	NT	-	4
Latham's Snipe	*Gallinago hardwickii*	1987	3	-	-	NT	-	4
Long-toed Stint	*Calidris subminuta*	1967	1	-	-	NT	-	4
Whiskered Tern	*Chlidonias hybridus javanicus*	2004	20	-	-	NT	-	4
Azure Kingfisher	*Alcedo azurea*	1977	1	-	-	NT	-	4
Long-necked Turtle	*Chelodina longicollis*	1990	1	-	-	DD	-	4

Notes: EPBC = Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), FFG = Flora and Fauna Guarantee Act 1988 (FFG Act), DSE = Advisory List of Threatened Fauna in Victoria (DSE 2013), # = Records identified from EPBC Act Protected Matters Search Tool, EX = Extinct, CR = Critically endangered, EN = Endangered, VU = Vulnerable, K = Poorly Known, X = Extinct, e = Endangered, v = Vulnerable, r = Rare, k = Poorly Known, L = Listed.

Data sources: Victorian Biodiversity Atlas (DEPI 2014); Victorian Fauna Database (Viridans 2014b); Protected Matters Search Tool (DoE 2015); and the current site assessment.

Taxonomic order: Mammals (Strahan 1995 in Menkhorst & Knight 2004); Birds (Christidis & Boles, 2008); Reptiles and Amphibians (Cogger et al. 1983 in Cogger 1996); Fish (Nelson 1994); Mussels & Crustaceans (Alphabetical); Invertebrates (Alphabetical).

Likelihood: Habitat characteristics of significant fauna species previously recorded within 10 kilometres of the study area, or that may potentially occur within the study area were assessed to determine their likelihood of occurrence. The likelihood of occurrence rankings are defined below.

1 - High Likelihood
- Known resident in the study area based on site observations, database records, or expert advice; and/or,
- Recent records (i.e. within five years) of the species in the local area (DEPI 2014); and/or,
- The study area contains the species' preferred habitat.

2 - Moderate Likelihood
- The species is likely to visit the study area regularly (i.e. at least seasonally); and/or,
- Previous records of the species in the local area (DEPI 2014); and/or,
- The study area contains some characteristics of the species' preferred habitat.

3 - Low Likelihood
- The species is likely to visit the study area occasionally or opportunistically whilst en route to more suitable sites; and/or,
- There are only limited or historical records of the species in the local area (i.e. more than 20 years old); and/or,
- The study area contains few or no characteristics of the species' preferred habitat.

4 - Unlikely
- No previous records of the species in the local area; and/or,
- The species may fly over the study area when moving between areas of more suitable habitat; and/or,
- Out of the species' range; and/or,
- No suitable habitat present.

Appendix 3.3 – Migratory Birds

Table A3.3. Migratory birds listed under the Bonn Convention, CAMBA, JAMBA or ROKAMBA agreements, within 10 kilometres of the study area.

Common name	Scientific name	Count	Year	FFG	DSE	EPBC	Location	LONG_DD94	LAT_DD94	TREATY
Black-tailed Godwit	*Limosa limosa*	-	1952	-	vu	-	10' BLOCK CONTAINING WILLAURA NORTH	142.8346	-37.4985	BONNA2H,CAMBA,JAMBA,ROKAMBA
Cattle Egret	*Ardea ibis*	5	2002	-	-	-	Lake Buninjon	142.7854	-37.4751	CAMBA,JAMBA
Clamorous Reed Warbler	*Acrocephalus stentoreus*	-	1980	-	-	-	LANGI LOGAN SOUTH	142.918	-37.4151	BONNA2H
Clamorous Reed Warbler	*Acrocephalus stentoreus*	-	1980	-	-	-	LANGI LOGAN SOUTH	142.918	-37.4151	BONNA2H
Clamorous Reed Warbler	*Acrocephalus stentoreus*	-	1990	-	-	-	24 km SW of Ararat	142.8058	-37.4765	BONNA2H
Clamorous Reed Warbler	*Acrocephalus stentoreus*	-	2000	-	-	-	Lake Buninjon	142.7923	-37.4822	BONNA2H
Common Greenshank	*Tringa nebularia*	1	1986	-	vu	-	Not provided	142.7791	-37.4941	BONNA2H,CAMBA,JAMBA,ROKAMBA
Common Greenshank	*Tringa nebularia*	3	1987	-	vu	-	Lake Buninjon	142.7854	-37.4751	BONNA2H,CAMBA,JAMBA,ROKAMBA
Common Greenshank	*Tringa nebularia*	4	1987	-	vu	-	Lake Buninjon	142.7854	-37.4751	BONNA2H,CAMBA,JAMBA,ROKAMBA
Common Greenshank	*Tringa nebularia*	2	1987	-	vu	-	Shooters Swamp(Buninjon Swamp)	142.7722	-37.4933	BONNA2H,CAMBA,JAMBA,ROKAMBA
Common Greenshank	*Tringa nebularia*	-	1999	-	vu	-	Bunijon Swamp	142.7855	-37.4814	BONNA2H,CAMBA,JAMBA,ROKAMBA
Curlew Sandpiper	*Calidris ferruginea*	-	1991	-	en	-	Lake Buninjon	142.7854	-37.4751	BONNA2H,CAMBA,JAMBA,ROKAMBA
Curlew Sandpiper	*Calidris ferruginea*	4	2004	-	en	-	NA	142.7888	-37.4768	BONNA2H,CAMBA,JAMBA,ROKAMBA
Double-banded Plover	*Charadrius bicinctus*	34	1986	-	-	-	Not provided	142.778	-37.4481	BONNA2H
Double-banded Plover	*Charadrius bicinctus*	-	1991	-	-	-	Lake Buninjon	142.7854	-37.4751	BONNA2H
Eastern Great Egret	*Ardea modesta*	-	1977	L	vu	-	WILLAURA NORTH	142.7513	-37.4151	CAMBA,JAMBA
Eastern Great Egret	*Ardea modesta*	-	1986	L	vu	-	Lake Buninjon	142.7854	-37.4751	CAMBA,JAMBA
Eastern Great Egret	*Ardea modesta*	-	1986	L	vu	-	Lake Buninjon	142.7854	-37.4751	CAMBA,JAMBA
Eastern Great Egret	*Ardea modesta*	-	1986	L	vu	-	Lake Buninjon	142.7854	-37.4751	CAMBA,JAMBA
Eastern Great Egret	*Ardea modesta*	-	1986	L	vu	-	Lake Buninjon	142.7854	-37.4751	CAMBA,JAMBA
Eastern Great Egret	*Ardea modesta*	1	1987	L	vu	-	Lake Buninjon	142.7854	-37.4751	CAMBA,JAMBA
Eastern Great Egret	*Ardea modesta*	1	1987	L	vu	-	Lake Buninjon	142.7854	-37.4751	CAMBA,JAMBA
Eastern Great Egret	*Ardea modesta*	3	1988	L	vu	-	Lake Buninjon	142.7854	-37.4751	CAMBA,JAMBA

Common name	Scientific name	Count	Year	FFG	DSE	EPBC	Location	LONG_DD94	LAT_DD94	TREATY
Eastern Great Egret	*Ardea modesta*	1	1989	L	vu	-	Lake Buninjon	142.7854	-37.4751	CAMBA,JAMBA
Eastern Great Egret	*Ardea modesta*	2	1990	L	vu	-	Lake Buninjon	142.7854	-37.4751	CAMBA,JAMBA
Eastern Great Egret	*Ardea modesta*	3	1990	L	vu	-	BUNINJON L	142.7854	-37.4751	CAMBA,JAMBA
Eastern Great Egret	*Ardea modesta*	2	1990	L	vu	-	Lake Buninjon	142.7854	-37.4751	CAMBA,JAMBA
Eastern Great Egret	*Ardea modesta*	100	1990	L	vu	-	24 km SW of Ararat	142.8058	-37.4765	CAMBA,JAMBA
Eastern Great Egret	*Ardea modesta*	1	1992	L	vu	-	Lake Buninjon	142.7854	-37.4751	CAMBA,JAMBA
Eastern Great Egret	*Ardea modesta*	1	1994	L	vu	-	Shooters Swamp(Buninjon Swamp)	142.7722	-37.4933	CAMBA,JAMBA
Eastern Great Egret	*Ardea modesta*	1	1995	L	vu	-	Shooters Swamp(Buninjon Swamp)	142.7722	-37.4933	CAMBA,JAMBA
Eastern Great Egret	*Ardea modesta*	-	2000	L	vu	-	Lake Buninjon	142.7923	-37.4822	CAMBA,JAMBA
Eastern Great Egret	*Ardea modesta*	1	2001	L	vu	-	Lake Buninjon	142.7854	-37.4751	CAMBA,JAMBA
Eastern Great Egret	*Ardea modesta*	2	2001	L	vu	-	Lake Buninjon	142.7854	-37.4751	CAMBA,JAMBA
Eastern Great Egret	*Ardea modesta*	4	2002	L	vu	-	NWL	142.7831	-37.4751	CAMBA,JAMBA
Eastern Great Egret	*Ardea modesta*	1	2002	L	vu	-	Lake Buninjon	142.7854	-37.4751	CAMBA,JAMBA
Glossy Ibis	*Plegadis falcinellus*	5	1994	-	nt	-	Shooters Swamp(Buninjon Swamp)	142.7722	-37.4933	BONNA2S,CAMBA
Latham's Snipe	*Gallinago hardwickii*	1	1986	-	nt	-	Lake Buninjon	142.7854	-37.4751	BONNA2H,CAMBA,JAMBA,ROKAMBA
Latham's Snipe	*Gallinago hardwickii*	1	1986	-	nt	-	Lake Buninjon	142.7854	-37.4751	BONNA2H,CAMBA,JAMBA,ROKAMBA
Latham's Snipe	*Gallinago hardwickii*	1	1987	-	nt	-	Lake Buninjon	142.7854	-37.4751	BONNA2H,CAMBA,JAMBA,ROKAMBA
Long-toed Stint	*Calidris subminuta*	-	1967	-	nt	-	10' BLOCK CONTAINING WILLAURA NORTH	142.8346	-37.4985	BONNA2H,CAMBA,JAMBA,ROKAMBA
Rainbow Bee-eater	*Merops ornatus*	-	1977	-	-	-	WILLAURA NORTH	142.7513	-37.4151	JAMBA
Red-necked Stint	*Calidris ruficollis*	-	1980	-	-	-	LANGI LOGAN SOUTH	142.918	-37.4151	BONNA2H,CAMBA,JAMBA,ROKAMBA
Red-necked Stint	*Calidris ruficollis*	-	1980	-	-	-	LANGI LOGAN SOUTH	142.918	-37.4151	BONNA2H,CAMBA,JAMBA,ROKAMBA
Red-necked Stint	*Calidris ruficollis*	3	1986	-	-	-	Not provided	142.8587	-37.4676	BONNA2H,CAMBA,JAMBA,ROKAMBA
Red-necked Stint	*Calidris ruficollis*	6	1986	-	-	-	Not provided	142.7791	-37.4941	BONNA2H,CAMBA,JAMBA,ROKAMBA
Red-necked Stint	*Calidris ruficollis*	11	1987	-	-	-	Not provided	142.7669	-37.5069	BONNA2H,CAMBA,JAMBA,ROKAMBA
Red-necked Stint	*Calidris ruficollis*	1	1987	-	-	-	Not provided	142.7758	-37.5013	BONNA2H,CAMBA,JAMBA,ROKAMBA
Red-necked Stint	*Calidris ruficollis*	-	1991	-	-	-	Lake Buninjon	142.7854	-37.4751	BONNA2H,CAMBA,JAMBA,ROKAMBA
Red-necked Stint	*Calidris ruficollis*	50	2004	-	-	-	NA	142.7888	-37.4768	BONNA2H,CAMBA,JAMBA,ROKAMBA

Common name	Scientific name	Count	Year	FFG	DSE	EPBC	Location	LONG_DD94	LAT_DD94	TREATY
Rufous Fantail	*Rhipidura rufifrons*	-	1977	-	-	-	WILLAURA NORTH	142.7513	-37.4151	BONNA2H
Sharp-tailed Sandpiper	*Calidris acuminata*	-	1980	-	-	-	LANGI LOGAN SOUTH	142.918	-37.4151	BONNA2H,CAMBA,JAMBA,ROKAMBA
Sharp-tailed Sandpiper	*Calidris acuminata*	-	1980	-	-	-	LANGI LOGAN SOUTH	142.918	-37.4151	BONNA2H,CAMBA,JAMBA,ROKAMBA
Sharp-tailed Sandpiper	*Calidris acuminata*	8	1986	-	-	-	Not provided	142.7791	-37.4941	BONNA2H,CAMBA,JAMBA,ROKAMBA
Sharp-tailed Sandpiper	*Calidris acuminata*	30	1986	-	-	-	Lake Buninjon	142.7854	-37.4751	BONNA2H,CAMBA,JAMBA,ROKAMBA
Sharp-tailed Sandpiper	*Calidris acuminata*	6	1987	-	-	-	Lake Buninjon	142.7854	-37.4751	BONNA2H,CAMBA,JAMBA,ROKAMBA
Sharp-tailed Sandpiper	*Calidris acuminata*	200	2004	-	-	-	NA	142.7888	-37.4768	BONNA2H,CAMBA,JAMBA,ROKAMBA

Notes: EPBC = Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act-), FFG = Flora and Fauna Guarantee Act 1988 (FFG Act), DSE = Advisory List of Threatened Fauna in Victoria (DSE 2013), BONNA2H = Bonn Convention Agreement; CAMBA = China Australia Migratory Bird Agreement; JAMBA = Japan Australia Migratory Bird Agreement; ROKAMBA = Republic of Korea Australia Migratory Bird Agreement; EX = Extinct, CR = Critically endangered, EN = Endangered, VU = Vulnerable, K = Poorly Known, X = Extinct, e = Endangered, v = Vulnerable, r = Rare, k = Poorly Known, L = Listed.