Draft Report

Existing Ecological Conditions: Merrimu Precinct Structure Plan, Victoria

Prepared for

Bacchus Marsh Developments Pty Ltd on behalf of the Victorian Planning Authority

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GLOSSARY

Acronym	Description
AVW	Atlas of Victorian Wildlife
CaLP Act	Victorian *Catchment and Land Protection Act 1994*
CAMBA	China Australia Migratory Bird Agreement
CMA	Catchment Management Authority
DAWE	Commonwealth Department of Agriculture, Water and the Environment
DELWP	Victorian Department of Environment, Land, Water and Planning
DoEE	(former) Commonwealth Department of the Environment and Energy
EES	Environment Effects Statement
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EVC	Ecological Vegetation Class
FFG Act	Victorian *Flora and Fauna Guarantee Act 1988*
GGF	Growling Grass Frog *Litoria raniformis*
GSM	Golden Sun Moth *Synemon plana*
HabHa	Habitat Hectare
JAMBA	Japan Australia Migratory Bird Agreement
NES	National Environmental Significance
NTGVVP	Natural Temperate Grassland of the Victorian Volcanic Plain ecological community
NVIM Tool	Native Vegetation Information Management Tool (DELWP)
NVPP	Native Vegetation Precinct Plan
PMST	Protected Matters Search Tool
PSP	Precinct Structure Plan.
SLL	Striped Legless Lizard *Delma impar*
SRF	Spiny Rice-flower *Pimelea spinescens* subsp. *spinescens*
TRZ	Tree Retention Zone
VBA	Victorian Biodiversity Atlas
VPA	Victorian Planning Authority
VROT	Victorian Rare or Threatened species
WoNS	Weeds of National Significance

EXECUTIVE SUMMARY

Introduction

Ecology and Heritage Partners Pty Ltd was commissioned by Bacchus Marsh Developments Pty Ltd (herein referred to as BMD) in collaboration with the Victorian Planning Authority (VPA) to prepare an existing conditions report for land located within the Merrimu Precinct Structure Plan (PSP) area (the study area).

The Merrimu PSP is within an area identified for potential future urban development as part of the expansion of Bacchus Marsh, and Moorabool Shire Council and the Victorian Planning Authority (VPA) have jointly prepared the Bacchus Marsh Urban Growth Framework (UGF).

This report summarises the methods and results of ecological studies undertaken within the Merrimu PSP, including detailed desktop assessments, vegetation mapping and habitat assessments and provides a single, consolidated report detailing the methodology and results of all previous investigations. This baseline ecological data is intended to be used by the VPA and Moorabool Shire Council (i.e. Council) to inform land-use decisions, including which biodiversity values to avoid and/or minimise impacts to in the subsequent Precinct Structure Plan/Native Vegetation Precinct Plan preparation.

Methods

Relevant literature, online-resources and databases were reviewed to determine the flora and fauna values across the study area. This included EPBC Act policy statements for listed species and ecological communities, FFG Act Action Statements, National Recovery Plans, and State Advisory Lists.

A review of several ecological assessments that have previously been undertaken within the study area that describe the known or likely ecological values present, was undertaken to determine the potential occurrence of listed species and ecological communities.

The Merrimu PSP contains several discrete areas that have been subject to various levels of ecological assessment. These study areas are the BMD Land, Long Forest Estate, 'Other Assessed Land', and Desktop Assessment only.

The field surveys were undertaken by qualified ecologists and sought primarily to assess the extent and condition of native vegetation and potential flora and fauna habitat, with particular consideration given to significant species and ecological communities. Ecological surveys were undertaken to optimise the survey timing, methods and frequency to enable sampling of those flora and fauna species which occur on a seasonal basis. Vegetation within the study area was assessed according to the habitat hectare methodology, which is described in the Vegetation Quality Assessment Manual.

Where access to parcels within the PSP was not granted, accurate on-ground field assessments were not able to be undertaken. The potential presence of ecological values that may occur within parcels not accessed is based wholly on the modelled extent of ecological values as determined by the Department of Environment, Land, Water and Planning (DELWP), and those values known to occur within the immediate vicinity based on previous assessments undertaken by Ecology and Heritage Partners within adjacent land.

Targeted surveys were undertaken for nationally significant flora (Spiny Rice-flower *Pimelea spinescens* subsp. *spinescens*) and nationally significant fauna (Striped Legless Lizard *Delma impar*, Growling Grass Frog *Litoria*

raniformis and Golden Sun Moth *Synemon plana*). Survey timing and extent for each survey event is summarised in Table 1.

All fieldwork was carried out under the appropriate licences, including a Research Permit (1008283) and Scientific Procedures Fieldwork Licence (SPFL20005) issued by DELWP under the *Wildlife Act 1975,* and an Animal Research permit issued by the Wildlife and Small Institutions Animal Ethics Committee (05.17).

Results

Most of the study area is highly modified due to past and current agricultural and farming practices and is dominated by pasture supporting non-indigenous grasses and weeds. Much of the indigenous vegetation and terrestrial fauna habitat remaining within the study area are confined to escarpments or agricultural areas not subjected to historical cropping activities. Native vegetation, where present within existing farmland, is highly modified, with vegetation generally lacking structure and exhibiting a low diversity of native species.

Despite historical impacts, areas supporting ecological values areas ranged in cover and quality from small, isolated patches to larger and diverse patches of Plains Grassland qualifying as the nationally significant *Natural Temperate Grassland of the Victorian Volcanic Plain* ecological community.

Flora

A total of 157 flora species (83 indigenous and 74 non-indigenous or introduced) were recorded within the study area on accessible parcels during the field assessment.

The nationally significant Spiny Rice-flower *Pimelea spinescens* subsp. *spinescens* was recorded during targeted surveys across the BMD land. The State significant Fragrant Saltbush *Rhagodia parabolica*, Black Roly-poly *Sclerolaena muricata* var. *muricata*, Slender Bindweed *Convolvulus angustissimus* subsp. *omnigracilis*, Melbourne Yellow-gum *Eucalyptus leucoxylon* subsp. *connata* and Bacchus Marsh Wattle *Acacia rostriformis* were recorded within the study area, as well as 15 species 'protected' under the FFG Act.

Based on habitat condition, and the proximity of previous records, there is also suitable habitat within the study area for the State-significant Buloke *Allocasuarina luehmannii* and Buloke Mistletoe *Amyema linophylla* subsp. *orientalis,* as well as Plains Joyweed *Alternanthera* sp. 1 (Plains), Small Scurf-pea *Cullen parvum*, Cane Spear-grass *Austrostipa breviglumis*, Heath Spear-grass *Austrostipa exilis*, Tough Scurf-pea *Cullen tenax* and Austral Tobacco *Nicotiana suaveolens*, particularly in patches of higher quality Plains Grassland EVC.

Based on the landscape context, highly modified nature of the broader Merrimu PSP and extent of previous vegetation removal, the likelihood of any additional significant flora occurring within the Merrimu PSP is considered low due to the absence of suitable habitat and lack of records in close proximity.

Fauna

Ecological surveys of the study area recorded 74 species of fauna, including 65 native species and nine introduced species. The nationally significant Golden Sun Moth was confirmed to be present within several properties within the Merrimu PSP (Figure 4).

Despite targeted surveys being undertaken during optimal surveys conditions across multiple years, no Striped Legless Lizard were recorded, and based on the lack of records within the project locality, a population of Striped Legless Lizard is considered highly unlikely to be present in the Merrimu PSP.

No Growling Grass Frog were detected during the targeted surveys despite weather conditions being conducive for frogs to be active.

No State significant fauna have been recorded as part of the ecological assessments. Based on habitat condition, and the proximity of previous records, there is potential habitat within the Merrimu PSP for the State-significant Brown Treecreeper *Climacteris picumnus victoriae*, Hooded Robin *Melanodryas cucullata cucullata*, Diamond Firetail *Stagonopleura guttata*, Bullant *Myrmecia* sp. 17, Speckled Warbler *Chthonicola sagittatus*, Barking Owl *Ninox connivens connivens* as well as the Regionally significant Fat-tailed Dunnart and Spotted Harrier *Circus assimilis.*

Based on the results of the ecological surveys, habitat assessments and landscape context, the remaining State significant fauna species previously recorded, or considered as having potential habitat within the project locality have been assessed as having a low likelihood of occurrence within the study area.

Ecological Communities

Based on past and current mapping, a total of three significant ecological communities were recorded within the Merrimu PSP:

- 91.895 hectares of the nationally significant *Natural Temperate Grassland of the Victorian Volcanic Plain* ecological community;
- 90.065 hectares of the State significant *Western (Basalt) Plains Grassland* ecological community; and,
- 34.517 hectares of the State significant *Rocky Chenopod Open Scrub* ecological community.

A summary of the breakdown of ecological values recorded in the Merrimu PSP is provided below (Table S1).

Table S1. Summary of the ecological values within the Merrimu PSP

Species diversity	Moderate assemblage of plants and animals, with 157 flora species and 74 fauna species recorded during the field surveys.
Confirmed vegetation	• 195.934 hectares of mapped native vegetation represented by four EVCs: o Grassy Woodland (EVC 175) 5.824 hectares; o Plains Grassy Wetland (EVC 125) 0.087 hectares; o Low rainfall Plains Grassland (EVC 132_63) 154.694 hectares; o Rocky Chenopod Woodland (EVC 64) 35.329 hectares o 120 Scattered Trees o 71 Large Trees in Patches
Modelled Native Vegetation	• 90.176 hectares represented by four EVCs: o Grassy Woodland (EVC 175) 51.326 hectares; o Red Gum Swamp (EVC 292) 1.551 hectares; o Low rainfall Plains Grassland (EVC 132_63) 30.095 hectares; o Rocky Chenopod Woodland (EVC 64) 7.204 hectares

Significant ecological communities	• A total of 91.895 hectares of the nationally significant ecological community *Natural Temperate Grassland of the Victorian Volcanic Plain* is present in the study area; • A total of 90.065 hectares of the State significant Western (Basalt) Plains Grassland (WBPG) ecological community; • A total of 34.517 hectares of the State significant Rocky Chenopod Open Scrub Community ecological community.
Significant flora species	• Large population of the nationally significant Spiny Rice-flower was recorded in the study area. • The confirmed presence of five State-significant flora (Fragrant Saltbush, Melbourne Yellow-gum, Slender Bindweed, Black Roly-poly and Bacchus Marsh Wattle); • Suitable habitat for eight State significant flora (Buloke, Buloke Mistletoe, Plains Joyweed, Small Scurf-pea, Cane Spear-grass, Heath Spear-grass, Tough Scurf-pea and Austral Tobacco); • The presence of 15 flora species 'protected' under the FFG Act.
Significant fauna species	• Approximately 190.748 hectares of confirmed habitat for Golden Sun Moth; • Potential habitat for six State significant fauna (Brown Treecreeper, Hooded Robin, Diamond Firetail, Bullant, Speckled Warbler , Barking Owl) • Potential habitat for two Regionally significant fauna (Fat-tailed Dunnart and Spotted Harrier).

Recommendations

Based on the quality and extent of known habitats within the study area, it is highly likely that the extent of suitable habitat as shown on Figure 4 5 extends beyond areas adequately surveyed to date.

Given the time that has elapsed since the previous habitat hectare assessment within Long Forest Estate , it is recommended an updated assessment is undertaken to confirm the current quality and extent of native vegetation as well as the presence of suitable habitat for any significant flora and fauna.

Areas within the Merrimu PSP that have only been subject to a Desktop Assessment must also subject to on ground assessments to confirm the current quality and extent of native vegetation as well as the presence of suitable habitat for any significant flora and fauna.

Areas within the Merrimu PSP that have been identified as requiring further assessment are shown in Figure 6.

CONTENTS

1 INTRODUCTION

1.1 Background

Ecology and Heritage Partners Pty Ltd was commissioned by the Bacchus Marsh Developments (herein referred to as BMD) on behalf of the Victorian Planning Authority (herein referred to as the VPA) to undertake a suite of ecological investigations the land located within the proposed Merrimu Precinct Structure Plan (PSP) boundary (the study area) (Figure 1).

The Merrimu PSP is within an area identified for potential future urban development as part of the expansion of Bacchus Marsh, and Moorabool Shire Council and the VPA have jointly prepared the Bacchus Marsh Urban Growth Framework (UGF).

Bacchus Marsh Developments are a major landowner within the Merrimu PSP, and have previously engaged Ecology and Heritage Partners to undertake a suite of ecological investigations on land in which they have an interest in (i.e. the BMD Land) (Ecology and Heritage Partners 2018a, 2018b, 2019).

To inform the preparation of the Merrimu PSP, BMD have engaged Ecology and Heritage Partners to undertake additional assessments within other parcels within the Merrimu PSP. These assessments comprised a combination of high-level field assessments on parcels where access was granted, and desktop assessments where field assessments were not able to be undertaken. Further, Ecology and Heritage Partners have undertaken additional assessments elsewhere within the Merrimu PSP on behalf of Regional Roads Victoria (RRV) for the Bacchus Marsh Eastern Link Project (BMEL), with relevant information shared between RRV and BMD as part of a data sharing agreement between both parties.

This report summarises the methods and results of ecological studies undertaken within the Merrimu PSP, including detailed desktop assessments, vegetation mapping and habitat assessments and provides a single, consolidated report detailing the methodology and results of all previous investigations. This baseline ecological data is intended to be used by the VPA and Moorabool Shire Council (i.e. Council) to inform land-use decisions, including which biodiversity values to avoid and/or minimise impacts to in the subsequent Precinct Structure Plan/Native Vegetation Precinct Plan preparation.

1.1.1 Amendment C81 – Bacchus Marsh Urban Growth Framework

With the population of Bacchus Marsh expected to double from 20,000 to 40,000 residents by 2041, the draft UGF is crucial to guide growth. The Urban Growth Framework Plan was gazetted into the planning scheme on 6 December 2018 (Amendment C81).

Amendment C81 affects land in the urban and rural areas of Bacchus Marsh, Darley, Maddingley and Pentland Hills, together with the rural fringe areas of Merrimu, Parwan, Hopetoun Park, Coimadai (part), Long Forest (part) and Rowsley (part).

Amendment C81 promotes coordinated, master-planned development of identified areas in and around Bacchus Marsh, by identifying a need to:

- Contain short to medium term residential development within the existing settlement boundary (infill and greenfield);

- Prepare for medium to long term residential growth within the investigation areas at Merrimu, Parwan Station and Hopetoun Park;
- Require precinct structure plans for any urban growth precincts at Merrimu and Parwan Station, and a development plan for any growth precinct at Hopetoun Park, and ensure that such plans provide for appropriate community and social infrastructure, activity centres, schools, integrated transport, reticulated services and local job opportunities;
- Prepare a precinct structure plan for Parwan Employment Precinct, to address key infrastructure and land use priorities that will deliver value-added and vertically or horizontally integrated agribusiness/industries; and
- Work with State Government and other relevant servicing authorities towards the servicing of Parwan Employment Precinct, with particular emphasis on the provision of reticulated water and gas.

It is important to note that Amendment C81 does not rezone any land. It provides a strategic framework for determining where future urban growth precincts and employment growth precincts will occur. A future, separate planning scheme amendment will be required, to identify exact boundaries for these precincts and to rezone land to facilitate master-planned urban development.

1.2 Objectives

The purpose of the works was to review the previous assessments undertaken within the Merrimu PSP area, and provide a single, consolidated report to provide a baseline assessment to quantify the extent and type of native vegetation present within the Merrimu PSP and to determine the likely presence, or otherwise, of significant flora and fauna species and/or ecological communities. The information presented in this report is based on a detailed desktop review and field assessment of accessible land within the PSP undertaken between 2013 and 2020.

Specifically, the following have been undertaken as part of the project:

- Identification, assessment, and mapping of areas supporting native vegetation and fauna habitat, including a determination of conservation significance;
- Data collection at sufficient detail and standard that enables a biodiversity assessment and associated NVPPs to be prepared in accordance with DELWP's – *Preparing a Native Vegetation Precinct Plan* (DELWP 2017a);
- Collection and presentation of biodiversity values to allow integration with the planning and development of the PSP; and,
- Advise whether any additional flora and/or fauna surveys are required (e.g. targeted surveys for significant flora and fauna species) to inform future approvals within the PSP.

1.3 Study Area

Merrimu is located north-east of the Bacchus Marsh town centre, and east of Darley (Figure 1). It is physically separated from the centre of Bacchus Marsh by the Bacchus Marsh Irrigation District and the Western Freeway. It features strong links into the centre of Bacchus Marsh via Gisborne Road.

The Merrimu PSP sits on an elevated plateau. Land within the precinct is relatively flat but is characterised by a dramatic escarpment where the land falls away to the Irrigation District to the south. The Merrimu PSP is currently mostly rural in use, with a pocket of rural residential/lifestyle blocks in its south-east.

The land within and surrounding the Merrimu PSP predominantly supports agricultural activities in the form of grazing, cropping, market gardens, orchards, and vineyards. Two operating quarries are located immediately to the west of the PSP boundary, while the Long Forest Flora and Fauna Reserve is located to the east of Bences road in close proximity to the study area (Figure 1).

The study area is generally flat, aside from several escarpments located to the west and south of the study area. The headwaters of several designated waterways commence within the Merrimu PSP and follow the escarpments into lower lying areas to the east and west.

Erosion is evident throughout all observed escarpments and has resulted in a shallow soil profile at both the top and mid-slope of these the escarpments. The location of waterways, escarpments, steep slopes and erosion within the study area is shown in Figure 1 and Figure 3.

According to the Department of Environment, Land, Water and Planning (DELWP) Native Vegetation Information Management (NVIM) Tool (DELWP 2021a), the study area occurs within the Victorian Volcanic Plain and Central Victorian Uplands bioregions. It is located within the jurisdiction of the Port Philip and Westernport Catchment Management Authority (CMA) and the Moorabool Shire Council municipality.

The Merrimu PSP contains several discrete areas that have been subject to various levels of ecological assessment. These study areas (as shown in Figure 2) are:

1.3.1 BMD Land

The study area covers approximately 435 hectares and comprises 17 properties bound by Gisborne Road to the west, and Bences Road to the east. Several detailed ecological investigations (including targeted surveys) were undertaken between August 2017 and July 2018 across the BMD Land (Ecology and Heritage Partners 2018a, 2018b, 2019a).

1.3.2 Long Forest Estate

The land known as Long Forest Estate covers approximately 107 hectares and is located in the eastern section of the Merrimu PSP abutting the Long Forest Nature Conservation Reserve (Figure 2). Several on-ground ecological investigations (including targeted surveys) were undertaken between August 2012 and December 2012 across the Long Forest Estate (Ecology and Heritage Partners 2013a; 2013b).

More recent ecological assessments were undertaken within Long Forest Estate in November and December 2019 as part of the BMEL investigations (Ecology and Heritage Partners 2020a).

It should be noted that Ecology and Heritage Partners were not engaged to undertake an updated Biodiversity Assessment/habitat hectare assessment within Long Forest Estate as part of the recent suite of ecological investigations.

1.3.3 Other Assessed Areas

Additional parcels of land within the Merrimu PSP (outside of the BMD Land and Long Forest Estate) (as shown in Figure 2) were subject to a Biodiversity Assessment with the intention of mapping the quality and extent of native vegetation and identifying the potential presence of habitat for significant flora or fauna (Ecology and Heritage Partners 2019b; 2020b).

It should be noted that Ecology and Heritage Partners were not engaged to undertake targeted surveys throughout all areas of suitable habitat as part of the recent suite of ecological investigations. However, it is noted that as part of works Ecology and Heritage Partners undertook on behalf of RRV, targeted surveys for significant species were undertaken in these parcels only where there was overlap with areas assessed as part of the BMEL investigations (Ecology and Heritage Partners 2020a).

1.3.4 Desktop Assessments Only

Where access to parcels within the Merrimu PSP was not secured, accurate on-ground field assessments were not able to be undertaken. The potential presence of ecological values that may occur within parcels not accessed is based wholly on the modelled extent of ecological values as determined by the DELWP (DELWP 2021a), or those values known to occur due to previous assessments undertaken by Ecology and Heritage Partners within adjacent land (Ecology and Heritage Partners 2020b).

Where visible, the extent of mapped native vegetation within such areas was estimated. These areas require further on ground assessment to confirm the extent and quality of native vegetation. Properties where access was not permitted during on-ground assessments are shown in Figure 2.

2 METHODS

The following provides information relating to the desk-based and field methods undertaken to survey the current environment as well as the methods used to assess the likelihood of significant flora and fauna species occurring within the study area. This include how the survey effort, design and methods for each of the relevant ecological values were undertaken in accordance with the Commonwealth and Victorian flora and fauna survey guidelines. The methods detailed below are in accordance with the standard ecological assessment requirements used to inform the precinct structure planning process (DELWP 2017a).

2.1 Nomenclature

Common and scientific names of vascular plants follow the Victorian Biodiversity Atlas (VBA) (DELWP 2020a) and the Census of Vascular Plants of Victoria (Walsh and Stajsic 2007). Vegetation community names follow DELWP's EVC benchmarks (DELWP 2021c). The names of aquatic and terrestrial vertebrate and invertebrate fauna follow the VBA (DELWP 2020a).

2.2 Desktop Assessment

Relevant literature, online-resources and 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 NVIM Tool (DELWP 2021a) and NatureKit Map (DELWP 2021b) for:
    - Modelled data for location category, remnant vegetation patches, scattered trees and habitat for rare or threatened species;
    - The extent of historic and current EVCs;
    - Previously documented flora and fauna records within the project locality
- The Victorian Biodiversity Atlas (VBA) for previously documented flora and fauna records within the project locality (DELWP 2020a);
- EVC benchmarks (DELWP 2021c) for descriptions of EVCs within the Victorian Volcanic Plain and Otway Plain bioregions;
- VicPlan Online (DELWP 2021d) to ascertain current zoning and environmental overlays in the study area;
- The Illustrated Flora Information System of Victoria (IFLISV) (Gullan 2017) for assistance with the distribution and identification of flora species;
- The Commonwealth Department of Agriculture Water and the Environment (DAWE) Protected Matters Search Tool (PMST) for matters of National Environmental Significance (NES) protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (DAWE 2021);
- Relevant listings under the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act), including the latest Threatened and Protected Lists (DELWP 2019a; 2019b; 2020b);

- Aerial photography of the study area;
- Relevant environmental legislation and policies pertaining to target species including EPBC Act Policy Statements, FFG Act Action Statements, National Recovery Plans, Advisory Lists, including;
    - DEWHA 2009a. Significant impact guidelines for the critically endangered spiny rice-flower (*Pimelea spinescens* subsp. *Spinescens*).
    - DEWHA 2009b. Significant impact guidelines for the critically endangered Golden Sun Moth (*Synemon plana*).
    - DEWHA 2009c. Background Paper to EPBC Act Policy Statement 3.12 – Nationally Threatened Species and Ecological Communities Significant Impact Guidelines for the Critically Endangered Golden Sun Moth (*Synemon plana*).
    - DoE 2013. Significant Impact Guidelines 1.1. Matters of National Environmental Significance. Commonwealth Department of the Environment, Canberra, ACT.
    - DSEWPaC 2011a. *Environment Protection and Biodiversity Conservation Act 1999*. Referral guidelines for the vulnerable striped legless lizard, *Delma impar*.
    - DSEWPaC 2011b. Survey Guidelines for Australia's threatened reptiles. Guidelines for detecting reptiles listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999.*
    - DSEWPaC 2011c. Nationally Threatened Ecological Communities of the Victorian Volcanic Plain: Natural Temperate Grassland and Grassy Eucalypt Woodland A guide to the identification, assessment and management of nationally threatened ecological communities *Environment Protection and Biodiversity Conservation Act 1999*.
- Previous Assessments within or adjacent to the Merrimu PSP, including:
    - Ecology and Heritage Partners 2013a. Flora and Fauna assessment, and Net Gain analysis at Long Forest Estate, Merrimu, Victoria.
    - Ecology and Heritage Partners 2013b. Targeted flora and fauna surveys at Long Forest Estate, Merrimu, Victoria.
    - Ecology and Heritage Partners 2018a. Targeted surveys for Golden Sun Moth *Synemon plana* and Striped Legless Lizard *Delma impar*: Bacchus Marsh Development Project, Bacchus Marsh, Victoria.
    - Ecology and Heritage Partners 2018b. Ecological Assessment: Bacchus Marsh Development Project, Victoria. Report prepared for Bacchus Marsh Developments on behalf of the Victorian Planning Authority.
    - Ecology and Heritage Partners 2019a. Ecological Assessment for state significant values: Merrimu Precinct Structure Plan, Victoria. Report prepared for Bacchus Marsh Developments on behalf of the Victorian Planning Authority.
    - Ecology and Heritage Partners 2019b. Existing Ecological Conditions Report: Merrimu Precinct Structure Plan (part), Victoria. Report prepared for Bacchus Marsh Developments on behalf of the Victorian Planning Authority.

- Ecology and Heritage Partners 2020a. Ecological Assessments of 12 Alignment Options for the Bacchus Marsh Eastern Link Project, Bacchus, Victoria. Prepared for Regional Roads Victoria.
- Ecology and Heritage Partners 2020b. Ecological Values: Merrimu Precinct Structure Plan Areas 1-6, Victoria. Report prepared for Bacchus Marsh Developments.
- Practical Ecology 2016. Bacchus Marsh Environmental Assessment. Prepared for Moorabool Shire Council.

2.3 Field Assessments

The below methods are based on works undertaken within the Merrimu PSP, with the inclusion of relevant data shared by agreement with the Bacchus Marsh Eastern Link (BMEL) Project funded by Regional Roads Victoria.

The ecological field assessment program detailed in this report was completed by qualified ecologists within the Merrimu PSP between August 2012 and January 2020. The field assessments sought primarily to assess the extent and condition of native vegetation communities and potential flora and fauna habitat, with consideration given to significant ecological communities and species of conservation concern, such as threatened and migratory species. The survey program was designed to optimise the survey timing, methods and frequency to enable sampling of those flora and fauna species which occur seasonally.

All fieldwork was carried out under the appropriate licences, including a Research Permit (1008283) and Scientific Procedures Fieldwork Licence (SPFL20005) issued by DELWP under the *Wildlife Act 1975*, and an Animal Research permit issued by the Wildlife and Small Institutions Animal Ethics Committee (05.17).

The timing and extent of each survey event is summarised below (Table 1).

Table 1. Survey schedule for the ecological assessment program.

Ecological Value	Species / Community	Survey Dates	Resources	Location
Threatened Ecological Communities	NTGVVP Ecological Community	Long Forest Estate 20, 27, 30-31 Oct, 3-6 Nov 2012 BMD Land 15-17 Aug; 10 Sep, 25 Oct, 8 Dec 2017; 3 Jul 2018 Other Assessed Land 9, 18 Dec 2018; 21 Jan; 21-23 Aug 2019; 31 Jan 2020.	4 x ecologists	Throughout study areas Figure 2 and 3.
Threatened EPBC Act Fauna Species	Striped Legless Lizard *Delma impar* (Tile Checks)	Long Forest Estate 20 Oct – 20 Dec 2012 (8 checks) BMD Land 28 Sep – 24 Nov 2017 (6 checks) Other Assessed Land 16 Dec 2019 – 3 Feb 2020 (8 checks) 2 Oct – 2 Dec 2020 (8 checks)	2 x ecologists	Figure 4.

Ecological Value	Species / Community	Survey Dates	Resources	Location
	Growling Grass Frog *Litoria raniformis*	Other Assessed Land 23, 28 Dec 2019	2 x ecologists	Dams, Lerderderg and Werribee River Figure 4
	Golden Sun Moth *Synemon plana*	Long Forest Estate 7-18 Dec 2012 BMD Land 30 Nov 2017 – 3 Jan 2018 Other Assessed Land 16 Dec 2019 – 8 Jan 2020	4 x ecologists	Figure 4
Threatened EPBC Act Flora Species	Large-headed Fireweed *Senecio macrocarpus*	Long Forest Estate 30 Oct; 3, 6 Nov; 7, 11, 18 Dec 2012	4 x ecologists	Figure 5.
	Matted Flax-lily *Dianella amoena*	Long Forest Estate 30 Oct; 3, 6 Nov; 7, 11, 18 Dec 2012	4 x ecologists	Figure 5
	Clover Glycine *Glycine latrobeana*	Long Forest Estate 30 Oct; 3, 6 Nov; 7, 11, 18 Dec 2012	4 x ecologists	Figure 5
	Button Wrinklewort *Rutidosis leptorhynchoides*	Long Forest Estate 30 Oct; 3, 6 Nov; 7, 11, 18 Dec 2012	4 x ecologists	Figure 5
	Spiny Rice-flower *Pimelea spinescens* subsp. *spinescens*	Long Forest Estate 24 May; 5, 8, 12 Jul 2013. 20-23 and 27-28 Aug; 3-4 Sep 2019. BMD Land 17, 21, 24, 31 Aug;4-5 Sep 2017; 3 Jul 2018. Other Assessed Land 20-23 Aug 2019	4-6 ecologists	Figure 5
FFG Act and VROT Flora	FFG Act Protected Species (i.e. Acacias, Daisies, Orchids)	Long Forest Estate 30-31 Oct 2012 BMD Land 15-17 Aug; 10 Sep, 25 Oct, 8 Dec 2017; 3 Jul 2018 Other Assessed Land 9, 18 Dec 2018; 21 Jan; 21-23 Aug 2019; 31 Jan 2020.	4 x ecologists	Throughout
	VROT	Long Forest Estate 30-31 Oct 2012; 30 Oct; 3, 6 Nov; 7, 11, 18 Dec 2012; 27-28 Aug; 3-4, Sep 2019. BMD Land 15-17 Aug; 10 Sep, 25 Oct, 8 Dec 2017; 3 Jul 2018 Other Assessed Land 9, 18 Dec 2018; 21 Jan; 21-23 Aug 2019; 31 Jan 2020.	4 x ecologists 4 x ecologists	Throughout

Ecological Value	Species / Community	Survey Dates	Resources	Location
FFG Act and VROT Fauna	Tussock Skink *Pseudemoia pagenstecheri* and Fat-tailed Dunnart *Sminthopsis crassicaudata* and Common Dunnart *Sminthopsis murina murina*	Long Forest Estate 20 Oct – 20 Dec 2012 (8 checks) BMD Land 28 Sep – 24 Nov 2017 (6 checks) Other Assessed Land 16 Dec 2019 – 3 Feb 2020 (8 checks) 2 Oct – 2 Dec 2020 (8 checks)	2 x ecologists	Figure 4.
	Western (Basalt) Plains Grassland	Long Forest Estate 20, 27, 30-31 Oct, 3-6 Nov 2012 BMD Land 15-17 Aug; 10 Sep, 25 Oct, 8 Dec 2017; 3 Jul 2018 Other Assessed Land 9, 18 Dec 2018; 21 Jan; 21-23 Aug 2019; 31 Jan 2020.	4 x ecologists	Throughout. See Figures 2 and 3.
Habitat Hectare Assessment	Patches of Native Vegetation, Large Trees and Scattered Trees	Long Forest Estate 20, 27, 30-31 Oct, 3-6 Nov 2012 BMD Land 15-17 Aug; 10 Sep, 25 Oct, 8 Dec 2017; 3 Jul 2018 Other Assessed Land 9, 18 Dec 2018; 21 Jan; 21-23 Aug 2019; 31 Jan 2020.	VQA Methodology	Throughout. See Figures 2 and 3.

Note: * Optimal timing based on flowering season, or when the species can be reliably identified using other morphological features.

2.3.1 Ecological Assessment (including Habitat Hectare Assessment)

Detailed ecological assessments were undertaken by botanists accredited by DELWP in the habitat hectare methodology (DSE 2004) to quantify the quality and extent of native vegetation values within the study area, identify flora and fauna habitat values within the study area, and to determine conditions with reference to findings of the desk-based assessment.

The accessible parcels were walked and/or driven, with all observed vascular flora and fauna species recorded, any significant records mapped and the overall condition of vegetation and habitats noted. Native vegetation in the local area was also investigated to assist in determining the pre-European vegetation within the study area. Ecological Vegetation Classes were determined with reference to DELWP pre-1750 and extant EVC mapping (DELWP 2021a) and their published descriptions (DELWP 2021c).

The surveys sought primarily to assess the extent and condition of native vegetation communities and potential flora and fauna habitat, with consideration given to significant ecological communities and species of conservation concern, such as threatened and migratory species.

Where native vegetation was identified a habitat hectare assessment was undertaken following the methods described in the Vegetation Quality Assessment Manual (DSE 2004), with the results provided in Appendix 2.3

– Habitat Hectare Assessment. Native vegetation was classified in accordance with the definitions provided in Table 2, as defined in the '*Guidelines for the removal, destruction or lopping of native vegetation'* (the Guidelines) (DELWP 2017b).

In summary, the following tasks were undertaken as part of the field assessments within the study area:

- The identification of flora and fauna habitat values;
- An assessment of all watercourses, wetlands and springs;
- An assessment of all potential native fauna habitat, including habitat corridors, food and water sources, nesting and foraging sites;
- The identification of all native vegetation, including:
    - EVCs; and,
    - Scattered trees, with Diameter and Breast Height (DBH) quantified, and trees identified as Large Trees or Small Trees.
- Identify the potential presence of any Matters of National Environmental Significance (NES) listed under the EPBC Act;
- Identify the potential presence of any State significant flora and fauna listed under the EPBC Act
- A habitat hectares assessment of the native vegetation within the study area, in accordance with the Vegetation Quality Assessment Manual (DSE 2004).

2.3.1.1 Removal, Destruction or Lopping of Native Vegetation (the Guidelines)

Under the *Planning and Environment Act 1987*, Clause 52.17 of the Planning Schemes requires a planning permit from the relevant local Council to remove, destroy or lop native vegetation. The assessment process for the clearing of vegetation follow the '*Guidelines for the removal, destruction or lopping of native vegetation*' (the Guidelines) (DELWP 2017b)

Vegetation Assessment

Native vegetation as defined in the Guidelines (DELWP 2017b) (Table 2) is assessed using two key parameters: extent (in hectares) and condition. For the purposes of this assessment, both condition and extent were determined as part of the habitat hectare assessments.

In addition, the type and general condition of all vegetation was assessed and a determination made as to whether it qualifies for further consideration under local, State or national legislation and policy.

Table 2. Determination of native vegetation (DELWP 2017b)

Category	Definition	Extent	Condition
Patch of native vegetation	An area of vegetation where at least 25 per cent of the total perennial understorey plant cover is native; OR An area with three or more native canopy trees where the drip line of each tree touches the drip line of at least one other tree, forming a continuous canopy;	Measured in hectares. Based on hectare area of the patch.	Vegetation Quality Assessment Manual (DSE 2004). Modelled condition for *Current Wetlands*.

Category	Definition	Extent	Condition
	OR Any mapped wetland included in the *Current Wetlands map*, available in DELWP systems and tools.		
Scattered tree	A native canopy tree that does not form part of a remnant patch.	Measured in hectares. Each Large scattered tree is assigned an extent of 0.071 hectares (30m diameter). Each Small scattered tree is assigned a default extent of 0.31 hectares (10 metre diameter)	Scattered trees are assigned a default condition score of 0.2 (outside a patch).

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

Assessment Pathway

The Guidelines manage the impacts on biodiversity from native vegetation removal using an assessment-based approach. Two factors – extent and location – are used to determine the assessment pathway associated with an application for a permit to remove native vegetation. The location category (1, 2 or 3) has been determined for all areas in Victoria and is available on DELWP's Native Vegetation Information Management (NVIM) Tool (DELWP 2021b). Determination of the assessment pathway is summarised in Table 3.

Table 3. Assessment pathways for applications to remove native vegetation (DELWP 2017b)

Extent		Location		
		1	2	3
Native Vegetation	< 0.5 hectares, and not including any large trees	Basic	Intermediate	Detailed
	Less than 0.5 hectares, and including one or more large trees	Intermediate	Intermediate	Detailed
	0.5 hectares or more	Detailed	Detailed	Detailed

Notes: For the purpose of determining the assessment 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.

Current Wetlands (DELWP)

Wetlands can be difficult to map and assess accurately as they respond quite quickly to changes in environmental condition, especially rainfall. After a period of no or low rainfall they can disappear or appear very degraded. However, wetlands are known to rapidly recover when inundated after rainfalls. As a result, all DELWP mapped wetlands (based on 'Current Wetlands' layer in the DELWP NVIM Map [DELWP 2021a]) that are to be impacted must be included as native vegetation, with the modelled condition score assigned to them (DELWP 2017b). Mapped wetlands within the study area are shown in Figure 2.

Note that Current Wetlands do not apply if they are covered by a hardened, man-made surface, for example, a roadway. If covered by any vegetation including crops, bare soil, a mapped wetland should be treated as a remnant patch. The mapped extent of Current Wetlands may be refined if supported by the outcome of a hydrological assessment and approved by DELWP.

Large Tree and Habitat Assessment

Large tree and habitat assessments were undertaken concurrently with the habitat hectare assessments to quantify the number of scattered trees and Large Trees within native vegetation, as well as to collate data pertaining to the presence of hollows and/or nests and significant 'habitat trees' that may provide habitat for fauna. Where present, hollows, nests or other relevant features were noted during the assessments.

Large Tree benchmarks relating to the potential EVCs present within the study area are summarised below (Table 4).

Table 4. Benchmark sizes for large trees within the study area.

EVC	Bioregion	Species	Large Tree (DBH)	Small Tree (DBH)
Rocky Chenopod Woodland (EVC 64)	VVP	*Eucalyptus* spp.	≥ 40 cm	< 40 cm
Rocky Chenopod Woodland (EVC 64)	CVU	*Eucalyptus* spp.	≥ 60 cm	< 60 cm
Plains Grassy Wetland (EVC 125)	CVU	N/A	-	-
Low Rainfall Plains Grassland (EVC 132_63)	CVU / VVP	N/A	-	-
Grassy Woodland (EVC 175)	CVU	*Eucalyptus* spp. *Allocasuarina* spp. *Acacia* spp.	≥ 70 cm ≥ 40 cm ≥ 30 cm	< 70 cm < 40 cm < 30 cm
Grassy Woodland (EVC 175)	VVP	*Eucalyptus* spp.	≥ 70 cm	< 70 cm
Red Gum Swamp (EVE 292)	CVU / VVP	*Eucalyptus* spp.	≥ 80 cm	< 80 cm

Note. DBH = Diameter at Breast Height (i.e. - 1.3 metres above ground level).

2.3.2 Targeted Flora Surveys

Based on the findings of the desktop assessment (Section 2.2), and the presence of suitable habitat identified as part of the Biodiversity Assessments, targeted surveys for the nationally significant Spiny Rice-flower *Pimelea spinescens* subsp. *spinescens* were undertaken within accessible areas of the Merrimu PSP.

Surveys were undertaken at this time to maximise the likelihood of detection of significant flora species identified as having the potential to occur within the study area (Table 1).

2.3.2.1 Spiny Rice-flower

Areas identified as supporting suitable habitat within the BMD Land, Long Forest Estate and the parcels located at 55 Oconnell Road and 95 Oconnell Road, Merrimu were walked, with surveys conducted along transect lines approximately five metres apart, or as dictated by the density of existing grasses and weeds. The location of all plants was recorded during the survey with a handheld GPS (accuracy of +/- 3 metres).

The survey methodology adhered to the survey guidelines for Spiny Rice-flower outlined in the Biodiversity Precinct Structure Planning Kit (DSE 2010a) and in the Significant Impact Guidelines for the species (DEWHA 2009). A summary of the survey effort compared with the survey guidelines is provided in Table 5.

Spiny Rice-flower is a perennial sub-shrub listed as Critically Endangered under the Commonwealth EPBC Act, as threatened under the Victorian FFG Act, and as endangered under the Advisory List of Rare and Threatened Plants in Victoria (DEPI 2014). The species is endemic to Victoria and is found between the south-west and north-central parts of the State. It occurs in grassy EVC such as Plains Grassland (EVC 132), Plains Grassy

Woodland (EVC 55), Plains Woodland (EVC 803) and Plains Grassland/Grassy Woodland Mosaic (EVC 897) (DEWHA 2009). Spiny Rice-flower is typically found in small populations (<500 individuals).

The species is slow-growing and reaches up to 30 cm in height (Plate 1; Plate 2). Plants are mostly dioecious (male and female flowers on separate plants) but some plants are monoecious (male and female flower on same plant). It bears small yellow flowers between April and August (DEWHA 2009).

Plate 1. Spiny Rice-flower within the Merrimu PSP (Ecology and Heritage Partners Pty Ltd 2017).

Plate 2. Spiny Rice-flower within the Merrimu PSP (Ecology and Heritage Partners Pty Ltd 2017).

Table 5. Survey effort compared with the Biodiversity Precinct Structure Planning Kit (DSE 2010a) and the Significant Impact Guidelines for the species (DEWHA 2009).

Survey Guidelines	Comment
Targeted surveys should be done by people familiar with recognising the subspecies.	Yes. Surveys were completed by assessors familiar with the appearance and ecology of the subspecies.
Multiple surveys may be required to identify the species and provide adequate survey effort.	Given that the species was known to be flowering at the time of the assessments, and biomass was generally low across areas of suitable habitat, specimens were easily identifiable, a single survey effort across most of the properties was considered appropriate to accurately record the species. Multiple surveys were undertaken where large populations were identified.
Surveys should not be conducted for at least six months after fires and for at least three months after the cessation of grazing (DEWHA Survey Guidelines).	Yes. The assessors are not aware of any fires or grazing within the specified timeframes.
Survey Spiny Rice-flower between April and August (easily overlooked when not in flower).	Yes. The assessments were conducted within the flowering period for the species by ecologists familiar with the species in and out of flower. Given the survey effort within areas of suitable habitat, there is reasonable assurance that individuals were not overlooked.
The targeted survey effort should be directed to all potential habitat areas i.e. remnant grassland including degraded grassland.	Yes. Accessible areas of suitable habitat were visually surveyed and traversed in linear transects (i.e. targeted survey areas).
Walk through transects at less than 5m grid intervals are required for all potential habitat.	Yes. Transects of five metres apart were utilised throughout the entire targeted survey areas.
Record the number of plants per land parcel.	Yes. Any observed plants were recorded.

2.3.2.2 *State Significant Flora*

Several State significant species are known to occur or are considered to have a moderate to high likelihood of occurrence (Appendix 2.2). Determining the presence of these species, plus any other incidental observation of significant flora was a specific focus of the habitat hectare assessments undertaken for the Project.

The habitat hectare assessments and subsequent survey effort for other species including Golden Sun Moth *Synemon plana* and Striped Legless Lizard *Delma impar* captured the flowering period for the majority of State significant flora that have the potential to occur within the study area. Where suitable habitat for a State significant flora species was identified, the 'random meander' technique as documented by Cropper (1993) was utilised. This method was adopted for all State-significant flora species within areas of suitable quality habitat outside of times when targeted surveys were undertaken in Long Forest Estate (Ecology and Heritage Partners 2013b). Handheld GPS units were used to record the location of any significant species encountered.

2.3.3 Targeted Fauna Surveys

Based on the findings of the desktop assessment (Section 2.2), and the presence of suitable habitat identified as part of the Biodiversity Assessments, targeted surveys were undertaken for the nationally significant Striped Legless Lizard *Delma impar* and Golden Sun Moth *Synemon plana*. Surveys were undertaken at a time to maximise the likelihood of detection of significant flora species identified as having the potential to occur within the study area (Table 1; Table 6).

Table 6. Targeted fauna species considered to have the highest likelihood of occurrence.

Common name	Species Name	Significance #	Optimal Survey Timing
Striped Legless Lizard	*Delma impar*	VU L en	Sept – Nov; (Dec – Mar for skins)
Golden Sun Moth	*Synemon plana*	CR L cr	Oct - Dec
Growling Grass Frog	*Litoria raniformis*	VU L en	Oct - Dec

Note: CR/VU – Critically Endangered / Vulnerable under the EPBC Act; L – Listed as threatened under the FFG Act; cr/en – listed as critically endangered/endangered on the DELWP Advisory List.

2.3.3.1 *Striped Legless Lizard*

Striped Legless Lizard typically occupy areas of native and introduced grassland, particularly where a high percentage of the native Kangaroo Grass is found. They are typically restricted to lowland tussock grassland habitat (Coulson 1990) in temperate south-eastern Australia, where the species has a limited and patchy distribution. A small percentage of the original habitat for Striped Legless Lizard now exists. As a result, this species is likely to occur in small, isolated populations due to the limited and severely fragmented nature of remaining habitat (Webster *et al.* 2003).

Before European settlement, the Striped Legless Lizard was presumed to be common across many grassland areas in north-eastern, central and south-western Victoria, south-eastern NSW, the ACT, and possibly, south-eastern South Australia (Robertson and Smith 2010). The species has suffered a substantial contraction in both geographic range and abundance over the past 100 years. The range contraction and resultant reduction in population size is likely to continue, due to the ongoing removal, fragmentation and deterioration of suitable

grassland habitat (Smith and Robertson 2010). Current populations in Victoria persist primarily in the basalt plains to the west of Melbourne, and areas around Ballarat and Bendigo (Hadden 1995; DSE 2003;).

Since European settlement, the distribution of Striped Legless Lizard has declined, and the species is known to have disappeared from many areas. Within Victoria, an estimated 95% of native lowland grasslands have been substantially altered since European settlement, including Western (Basalt) Plains Grassland community, the primary grassland habitat known to support Striped Legless Lizard. Western Plains Grasslands typically occur on cracking clay soils with at least some surface rock, which provides ideal shelter for Striped Legless Lizard (Coulson 1995).

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 *et al*. 1995). Although Striped Legless Lizards have been reported from areas of relatively undisturbed native grasslands, with a dense cover of perennial tussock grasses (Kukolic 1991; Kukolic and Osborne 1993), they are also known to inhabit areas of non-native grassland (Robertson and Smith 2010). 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).

The targeted surveys focussed on the installation of tile grids located in the highest quality habitat within the study area. Where possible, targeted surveys were undertaken in less disturbed areas of potential Striped Legless Lizard habitat (i.e. containing embedded rock and scattered native tussock grass species) to determine the likelihood of the species occurring.

The intention of establishing a grid of roof tiles is that Striped Legless Lizard will be drawn to use the artificial habitat for shelter and thermoregulation and be easily located when the tile is lifted. This adopted method is widely accepted as the primary survey technique for this species, particularly in areas supporting surface rock cover (DSEWPaC 2011a, 2011b). Targeted Striped Legless Lizard Surveys were undertaken in accordance with the *EPBC Act Referral Guidelines for the Vulnerable Striped Legless Lizard, Delma impar* (DSEWPaC 2011a) and the Biodiversity Precinct Structure Planning Kit, Guidelines for surveying Striped Legless Lizard *Delma impar* (DSE 2010).,

The survey method undertaken for the Striped Legless Lizard surveys within the study area was as follows:

- Tiles were laid in grids consisting of 50 tiles, at five metre spacing between tiles, arranged in grids of 10 tiles by five tiles, positioned in vegetated areas with a northerly aspect;
- Tile checks involve systematically lifting each tile in the grid and observing and recording the species under each tile. All vertebrate species encountered beneath tiles were identified;
- Optimal time for checking is when weather is fine but preferably with >50% cloud cover. Air temperature should be in low - mid 20s and ground temperature high 20s to low 30s (C°);
- The following details were recorded:
- Location and number of each tile grid;
- Date and weather conditions for each survey, including air and ground temperature;
- Location and number of any Striped Legless Lizard recorded; and,

- Any non-target species identified (the tile-grid method is likely to identify other reptiles and small marsupials on site, including the State significant Tussock Skink *Pseudemoia pagenstecheri* and Regionally significant Fat-tailed Dunnart *Sminthopsis crassicaudata*; and,
- In addition to tile checks, the survey included active searching where Zoologists searched underneath rocks and logs that may have provided suitable refuge for the species.

Long Forest Estate

Ten tile grids were established within Long Forest Estate in mid-August 2012. Eight tile grid checks occurred between 20 October and 20 December 2012 (Ecology and Heritage Partners 2013b).

BMD Land

Seventeen tile grids were established within areas of suitable habitat throughout the BMD Land on 3 and 4 August 2017. Grids were checked on six occasions between 28 September and 24 November 2017 (Ecology and Heritage Partners 2018a).

BMEL Alignments

Four tile grids were established in potential habitat located at 55 Oconnell Road and 95 Oconnell Road, Merrimu. Grids were established on 20 and 21 August 2019. Tile grids were checked over two survey seasons. The first was on eight occasions between 16 December 2019 and 3 February 2020, and eight additional checks between 2 October and 2 December 2020 (Ecology and Heritage Partners 2020a).

2.3.3.2 Growling Grass Frog

Habitats favoured by the Growling Grass Frog include permanent or largely permanent still waterbodies with extensive emergent and submergent vegetation (DEPI 2013; Hero *et al.* 1991; Robertson *et al.,* 2002). The species is also associated with swamps, irrigated areas, farm dams, former quarry holes and off-stream habitats (DSE 2012). Suitable terrestrial habitat for post-breeding dispersal and overwintering refuge sites are also required, these include dense ground-level vegetation, rocks, logs and other ground debris (Robertson *et al.,* 2002). This species can also utilise temporarily inundated waterbodies for breeding purposes provided they contain water over the breeding season (Organ 2003).

Based on previous investigations there is a strong correlation between the presence of the species and key habitat attributes at a given waterbody. For example, the species is typically associated with waterbodies supporting an extensive cover of emergent, submerged and floating vegetation (Robertson *et al*. 2002, Organ 2004, 2005). Emergent vegetation provides basking sites for frogs and protection from predators, while floating vegetation provides suitable calling stages for adult males and breeding and oviposition (egg deposition) sites. Terrestrial vegetation (grasses, sedges), rocks and other ground debris around wetland perimeters also provide foraging, dispersal and over-wintering sites for frogs.

Potential habitat is present within aquatic habitats immediately adjacent to the Merrimu PSP within the Lerderderg River, artificial dams adjacent to Lerderderg Park Road, as well as the Werribee River. A total of seven sites were surveyed for the potential presence of Growling Grass Frog (Figure 4).

The surveys were conducted with reference to the prescribed methodology detailed in the following guidelines:

- *Significant Impact Guidelines for the Vulnerable Growling Grass Frog (Litoria raniformis) EPBC Act Policy Statement 3.14* (DEWHA 2009d);
- *Survey Guidelines for Australia's Threatened Frogs* (DEWHA 2010a); and,

Based on the survey protocols to be adhered to for this study, this will achieve a probability detection threshold of 0.95 as per the probability thresholds specified by DELWP (Heard *et al.,* 2010).

The following was undertaken:

- Completion of targeted surveys by experienced zoologists within the study area during the species mating season. This included:
    - Two nights of spotlighting surveys, call identification, and active searching for adults and metamorphs;
    - An initial period of five minutes was spent listening to any calling frogs (all species) in and adjacent to habitats;
    - The advertisement call was broadcast to elicit a response from any adult males present;
    - Experienced personnel used "Olight" LED hand-held spotlights (up to 1020 lumens/8.4 volts) to locate any calling males on floating vegetation in the waterbody and around the perimeter of waterbodies;
    - Surveyors actively searched ground-level habitat including surface rocks, underneath hard litter, and at the base of vegetation for frogs; and
    - Determination of the significance of any recorded Growling Grass Frog populations.

The following attributes of habitat quality for the Growling Grass Frog were recorded:

- The hydroperiod;
- The location and extent of instream pools and off stream waterbodies;
- Habitat values including the type (e.g. dam, creek etc.) flow (still, slow rapid), depth and presence of terrestrial refuge sites (e.g. rocks, logs, debris);
- Aquatic vegetation cover (% cover of emergent, submergent and floating aquatic plants);
- Presence/ absence of predator fish (opportunistic); and
- Barriers to frog movement between waterbodies.

The hydroperiod (as defined in Heard *et al.,* 2010) is the likelihood that an individual wetland will remain inundated over the course of a single breeding season, on an ordinal scale where:

- 0 = fills only in years with above average rainfall (intermittent);
- 1 = fills and dries out annually with average rainfall (ephemeral);
- 2 = dries out only during years of below average rainfall (semi-permanent);
- 3 = never dries out regardless of rainfall (permanent).

Long Forest Estate

No suitable habitat is present within the Long Forest Estate, and targeted surveys are not required in Long Forest Estate.

BMD Land

Although several artificial farm dams are present within the BMD Land, these lack the habitat features preferred by the species (i.e. extensive emergent and submergent vegetation) and exhibit poor connectivity and unsuitable terrestrial habitat for post-breeding dispersal to other waterbodies where the species has previously been documented (i.e. Lerderderg River, Werribee River). As such, suitable habitat is not considered to be present, and targeted surveys are not required in the BMD Land.

Other Assessed Land

No suitable habitat is present within the Other Assessed Land, and targeted surveys are not required in these parcels. However, potential habitat is present within aquatic habitats immediately adjacent to the Merrimu PSP within the Lerderderg River, artificial dams adjacent to Lerderderg Park Road, as well as the Werribee River which is located downstream form the PSP. A total of seven sites were surveyed for the potential presence of Growling Grass Frog (Figure 4).

2.3.3.3 Golden Sun Moth

Golden Sun Moth (Plate 3) typically occur in native grassland, grassy woodland, dominated by greater than 40% cover of Wallaby-grass, in particular *Rytidosperma* spp. (DSE 2004), but may also inhabit areas dominated by Kangaroo Grass *Themeda triandra* (Endersby and Koehler 2006) and introduced grassland dominated by Chilean Needle-grass *Nassella neesiana* and other introduced species (A. Organ pers. obs.). Male flight is typically low, to about a metre above the ground, fast and can be prolonged, but they are generally not recorded flying more than 100 metres from suitable habitat (Clarke and O'Dwyer 1999). The male of this species generally flies between 11am and 3pm on calm, warm (over 20°C), sunny days.

Many populations are isolated and fragmented, impeding the ability of the relatively immobile females to recolonise areas, thereby reducing the likelihood of genetic exchange (DSE 2004). Such populations are therefore vulnerable as there is little likelihood of recolonisation in the event of a local extinction.

For all surveys undertaken, surveys focussed on areas supporting suitable host plants including native Wallaby-grass and the noxious weed Chilean Needle-grass. Surveys were undertaken at a time which is considered suitable for detecting Golden Sun Moth (i.e. when adult males are flying), and when the species was confirmed flying at known reference site (e.g. 289 Bences Rd, Merrimu or Long Forest Estate).

Survey procedures were in accordance with the *Significant Impact Guidelines for the Critically Endangered Golden Sun Moth* (DEWHA 2009a) and Biodiversity Precinct Structure Planning Kit (DSE 2010), with the following tasks undertaken:

- Surveys were conducted by ecologists experienced in the detection and identification of Golden Sun Moth;

- Each site containing suitable habitat was surveyed on four separate occasions (if the species was not recorded prior), with at least one week between surveys where possible;
- Moths were confirmed flying at known, nearby reference sites prior to undertaking each survey;
- Surveys were undertaken during weather conditions suitable for detecting the species. Male moths generally fly between 10am and 3pm on warm (over 20˚C by 10am) days with minimal cloud cover and still conditions. However, if males are observed flying on site after 3pm or during moderately windy conditions surveys can continue until males are no longer observed flying; and,
- Surveys were conducted using parallel transects between 50 metres and 10 metres width, with observers walking or, if terrain permitted, driving in a car at < 10 kilometres / hour (flying male moths can be readily seen from a vehicle) until moths are observed).

Plate 3. Golden Sun Moth (Synemon plana) Ecology and Heritage Partners Pty Ltd.).

Plate 4. Growling Grass Frog (*Litoria raniformis*) Ecology and Heritage Partners Pty Ltd.

Long Forest Estate

Targeted Golden Sun Moth surveys were undertaken on 7 and 18 December 2012. An additional survey was undertaken on 16 December 2019.

BMD Land

Targeted Golden Sun Moth surveys were undertaken over four occasions - 30 November 2017, 12 and 15 December 2017 and 3 January 2018.

BMEL Alignments

Targeted surveys for Golden Sun Moth were undertaken within suitable habitat within 55 and 95 Oconnell Road, Merrimu on 16, 18 and 28 December 2019, and 8 January 2020.

2.4 Likelihood of Occurrence Assessment

Relevant biological databases, literature and expert advice were used to identify all species records of national, State and regional conservation significance within 10 kilometres of the study area. The proximity, number,

dispersion and date of known locality records (assuming over-dispersed and random patterns of locality records being more likely to occur in the study area) were considered to determine a species' likelihood of occurrence within the study area.

Additional factors also taken into consideration include: the known biogeographical distribution of the species; underlying geology of existing locality records; and, vegetation and habitat associations. The decision guidelines for determining the likelihood of occurrence of flora and fauna species are presented in Table 7 and Table 8 respectively.

The results of the likelihood of occurrence assessment for listed flora and fauna species are provided in Appendices 2.2 and 3.2, respectively.

All significant flora and fauna species considered to have the highest likelihood of occurrence within potential habitats within the study area are discussed in the body of this report.

Table 7. Decision guidelines for determining a flora species likelihood of occurrence within the study area.

Likelihood of occurrence	Ecology and Heritage Partners Decision Criteria
1 – Known occurrence	Recorded within the study area recently (i.e. within ten years).
2 - High	Previous records of the species in the local vicinity; and/or, the study area contains areas of high-quality habitat.
3 – Moderate	Limited previous records of the species in the local vicinity; and/or, the study area contains some characteristics of the species' preferred habitat.
4 – Low	Poor or limited habitat for the species however other evidence (such as a lack of records or environmental factors) indicates there is a low likelihood of presence.
5 – Unlikely	No suitable habitat and/or outside the species range.

Table 8. Decision guidelines for determining fauna species likelihood of occurrence within the study area.

Likely presence or use of the study area	Ecology and Heritage Partners Decision Criteria
1 – Known occurrence	Recorded within the study area recently (i.e. within ten years).
2 - High	Likely resident in the study area based on database records, or expert advice; and/or, recent records (i.e. within ten years) of the species in the local area; and/or, the study area contains the species' preferred habitat.
3 - Moderate	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; and/or, the study area contains some characteristics of the species' preferred habitat.
4 - Low	The species may 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.
5 - 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.

2.5 Assessment Qualification and Limitations

Data and information held within the ecological databases and mapping programs reviewed as part of the desktop assessment (e.g. VBA, PMST, NatureKit 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. Furthermore, a documented record may indicate a species' presence in an area at a given point in time, but it generally does not offer information about how a species is making use of an area (e.g. foraging, nesting, dispersing). This can be important information when determining the potential impact of a proposed action on a threatened species.

The 'snap shot' nature of a biodiversity assessment, meant that migratory, transitory or uncommon fauna species may have been absent from typically occupied habitats at the time of the field assessment. In addition, annual or cryptic flora species such as those that persist via underground tubers may also be absent. Nevertheless, the terrestrial flora and fauna data collected during the field assessment and information obtained from relevant desktop sources is considered adequate to provide an accurate assessment of the ecological values present within the study area.

Ecological values identified within the study area were recorded using a hand-held GPS or tablet with an accuracy of +/-3 metres. This level of accuracy is considered adequate to provide an accurate assessment of the ecological values present within the study area; however, this data should not be used for detailed surveying purposes.

2.5.1 Long Forest Estate

This report includes the results of ecological surveys conducted in Long Forest Estate in 2012 and 2013. It is recognised that the quality and extent of ecological values that were present at that time may be different to what is currently present.

Although recent (2019) targeted surveys for Spiny Rice-flower have been undertaken, targeted survey for other significant flora, or an updated habitat hectare assessment has not been completed.

As such, the quality and extent of ecological values within Long Forest Estate detailed in this report (Spiny Rice-flower presence/absence aside) should be taken as indicative, and additional surveys should be undertaken to inform ongoing development of the PSP and associated PSP.

2.5.2 Access Constraints

The ecological site assessments were restricted to parcels/properties where access was permitted (Figure 2). Where access to parcels/properties was not permitted, an assessment was conducted from areas of public access such as reserves, roadsides and adjacent properties where possible. Patches of native vegetation were identified from a distance, however the extent and quality throughout was estimated based on extent of vision and species observed nearby. As this is not an acceptable method of determining the extent and quality of native vegetation, where access was not permitted, the extant (2005) DELWP modelled extent of native vegetation (DELWP 2021a) has been used to give an indication of the potential values present within unassessed land. Further on-ground assessments will be required to confirm the quality and extent of native vegetation within these parcels.

2.5.3 Targeted Surveys

Due to access constraints, targeted flora and fauna surveys were restricted to the following areas:

- BMD Land (2017/2018);
- Long Forest Estate (predominantly in 2012/2013; Spiny Rice-flower in 2019);
- 55 and 95 Oconnell Road, Merrimu – within the 'other assessed land' (2019/2020).

2.5.3.1 Striped Legless Lizard Surveys

Although the time between the establishment of new tile grids and the commencement of tile checks was less than the three month period recommended by the Survey Guidelines for Australia's Threatened Reptiles (DSEWPaC 2011a), the reduced period is considered to be appropriate in this instance, with a greater importance placed on commencing the surveys in late September to maximise the likelihood of detection during the peak period of detectability for the species (late September – late November) as noted by Scroggie *et. al.,* (2019).

Based on the results of previous Striped Legless Lizard surveys undertaken within western Melbourne, it has regularly been observed that Striped Legless Lizard (and other reptiles) will generally commence using artificial shelter sites (i.e. tiles) 2-3 weeks after the tiles are established. Several reptile species, including the Eastern Blue-tongued Lizard *Tiliqua scincoides scincoides* and Marbled Gecko *Christinus marmoratus* were detected under tiles during the first or second tile checks. This provides substantive evidence that reptiles regularly and opportunistically acclimatise to using artificial shelter tiles for thermoregulation and cover within short timeframes.

The peak detection of Striped Legless Lizard typically occurs between late September – late November (DSEWPaC 2011a; Scroggie *et. al.,* 2019). As such, it is considered that the survey timing was appropriate (high detection probability) to detect the species should a resident population of the species occur within the study area.

Long Forest implications

Striped Legless Lizard surveys were last undertaken in Long Forest Estate in 2012, with no individuals recorded (Ecology and Heritage Partners 2013b). There are no records of Striped Legless Lizard within 10 kilometres of the Merrimu PSP registered in the VBA (2020a), although there is an unverified record located immediately south of the Werribee River (ALA 2021). Several targeted surveys have been undertaken within the Merrimu PSP (as detailed in this report) in recent years, and given the absence of any records of Striped Legless Lizard as a result of these surveys, it is considered that a population of the species no longer persists in the locality.

Further, Striped Legless Lizard is known to have a very small home range (Robertson and Smith 2010) and is documented to move as little as 4 square metres per year (O'Shea 2005). As such, given the likely absence of the species in the broader Merrimu locality based on the results of known documented record and the results of targeted surveys, as well as the small home range of the species, it is highly unlikely that a population of the species would recolonise the Long Forest Estate during the intervening years since the 2012. Therefore, it is considered that the results of the 2012 targeted surveys for Striped Legless Lizard are still a valid representation of the likelihood of the species occurring within that part of the Merrimu PSP.

2.5.4 Golden Sun Moth

Recommended survey conditions specify targeted searches for the species be conducted within climatic conditions relating to temperature (above 20 degrees Celsius before 10am) with minimal cloud cover, wind speed and days since rain. Surveys for the species were conducted in line with the recommended conditions, although if the species was confirmed flying at a reference site during conditions outside of the optimal conditions stated in the recommended survey guidelines, then surveys proceeded under sub-optimal conditions until the species was no longer recorded.

The suboptimal conditions of high winds, rain, and/or cool weather over the 2017/18 and 2019/20 flight season meant that it was not always possible to achieve at least a one-week period between surveys. Given the temporal availability of survey conditions and extensive area of known and potentially suitable habitat across the Merrimu PSP, targeted surveys had to be undertaken opportunistically when conditions were optimal, and/or the species was confirmed to be flying. As such, the surveys may not have captured the additional emergence of larvae, making it difficult to capture the size of the full population of the species. However, it is noted that where the species was recorded in areas of suitable habitat, the entire contiguous extent of suitable habitat has been noted as confirmed habitat for the species. Further, high numbers of the species were recorded in several parcels, and additional numbers of the species would not alter the findings or implications of the assessments.

2.5.5 Qualifications Relating to Ecological Values within Parcels not Assessed

The results of the field assessments, including data related to the presence or absence of significant flora, fauna and ecological communities and associated implications detailed in this report relate only to the areas that were subject to the on-ground assessments (unless specifically indicated otherwise).

It is acknowledged that the unassessed properties within the Merrimu PSP may support ecological values that have not been observed or recorded as part of this suite of ecological investigations. High level implications and recommendations associated with unassessed parcels within the Merrimu PSP are provided in Section 6.4.

2.5.6 General Limitations

General ecological limitations associated with the ecological investigations include:

- The VBA was last updated on August 2020 and therefore any additional species recorded after this date are not currently available on the VBA;
- Surveys for listed flora and fauna species were undertaken during the optimal flowering/breeding period for all targeted species to maximise the probability of detecting each species. Given that accessible areas of suitable habitat for significant flora and fauna species were extensively surveyed, it is considered that sufficient effort has been employed to determine the likely presence or otherwise of targeted species within accessible areas. However, areas that could not be accessed to adequately conduct surveys have been identified as requiring additional surveys;
- The assessment of likelihood of occurrence is based on survey effort and results, background information and previous records compiled;

- Non-vascular flora (i.e. mosses, liverworts) were not recorded, although their presence is noted as part of the cover of native species in the definition of a patch of native vegetation;
- Ecological features identified during field assessments were recorded using a hand-held GPS or tablet with an accuracy of between +/- 3 to 5 metres. This level of accuracy is considered adequate to provide an accurate assessment of the ecological features present within the study area; however, this data should not be used for detailed surveying purposes;
- For cryptic and less abundant species that are known to, or that have the potential to use habitat resources within the study area as a resident or a visitor on a regular or infrequent basis, the precautionary principle has been applied when determining the likelihood of occurrence.

3 EXISTING ENVIRONMENT

The following description of the existing environment is based on the landscape, vegetation, fauna habitats and species identified from the desktop assessment and within the study area during the ecological surveys.

3.1 Ecological Values

Ecological values of the study area, as determined through field assessments and targeted surveys undertaken within the property parcels, are summarised below.

3.1.1 Overview

Most of the study area is highly modified due to past and current agricultural and farming practices and is dominated by pasture supporting non-indigenous grasses and weeds. Much of the indigenous vegetation and terrestrial fauna habitat remaining within the study area are confined to escarpments or agricultural areas not subjected to historical cropping activities. Native vegetation, where present within existing farmland, is highly modified, with vegetation generally lacking structure and exhibiting a low diversity of native species.

On-ground mapped native vegetation in the study area is representative of four EVCs: *Low Rainfall* Plains Grassland (EVC 132_63), Rocky Chenopod Woodland (EVC 64), Plains Grassy Wetland (EVC 125) and Grassy Woodland (EVC 175). A summary of the bioregional conservation status of each EVC is provided in Table 9.

. The presence of these EVCs is generally consistent with the modelled extant (2005) native vegetation mapping (DELWP 2021c), which also shows Red Gum Swamp (EVC 292) occurring adjacent to the Lerderderg River within the 'Desktop Assessment Only' land, with a summary of the extent of modelled vegetation in areas unable to be assessed on-ground shown in Table 10. Specific details relating to observed EVCs are provided below.

The results of the habitat hectare assessment are provided in Appendix 1.2.

One DELWP modelled 'Current Wetland' is modelled to occur within the Merrimu PSP. However, this wetland has been subject to an approved application to DELWP to remove the wetland from further consideration from any future development within the Merrimu PSP (Appendix 4). As such, the Current Wetlands within the Merrimu PSP is not included within the overall extent of native vegetation recorded as part of this suite of ecological investigations.

Specific details relating to observed and modelled EVCs are provided below, with a summary of the extent of each vegetation type provided in Table 9 and Table 10.

Table 9. Extent of mapped vegetation type (EVC) within the study area.

Ecological Vegetation Class	Bioregional Conservation Significance	BMD Land	Long Forest Estate	Other Assessed Land	Total
Low Rainfall Plains Grassland (EVC 132_63)	Endangered	34.459	89.86	30.375	**154.694**
Rocky Chenopod Woodland (EVC 64)	Vulnerable	28.17	3.72	3.439	**35.329**
Plains Grassy Wetland (EVC 125)	Endangered	0.069	-	0.018	**0.087**

Ecological Vegetation Class	Bioregional Conservation Significance	BMD Land	Long Forest Estate	Other Assessed Land	Total
Grassy Woodland (EVC 175)	Endangered	4.776	-	1.048	**5.824**
Total	**-**	**67.474**	**93.58**	**34.88**	**195.934**

Note. Area measured in hectares.

Table 10. Extent of modelled vegetation type (EVC) within the land not subject not on ground assessments

Ecological Vegetation Class	Bioregional Conservation Significance	Desktop Assessment Land
Low Rainfall Plains Grassland (EVC 132_63)	Endangered	30.095
Rocky Chenopod Woodland (EVC 64)	Vulnerable	7.204
Red Gum Swamp	Endangered	1.551
Grassy Woodland (EVC 175)	Endangered	51.326
Total (hectares)	**-**	**90.176**

Note. Area measured in hectares.

3.1.1.1 Flora

A total of 157 flora species (83 indigenous and 74 non-indigenous or introduced) were recorded within the study area on accessible parcels during the field assessment. The nationally significant Spiny Rice-flower *Pimelea spinescens* subsp. *spinescens* was identified during the targeted surveys across the BMD Land. In addition, five State significant flora (Fragrant Saltbush *Rhagodia parabolica*, Black Roly-poly *Sclerolaena muricata* var. *muricata*, Slender Bindweed *Convolvulus angustissimus* subsp. *omnigracilis*, Melbourne Yellow-gum *Eucalyptus leucoxylon* subsp. *connata* and Bacchus Marsh *Wattle Acacia rostriformis*) were recorded within the study area.

A consolidated list of flora species recorded is provided in Appendix 2.1.

Noxious Weeds

Thirteen species recorded in the study area are declared noxious weeds listed under the Victorian *Catchment and Land Protection Act 1994* (CaLP Act) (Table 11). Bridal Creeper *Asparagus asparagoides*, *Chilean* Needle-grass *Nassella neesiana*, Serrated Tussock *Nassella trichotoma*, Blackberry *Rubus fruticosus* sp. agg., and African Box-thorn *Lycium ferocissimum* are also Weeds of National Significance (WoNS), under national management as part of the National Weeds.

Table 11. Noxious weeds recorded within the study area.

Species Name	Common Name	CaLP Act Category[1]	WoNS[2]
Nassella neesiana	Chilean Needle-grass	**Restricted Weed**	Yes
Juncus acutus	Spiny Rush		No
Oxalis pes-caprae	Soursob		No
Asparagus asparagoides	Bridal Creeper		Yes

Species Name	Common Name	CaLP Act Category[1]	WoNS[2]
Lycium ferocissimum	African Box-thorn	**Regionally Controlled**	Yes
Cirsium vulgare	Spear Thistle		No
Cynara cardunculus	Artichoke Thistle		No
Echium plantagineum	Patterson's Curse		No
Marrubrium vulgare	Horehound		No
Nassella trichotoma	Serrated Tussock		Yes
Rosa rubignosa	Sweet Briar		No
Rubus fruticosus spp. agg.	Blackberry		Yes
Xanthium spinosum	Bathurst Burr		No

Note: 1) Regionally Controlled Weed and Restricted Weed under the CaLP Act; 2) WoNS under national management.

3.1.1.2 Fauna

Ecological surveys of the study area recorded 74 species of fauna, comprising 65 native species and nine introduced species (Table 12). Several mammal species were detected within study area (six species), while a wide range of bird species were also observed (e.g. woodland specialists and waterbirds), along with those adapted to open and/or modified landscapes (Appendix 3.1). A consolidated list of fauna species recorded is provided in Appendix 3.1.

Table 12. Summary of fauna species identified within the study areas.

Fauna Guild	Species Richness	
	Native	Introduced
Mammals	2	4
Birds	50	5
Reptiles	7	0
Frogs	5	0
Invertebrate	1	0
Total	**65**	**9**

Pest Animals

Three of the introduced fauna species recorded within the study area are declared pests under the Victorian CaLP Act (Table 13). These species are classified as Established Pest Animals, which indicates they pose a serious threat to primary production, Crown Land, the environment or community health in Victoria. It is not possible to eradicate these pest animals form Victoria, therefore asset protection is considered to the most effective approach to minimise impacts to high value assets.

Table 13. Pest Animals recorded in the study areas

Common Name	Scientific Name	CaLP Act Category[1]	Priority Pest[2]
European Rabbit	*Oryctolagus cuniculus*	**Established**	Yes

Common Name	Scientific Name	CaLP Act Category[1]	Priority Pest[2]
European Hare	*Lepus europaeus*		Yes
Red Fox	*Vulpes vulpes*		No

Note: 1) Declared Established pest animal under the CaLP Act; 2) designated for priority control under the CaLP Act.

3.1.2 Native Vegetation

Modelling undertaken by DELWP provides an indication of the likely extent and type of patches of native vegetation present within the study area prior to European settlement (1750), and in 2005 (DELWP 2021a).

Native vegetation in the study area is representative of four EVCs: *Low Rainfall* Plains Grassland (EVC 132_63), Grassy Woodland (EVC 175), Rocky Chenopod Woodland (EVC 64) and Plains Grassy Wetland (EVC 125). The presence of these EVCs is generally consistent with the modelled pre-1750s native vegetation mapping (DELWP 2021a).

The remainder of the study area comprises introduced and planted vegetation, present as crop, pasture, windrows and ornamental plantings. Specific details relating to observed EVCs are provided below.

3.1.2.1 Low Rainfall Plains Grassland

Low-rainfall Plains Grassland (EVC 132_63) typically consists of treeless vegetation mostly less than one metre in height and dominated by a mixture of grasses and herbs. This EVC usually occupies cracking basalt soils prone to seasonal waterlogging in areas receiving less than 500 millimetres of annual rainfall (DELWP 2021c).

BMD Land

Plains Grassland was recorded along the north-west boundary, and in scattered patches to the south and east of the BMD Land (Figure 3). Dominant native grasses recorded throughout most patches included Spurred Spear-grass *Austrostipa gibbosa*, Rough Spear-grass *Austrostipa scabra* subsp. *falcata*, Common Wallaby-grass *Rytidosperma caespitosa*, Bristly Wallaby-grass *Rytidosperma setaceum*, and Kneed Wallaby-grass *Rytidosperma geniculatum* (Plate 5). Commonly observed shrubs and herbs within this vegetation type comprised Berry Saltbush *Atriplex semibaccata*, Sheep's Burr *Acaena echinata*, Wingless Bluebush *Maireana enchylaenoides*, Nodding Saltbush *Einadia nutans*, Ruby Saltbush *Enchylaena tomentosa* var. *tomentosa*, Native Flax *Linum marginale* and occasional specimens of Lemon Beauty-heads *Calocephalus citreus*, Fuzzy New Holland Daisy *Vittadinia cuneata*, and Golden Billy-buttons *Pycnosorus chrysanthes* (Plate 6).

A total of 10 habitat zones comprising 34.459 hectares were recorded within the BMD Land (PG1 – PG10) (Figure 3), with habitat zones differing in quality predominantly due to the diversity and/or of native species present, and the type and extent of weeds present in the habitat zone (Appendix 2.3). Of this, a total of 15.095 hectares of Plains Grassland is located within the eastern-most parcel.

Some remnants of habitat zone PG4, and all of PG7, PG8 and PG9 met the thresholds that define the nationally significant *Natural Temperate Grasslands of the Victorian Volcanic Plain* (NTGVVP) ecological community.

Patches PG8 and PG9 were of the highest quality, were contiguous with each other and other larger remnants of vegetation in the easternmost parcel and supported high native species diversity.

Plate 5. Plains Grassland (PG2) within the BMD Land (Ecology and Heritage Partners Pty Ltd 17/08/2017).

Plate 6. Fuzzy New Holland Daisy-dominated Plains Grassland (PG8) within the BMD Land (Ecology and Heritage Partners Pty Ltd 10/09/2017).

Lower quality remnants were located elsewhere throughout the study area, and due to former or ongoing land practices, exhibited a lower species diversity, with PG2, PG3 and PG6 often being defined by only one or two native species, and high cover of exotic flora.

Exotic flora was dominant throughout most areas within and adjacent to Plains Grassland vegetation. The most commonly observed weeds were the declared noxious weeds African Box-thorn, Artichoke Thistle *Cynara cardunculus*, Horehound *Marrubium vulgare* and Serrated Tussock. Other common environmental weeds present throughout included Galenia *Galenia pubescens*, Cape Weed *Arctotheca calendula*, Wild Turnip *Brassica* spp., Perennial Rye-grass *Lolium perenne*, Barley *Hordeum* spp., Rat's-tail Fescue *Vulpia myuros*, Ribwort *Plantago lanceolata* and Soft Brome *Bromus hordeaceus* (Plate 7; Plate 8).

Plate 7. Galenia and African Box-thorn within the study area (Ecology and Heritage Partners Pty Ltd 15/08/2017).

Plate 8. Serrated Tussock-dominated grassland (Ecology and Heritage Partners Pty Ltd 25/10/2017).

Long Forest Estate

Patches of Plains Grassland were recorded throughout the study area. Five habitat zones comprising 89.86 hectares were recorded within the Long Forest Estate. The predominant difference in quality between zones was the amount of weed cover, as well as the amount of bare ground available for recruitment. The prominent

species were a range of Spear grass, Wallaby-grass and a number of herbs similar to those present in the BMD Land.

Many of these patches were modified and contained a cover of approximately 50% exotic species including Spear Thistle *Cirsium vulgare*, Serrated Tussock and Red Brome *Bromus rubens*.

Other Assessed Land

Dominant native grasses and herbs recorded throughout most patches of Plains Grassland within the 'other assessed land' were generally consistent with those recorded in the BMD Land, with occasional specimens of the State significant Slender Bindweed *Convolvulus angustissimus* subsp. *omnigracilis* observed (Plate 9; Plate 10).

A total of four habitat zones comprising 30.375 hectares of Plains Grassland were recorded within the study area (PG1 – PG4) (Figure 3), with habitat zones differing in quality predominantly due to the diversity and/or of native species present, and the type and extent of weeds present in the habitat zone (Appendix 2.3).

Habitat zone PG4 at 55 Oconnell Road met the thresholds that define the nationally significant *Natural Temperate Grasslands of the Victorian Volcanic Plain* (NTGVVP) ecological community (Figure 3) (Section 0).

Plate 9. Wallaby-grass dominated Plains Grassland within the 'Other Assessed Land' (Ecology and Heritage Partners Pty Ltd 18/12/2019).

Plate 10. Slender Bindweed in Plains Grassland EVC within the 'Other Assessed Land' (Ecology and Heritage Partners Pty Ltd 18/12/2019).

Lower quality remnants were located elsewhere throughout the 'other assessed land', and due to former or ongoing land practices, exhibited a lower species diversity, with PG2 and PG3 often being defined by only one or two native species, and high cover of exotic flora.

Exotic flora was dominant throughout most areas within and adjacent to Plains Grassland vegetation. The most commonly observed weeds were the declared noxious weeds and Weeds of National Significance (WoNS) Serrated Tussock and Chilean Needle-grass. Other noxious weeds observed in lower abundance included African Box-thorn, Artichoke Thistle *Cynara cardunculus* and Horehound *Marrubium vulgare*. Common environmental weeds present in moderate to high abundance throughout included Galenia *Galenia pubescens*, Wild Turnip *Brassica* spp., Perennial Rye-grass *Lolium perenne*, Barley *Hordeum* spp., Rat's-tail Fescue *Vulpia myuros*, St John's Wort *Hypericum perforatum, Ribwort Plantago lanceolata* and Soft Brome *Bromus hordeaceus* (Plate 11; Plate 12).

Plate 11. Galenia-dominated grassland within the 'Other Assessed Land' (Ecology and Heritage Partners Pty Ltd 09/12/2019).

Plate 12. Serrated Tussock-dominated grassland in the 'Other Assessed Land' (Ecology and Heritage Partners Pty Ltd 18/12/2019).

3.1.2.2 Grassy Woodland

Grassy Woodland is described as a variable open eucalypt woodland over a diverse ground layer of grasses and herbs, with a sparse shrub component. The EVC usually occurs on sites with moderate fertility over a range of geologies, often on undulating hillsides or slopes (DELWP 2021c).

BMD Land

Within the BMD Land, Grassy Woodland was recorded in several small, scattered remnants adjacent to Gisborne Road, along with one large remnant immediately north of Oconnell Road (Figure 3).

The overstorey was predominantly comprised of Grey Box *Eucalyptus microcarpa*, with occasional specimens of Yellow Box *Eucalyptus melliodora* and Yellow Gum *Eucalyptus leucoxylon* subsp. *pruinosa* also present.

The understory was in poor condition in all habitat zones, with only occasional occurrences of native grasses and shrubs present. The State significant Fragrant Saltbush *Rhagodia parabolica* was relatively common within and adjacent to several patches of Grassy Woodland. However, the dominant understory species comprised African Box-thorn, Serrated Tussock and Galenia (Plate 13; Plate 14).

A total of four habitat zones were recorded within the BMD Land (GW1 – GW4) (Figure 3), comprising an area of 4.776 hectares, with habitat zones mostly defined by the number of Large Old Trees present, and the cover of weeds in the understory (Appendix 2.3).

Other Assessed Land

Within the 'other assessed land', Grassy Woodland was recorded in discrete, scattered remnants within the parcel located at 55 Oconnell Road.

The overstorey component was sparse, with occasional specimens of mature and immature Grey Box present. The understory was predominately comprised of shrubs, including Golden Wattle *Acacia pycnantha*, Hedge Wattle *Acacia paradoxa,* Common Eutaxia *Eutaxia microphylla* and the State significant Fragrant Saltbush (Plate 15; Plate 16).

Native grasses were common with Rough Spear-grass, Common Wallaby-grass and Bristly Wallaby-grass all observed. Serrated Tussock and Chilean Needle-grass were also common within and adjacent to the Grassy Woodland patches.

A total of two habitat zones were recorded within the study area (GW1 – GW2) (Figure 2), comprising an area of 1.048 hectares, with habitat zones mostly defined by the number of Large Old Trees present and canopy cover, as well as the presence of logs in the understory (Appendix 2.3).

Plate 13. Grassy Woodland (GW1) within the study area (Ecology and Heritage Partners Pty Ltd 25/10/2017).

Plate 14. Grassy Woodland (GW4) within the study area (Ecology and Heritage Partners Pty Ltd 16/08/2017).

Plate 15. Grassy Woodland (GW1) within the study area (Ecology and Heritage Partners Pty Ltd 18/12/2019).).

Plate 16. Grassy Woodland (GW1) within the study area (Ecology and Heritage Partners Pty Ltd 18/12/2019).

3.1.2.3 Rocky Chenopod Woodland

Rocky Chenopod Woodland is a low open eucalypt woodland (often in mallee-form) with an understory dominated by chenopod (saltbush) species, with scattered grasses and herbs (DELWP 2021c).

BMD Land

Rocky Chenopod Woodland was recorded in small patches near north-west boundary adjacent to Gisborne Road, as well as in a large patch to the east of the of the BMD Land (Figure 2). The overstorey of this EVC was

co-dominated by Grey Box and Bull Mallee *Eucalyptus behriana*, with the occasional Melbourne Yellow Gum specimen also present. The understory was generally sparse, and comprised Fragrant Saltbush, Ruby Saltbush, Moonah *Melaleuca lanceolata*, Gold-dust Wattle *Acacia acinacea*, Variable Groundsel *Senecio pinnatifolius* and Saloop *Einadia hastata* (Plate 17 and Plate 18).

Weed cover was high in habitat zones RCW1, RCW2 and RCW5, with African Box-thorn and Galenia dominating the understory in these habitat zones (Plate 19; Plate 20). Zones RCW3 and RCW4 were relatively weed free (Plate 17; Plate 18).

Five habitat zones (RCW1 – RCW5) were recorded comprising a total of 28.17 hectares. Habitat zones were predominantly differentiated due to the cover of weeds and number of woody species exhibiting recruitment (Appendix 2.3).

Plate 17. Rocky Chenopod Woodland (RCW3) within the study area (Ecology and Heritage Partners Pty Ltd 08/12/2017).

Plate 18. Rocky Chenopod Woodland (RCW3) within the study area (Ecology and Heritage Partners Pty Ltd 08/12/2017).

Plate 19. High cover of African Box-thorn within RCW5 (Ecology and Heritage Partners Pty Ltd 08/12/2017).

Plate 20. High cover of African Box-thorn within RCW5 (Ecology and Heritage Partners Pty Ltd 08/12/2017).

Long Forest Estate

Five differing quality patches of Rocky Chenopod Woodland were identified in the far east of the Long Forest Estate, with canopy species Bull Mallee, Yellow Gum, and Grey Box present. The understory was modified and

contained a mixture of indigenous and exotic grasses, and scattered shrubs, such as the State significant Fragrant Saltbush, and noxious woody weeds such as African Boxthorn. A total of 3.72 hectares of the EVC was recorded, with the difference in quality of the remnant patches predominantly due to the extent of both weed cover and canopy cover.

Other Assessed Land

Rocky Chenopod Woodland was recorded in a large patch within the parcels at 53 and 55 Oconnell Road (Figure 3). The overstorey of this EVC was co-dominated by Grey Box and Bull Mallee, with the occasional Melbourne Yellow Gum specimen also present. The understory was generally sparse, and comprised Fragrant Saltbush, Ruby Saltbush, Moonah, Gold-dust Wattle, Variable Groundsel and Saloop (Plate 21; Plate 22).

Weed cover was relatively low, with scattered specimens of African Box-thorn and Prickly-pear *Opuntia* sp., present the understory in these habitat zones.

Two habitat zones (RCW1 – RCW2) were recorded comprising a total of 3.439 hectares. Habitat zones were predominantly differentiated due to the cover of weeds and understory diversity (Appendix 2.3).

Plate 21. Rocky Chenopod Woodland in 53 Oconnell Road (Ecology and Heritage Partners Pty Ltd 09/12/2019).

Plate 22. Rocky Chenopod Woodland in 55 Oconnell Road (Ecology and Heritage Partners Pty Ltd 09/12/2019).

3.1.2.4 Plains Grassy Wetland

Plains Grassy Wetland is usually treeless, although a sparse shrub component may be present. The ground cover is usually dominated by grasses and small sedges and herbs. The vegetation is typically species-rich on the outer verges but is usually species-poor in the wetter central areas (DELWP 2021d).

BMD Land

One patch of Plans Grassy Wetland (PGWe1) was recorded around an artificial water body along a designated waterway, and was comprised of Cumbungi *Typha* spp., Common Spike-sedge *Eleocharis acuta*, Joint-leaf Rush *Juncus holoschoenus* and Pale Rush *Juncus pallidus* (Plate 23; Plate 24).

The exotic species Drain Flat-sedge *Cyperus eragrostis*, Lesser Quaking-grass *Briza minor* and Yorkshire Fog *Holcus lanatus* were common in this habitat zone.

Plate 23. PGWe1 within the study area (Ecology and Heritage Partners Pty Ltd 15/08/2017).

Plate 24. PGWe1 within the study area (Ecology and Heritage Partners Pty Ltd 15/08/2017).

Other Assessed Land

One patch of Plans Grassy Wetland (PGWe1) was recorded around an artificial water body within 55 Oconnell Road, and was comprised of Common Spike-sedge, Joint-leaf Rush and Pale Rush (Plate 23).

The exotic species St. John's Wort *Hypericum perforatum* was common in areas adjacent to the waterbody (Plate 24).

Plate 25. PGWe1 within the study area (Ecology and Heritage Partners Pty Ltd 09/12/2018).

Plate 26. St. John's Wort adjacent to PGWe1 (Ecology and Heritage Partners Pty Ltd 09/12/2018).

3.1.2.5 Large Trees and Scattered Trees

Large Trees

Seventy-one Large Trees in patches were recorded within the BMD Land, Long Forest Estate and the Other Assessed Land (Table 14). These trees were generally comprised of Grey Box, with occasional specimens of Yellow Box, and Messmate *Eucalyptus obliqua* (Appendix 2.4).

Scattered Trees

A total of 120 scattered trees were recorded within the assessed areas of the Merrimu PSP (Table 14) (Appendix 2.4).

These trees would once likely have been part of the Grassy Woodland EVC, however the understorey vegetation consists of predominantly introduced species (mainly exotic pasture grasses) and the trees no longer form a patch of native vegetation (Plate 27; Plate 28).

Plate 27. Two scattered Grey Box within the study area (Ecology and Heritage Partners Pty Ltd 10/09/2017).

Plate 28. Scattered River Red-gum within the study area (Ecology and Heritage Partners Pty Ltd 16/08/2017).

Table 14. Large Trees and Scattered Trees

Type	Size Class	BMD Land	Long Forest Estate	Other Assessed Land
Large Trees (in patches)	Large	44	15	12
Scattered Trees	Large	30	-	16
	Small	28	2	44

3.1.3 Introduced and Planted Vegetation

3.1.3.1 Introduced Vegetation

Areas not supporting remnant native vegetation have a high cover (>80%) of exotic grass species, many of which have been direct-seeded for use as pasture. Scattered native grasses are generally present in these areas, however they did not have the required 25% cover to be considered a patch of native vegetation. Removal of embedded rock has also been undertaken as part of historical agricultural activities throughout much of the Merrimu PSP.

Large areas of the study area have no native vegetation present, and are dominated by cereal crops (Plate 29).

Disturbed areas (not mapped as native vegetation) were mostly dominated by the environmental weeds Galenia, Rat's Tail Fescue, Ribwort, Wild Oat *Avena fatua,* Prairie Grass *Bromus catharticus*, Curled Dock *Rumex crispus*, Black Night-shade *Solanum nigrum*, Sticky Ground-cherry *Physalis hederifolia*, and Onion-grass *Romulea rosea*.

Noxious weeds are present throughout the study area, with common occurrences of Artichoke Thistle, Horehound and Spear Thistle *Cirsium vulgare* along with the Weeds of National Significance (WONS), African Boxthorn, Serrated Tussock, Prickly Pear *Opuntia* spp., Bridal Creeper *Asparagus asparagoides* and Blackberry *Rubus fruticosus* sp. agg. (Plate 30; Plate 31).

Plate 29. Cropped area within the study area (Ecology and Heritage Partners Pty Ltd 21/01/2019).

Plate 30. Horehound and Chilean Needle-grass within the study area (Ecology and Heritage Partners Pty Ltd 18/12/2018).

3.1.3.2 Planted Vegetation

Planted vegetation in the study area consists of native and non-native Victorian tree and shrub species. A Sugar Gum *Eucalyptus cladocalyx* plantation is located to the north of the BMD Land (Plate 32).

Aside from Sugar Gum, commonly planted species include Peppercorn *Shoenus molle*, Southern Mahogany *Eucalyptus botryoides*, and specimens of Grey Box and Yellow Gum. Most planted vegetation is situated in windrows, or around dwellings, sheds and laneways. A variety of ornamental shrubs have also been planted around sheds and dwellings.

Plate 31. Artichoke Thistle within the study area (Ecology and Heritage Partners Pty Ltd 08/12/2017).

Plate 32. Planted vegetation within the study area (Ecology and Heritage Partners Pty Ltd 11/02/2017).

3.1.4 Fauna Habitat

3.1.4.1 Native and Introduced Grasslands

The majority of the study area consists of paddocks which contain improved exotic pastures, likely to be used as a foraging resource by common generalist bird species which are tolerant of modified open areas. Fauna observed using this habitat included the native Australian Magpie *Cracticus tibicen*, Little Raven *Corvus mellori*, Magpie-lark *Grallina cyanoleuca*, Willie Wagtail *Rhipidura leucophrys*, and the exotic Common Blackbird *Turdus merula*, House Sparrow *Passer domesticus*, Red Fox *Vulpes vulpes* and European Rabbit *Oryctolagus cuniculus*.

Patches of native grassland occur throughout the study area. These vary in quality and floristic composition according to grazing regimes and historical land use. Habitat attributes of the native grassland are suitable for an array of common native fauna, including snakes, lizards and skinks, and grassland birds. Diurnal and nocturnal raptors are also likely to forage across these areas, with Wedge-Tailed Eagle *Aquila audax* and Black-shouldered Kite *Elanus axillaris* observed during the field assessment. Several Eastern Grey Kangaroos *Macropus giganteus* was also observed foraging in grassland areas.

Areas of native grassland, particularly those with a high cover of Wallaby-grasses *Rytidosperma* spp. may provide habitat for the nationally significant Golden Sun Moth *Synemon plana*. Some of these areas have cracking soils which may provide sheltering habitat for reptiles and small mammals including Striped Legless Lizard and Fat-tailed Dunnart.

3.1.4.2 Woodlands and Scattered Trees

Woodland and scattered remnant trees occur throughout the study area and provide an important resource for arboreal fauna. The majority of the eucalypts are mature, providing an array of small, medium and large, bark fissures and crevices. These are likely to be used for shelter and nesting by a range of hollow-dependent fauna including parrots, microbats, possums, gliders and owls. Scattered trees provide habitat for more mobile fauna species, vantage points and nesting areas for diurnal and nocturnal raptors, as well as stepping stones for more mobile fauna moving through the study area, enhancing landscape permeability for native fauna.

Species observed utilising woodland and scattered trees within the study area included the native Nankeen *Kestrel Falco cenchroides*, White-plumed *Honeyeater Lichenostomus penicillatus,* Red Wattlebird *Anthochaera*

carunculata, Magpie-Lark *Grallina cyanoleuca*, Australian Magpie *Cracticus tibicen*, Little Raven *Corvus mellori*, Willie Wagtail *Rhipidura leucophrys* and Yellow Thornbill *Acanthiza nana*.

3.1.4.3 Planted Vegetation

Planted vegetation is located throughout the study area predominantly as ornamental plantings around dwellings. These areas provide foraging, roosting and nesting habitat for mobile generalist fauna including locally common birds and microbats. Species observed using this habitat included the native Superb Fairy-wren *Malurus cyaneus*, Grey Fantail *Rhipidura albiscarpa*, New Holland Honeyeater *Phylidonyris novaehollandiae*, Grey Shrike-thrush *Colluricincla harmonica* and introduced bird species Common Blackbird *Turdus merula*, Noisy Miner *Manorina melanocephala* and Common Starling *Sturnus vulgaris*.

3.1.4.4 Aquatic Habitat

Multiple waterbodies in the form of artificial dams occur within the study area (Figure 3).

Where fringing vegetation occurs it is typically in the form of exotic pasture grasses such as Toowoomba Canary-grass. Water quality was typically low with turbidity typically high. Species observed utilising waterways were restricted to the native Common Froglet *Limnodynastes dumerilii*, White-necked Heron *Ardea pacifica*, White-faced heron *Egretta novaehollandiae* and Pacific Black Duck *Anas superciliosa*.

Of the water bodies present there was a clear lack of connectivity to natural aquatic habitats, and as such, it is highly unlikely these areas support a diversity of native species.

3.2 Nationally Significant Values

Matters of National Environmental Significance (NES) are listed and protected under the EPBC Act. Matters of NES relating to biodiversity are discussed below based on the results of the PMST (DAWE 2021), desktop review of literature, and the results of ecological surveys.

3.2.1 Flora

The VBA contains records of three nationally significant flora species previously recorded within 10 kilometres of the study area (DELWP 2020a) (Figure 3). The PMST nominated an additional 13 nationally significant species which have not been previously recorded but have the potential to occur in the locality (DAWE 2021) (Figure 7; Appendix 2.2).

Most records are located within and adjacent to the Long Forest Flora and Fauna Reserve to the east of the PSP, the Lerderderg State Park to the north-west of the study area, and existing road reserves within the local area where survey effort has likely been greater (Figure 7). A single species, Spiny Rice-flower, was historically within the north-east of the PSP in (Figure 7).

Of the 15 nationally significant flora species that are known to, or are predicted to occur within the locality, several species have a low likelihood of occurrence, while Spiny Rice-flower is known to occur within the broader locality. Prior to the ecological survey program, several other species were considered to have a moderate or higher likelihood of occurrence within the study area (Table 15).

Table 15. Nationally significant flora with potential habitat in the study area

Species	Conservation Significance	Suitable habitat within the study area
Spiny Rice-flower *Pimelea spinescens* subsp. *spinescens*	CR L e	There are five records of Spiny Rice-flower (SRF) recorded in the VBA within the local area, with the most recent from 2003 located east of the study area in Long Forest Flora and Fauna Reserve. There is suitable habitat within the study within Plains Grassland EVC, as well as non-native grassland not previously subject to previous cropping activities. Targeted surveys for the species have been undertaken, with the results of the targeted surveys provided below (Section 3.5).
Small Golden Moths *Diuris basaltica*	EN L e	There are six records of Small Golden Moths recorded in the VBA within the local area, with all located south of Werribee River and Bacchus Marsh township (VBA 2020a). An additional record is located further east near Melton, with another record north-west in Toolern Vale (DELWP 2020a). Small Golden Moth orchids typically grow in herb-rich native grasslands, dominated by Kangaroo Grass *Themeda triandra* on heavy basaltic soils, often embedded with basalt boulders, with the known distribution of the species highly restricted (DSE 2010b). Given the absence of Kangaroo Grass-dominated grassland within the study area, general poor condition of habitat (outside of 289 Bences Road), high levels of weed invasion, absence of other orchids within the locality, and history of agricultural activities, there is considered to be a low likelihood of occurrence within the Merrimu PSP.
Basalt Peppercress *Lepidium hyssopifolium*	EN L e	Although there are no records within the VBA within 10 kilometres, there is an informal record recorded in the Atlas of Living Australia (ALA) within a parcel immediately south of Buckleys Road (ALA 2021). This property has been cropped, and the specimen would no longer be present. It is understood that almost all remaining populations of Basalt Peppercress occur in heavily modified, non-natural environments, usually amongst exotic pasture grasses and weed species, sometimes with an overstorey of introduced tree species (DSE 2010c). However, the species appears to rely heavily on favourable microsite conditions, with Basalt Peppercress appearing to only establish in relatively open bare ground where there is limited competition from other plants (both native and introduced species), rather than in areas with thick ground cover (DSE 2010c). As the majority of grassland vegetation (native and non-native) supports high levels of biomass, with few patches of bare ground present, as well as the lack of other records in close proximity to the study area, there is considered a low likelihood of occurrence within the Merrimu PSP. Further, the biodiversity assessment and targeted surveys (for other species) did not note any specimens that meet the description of the species in areas of potential habitats.
Large-head Fireweed *Senecio macrocarpus*	VU L e	There are no known records of Large-headed Fireweed within 10 kilometres of the study area, with the closest known record located approximately 17 kilometres to the east (VBA 2020a). Previous surveys for the species in Long Forest Estate did not record the species (Ecology and Heritage Partners 2013b), and there is considered to be a low likelihood of occurrence that the species occurs in the locality.

Note. CR/EN/VU = Critically Endangered/Endangered/Vulnerable under the EPBC Act; L = Listed as Threatened under the FFG Act; e = endangered on the DELWP Advisory List (DEPI 2014).

3.2.1.1 Spiny Rice-flower

Spiny Rice-flower has the potential to occur within areas of relatively undisturbed Plains Grassland with Kangaroo Grass and or Wallaby-grass present (DAWE 2020a).

Generally, biomass levels were high, with Chilean Needle-grass and Toowoomba Canary-grass particularly dominant outside patches of native vegetation resulting in little inter-tussock space being available for Spiny Rice-flower to co-exist.

Most habitats within the Merrimu PSP were comprised of improved pasture, and combined with agricultural land use, ongoing disturbance (grazing, slashing) high biomass, no recent evidence of fire and little to no inter-tussock space, the assessed areas exhibited few of the preferred habitat attributes of the species (DEWHA 2009a).

BMD Land

Two large populations of Spiny Rice-flower were recorded within the BMS Land, with 201 individuals recorded within the land at 376 Bences Road, and 2452 individuals at 289 Bences Road, Merrimu (Figure 5).

Despite systematic targeted surveys within other parcels supporting potential habitat during the known flowering period when the species was known to be flowering within the locality, no additional Spiny Rice-flower were detected.

Based on the results of the targeted survey, site condition and proximity and distribution of previous records, there is considered to be a low likelihood that the BMD Land supports a population of Spiny Rice-flower outside of the two properties identified above.

Long Forest Estate

Despite systematic targeted surveys within Long Forest Estate during 2013 and 2019 during the known flowering period when the species was known to be flowering within the locality, no Spiny Rice-flower were detected (Figure 5).

Based on the results of the targeted survey, site condition and proximity and distribution of previous records, there is considered to be a low likelihood that Long Forest Estate supports a population of Spiny Rice-flower.

Other Assessed Land (55 and 95 Oconnells Rd)

Despite systematic targeted surveys within 55 and 95 Oconnells Rd during the known flowering period when the species was known to be flowering within the locality, no Spiny Rice-flower were detected (Figure 5).

Based on the results of the targeted survey, site condition and proximity and distribution of previous records, there is considered to be a low likelihood that the areas of assessed habitat within 55 and 95 Oconnells Rd supports a population of Spiny Rice-flower.

3.2.1.2 Other Nationally Significant Flora

As part of the ecological assessments undertaken within Long Forest Estate (Ecology and Heritage Partners 2013a; 2013b), targeted surveys were also undertaken for the nationally significant Small Golden Moths, Large-headed Fireweed, Maroon Leek-orchid and Clover Glycine

Despite targeted surveys being undertaken at an appropriate time of year when the species are generally known to be flowering, no specimens of Small Golden Moths *Diuris basaltica*, Large-headed Fireweed *Senecio macrocarpus*, Maroon Leek-orchid *Prasophyllum frenchii* or Clover Glycine *Glycine latrobeana* were recorded within Long Forest Estate (Ecology and Heritage Partners 2013a; 2013b).

Based on the results of the targeted surveys, site condition and proximity and distribution of previous records, there is considered to be a low likelihood that Long Forest Estate supports a population of any nationally significant flora.

Based on the landscape context, highly modified nature of the broader Merrimu PSP and extent of previous vegetation removal, the likelihood of any additional nationally significant flora occurring within the Merrimu PSP is considered low due to the absence of suitable habitat and lack of records in close proximity (Appendix 2.2).

3.2.2 Fauna

The VBA contains records of 10 nationally significant fauna species previously recorded within 10 kilometres of the study area (DELWP 2020a) (Appendix 3.2) (Figure 8). The PMST nominated an additional 10 nationally significant species which have not been previously recorded but have the potential to occur in the locality (DAWE 2021).

Most records are located within and adjacent to the Long Forest Flora and Fauna Reserve to the east of the PSP, and Merrimu Reservoir to the north of the study area (Figure 8). A single species, Golden Sun Moth has been recorded in high abundance within the Long Forest Estate as a result of the targeted surveys undertaken by Ecology and Heritage Partners in 2012/2013 (Figure 8).

Of the 20 nationally significant fauna species that are known to, or are predicted to occur within the locality, several species have a low likelihood of occurrence, while Golden Sun Moth is known to occur within the broader locality. Prior to the ecological survey program, two other species were considered to have a high likelihood of occurrence within the study area (Table 16).

Table 16. Nationally significant fauna with suitable habitat in the study area

Species	Conservation Significance	Suitable habitat within the study area
Striped Legless Lizard *Delma impar*	VU L e	There is one record of Striped Legless Lizard within 10 kilometres to the north of the PSP within the Lerderderg State Forest registered in the VBA (DELWP 2020a), as well as an unverified record located immediately south of the Werribee River approximately three kilometres south (ALA 2021). Areas of suitable tussock structure, cracking soils and embedded rock without major disturbance from ploughing comprise potential habitat. Due to the similarity in habitat within the study area, and known populations of the species located further to the east of Melton, there is considered to be a moderate possibility of the species occurring.
Growling Grass Frog *Litoria raniformis*	VU L e	The VBA contains 32 records of Growling Grass Frog within 10 kilometres of the study area (DELWP 2020a), with most of these being historical records (i.e. prior to 1990) from the Lerderderg River, Werribee River and Parwan Creek There is suitable habitat within areas of still or water flowing waterbodies with emergent vegetation in Lerderderg River and the Werribee River.
Golden Sun Moth *Synemon plana*	CR L ce	There are over 300 records of Golden Sun Moth from the local area recorded within the VBA (2020a), with the majority of these recorded by Ecology and Heritage Partners in a nearby property to the south-east (Ecology and Heritage Partners 2013b). There is suitable habitat for this species in areas of native and non-native grassland containing Wallaby-grass and/or Chilean Needle-grass.

Note. CR/VU = Critically Endangered/Vulnerable under the EPBC Act; L = Listed as Threatened under the FFG Act; cr/e = critically endangered/endangered on the DELWP Advisory List (DEPI 2013).

3.2.2.1 Golden Sun Moth

Golden Sun Moth were confirmed flying within the known population located within Long Forest Estate or the parcel at 289 Bences Road prior to undertaking targeted surveys within the Merrimu PSP.

Targeted surveys focussed on areas of potential habitat comprising uncropped land within the study area. This included the areas mapped as Plains Grassland EVC as well as predominantly introduced vegetation, where a high cover of the species preferred food plants (Wallaby-grass, Chilean Needle-grass) occurred.

Habitat within the study area was considered moderate to high quality where the presence of Wallaby-grass and/or Chilean Needle-grass was present at a cover of at least 20%.

BMD Land

Targeted surveys recorded significant numbers of Golden Sun Moth within the site during the four surveys, particularly on the first survey day (Table 17), with the study area supporting suitable habitat characteristics.

In total, 58.298 hectares of confirmed habitat was recorded within the BMD Land (Figure 4).

Table 17 Golden Sun Moth survey results

Date	Survey times	Temperature (°C) *	Wind (km/hr) Direction	Cloud cover (%)	Days since rain	Reference Site	No. GSM
30/11/2017	10:00 – 15:00	34 - 39	31 N	60	2+	Long Forest Estate	>200
12/12/2017	12:00 – 17:00	24 – 27	14 SW	5	2+	289 Bences Rd	2
18/12/2017	10:00 – 17:00	22 – 27	11 SE	30	2+	289 Bences Rd	0
04/01/2018	11:00 – 15:00	20 – 21	26 SSE	40	2+	289 Bences Rd	0

Note: Weather data taken from BOM website (Melbourne Airport).

Other Assessed Land (55 and 95 Oconnell Road)

The targeted surveys undertaken within 55 and 95 Oconnell Road in December 2019 and January 2020 recorded approximately 20 individuals dispersed across the site (Ecology and Heritage Partners 2021) (Figure 4).

On all four days, the presence of Golden Sun Moth was confirmed flying at the reference site (Table 18).

The study area and adjacent areas support discrete areas that provide suitable habitat characteristics for the species in the form of a moderate cover of Wallaby Grass and/or Chilean Needle-grass.

The study area supports 25.1 hectares of confirmed Golden Sun Moth habitat within 55 and 95 Oconnell Road (Figure 4).

Table 18. Summary of Golden Sun Moth survey results[1]

Survey # and Date	Survey times	Reference Site	Temperature (oC) (9am and 3pm)	Wind (km/hr)	Cloud cover (%)	No. of days since rain	No. GSM
1 - 16/12/19	11:00-16:00	Long Forest *	16.6 – 22.3	33	20	6	5
2 - 18/12/19	9:00-15:30	Long Forest *	24.2 - 38.1	35	15	8	8
3 - 28/12/19	10:00-14.30	289 Bences Rd *	24.6 – 31.2	20	15	20	3
4 - 08/01/20	10:00-16:00	289 Bences Rd *	19.1 – 25.4	28	35	1	4

Note. * GSM observed at reference site.

Long Forest Estate

The targeted surveys undertaken within the Long Forest Estate property in December 2012 recorded 551 individuals dispersed across the study area (Ecology and Heritage Partners 2013a) (Figure 4).

The moths were flying strongly and freely above the grassland, indicating that most of those detected were males. Golden Sun Moths were recorded throughout the property in comparable densities (Figure 4), reflective of the largely homogenous grassland habitat throughout. Overall, a total of 107.35 hectares of confirmed Golden Sun Moth habitat was recorded within Long Forest Estate.

Although recent targeted surveys have not been undertaken within Long Forest Estate, the site has been used as a reference site for other, nearby assessments, with the species observed to still be present in high numbers in December 2017 and December 2019 (Ecology and Heritage Partners 2018a; 2021).

3.2.2.2 Striped Legless Lizard

Habitat within the study area was considered sub-optimal for Striped Legless Lizard, largely due to the lack of high quality Kangaroo Grass grasslands or secondary grasslands with cracking soils, and surface or embedded rock which the species relies on for habitat. Although some discrete areas of embedded rock are still present, these areas are generally disturbed, dominated by exotic grasses.

BMD Land

Despite the presence of suitable habitat, 17 grids placed in areas representative of the best quality habitat (Figure 4; Plate 33), and targeted surveys undertaken at an appropriate time of year, no Striped Legless Lizards were detected within the study area during the six tile grid checks. The targeted survey recorded an additional four reptile species: Bougainville's Skink *Lerista bougainvillii,* Delicate Skink *Lampropholis delicata* (Plate 34), Common Bluetongue Lizard *Tiliqua scincoides*, and Eastern Tiger Snake *Notechis scutatus*. A summary of the survey results is provided in Table 19.

Based on targeted survey results, and the lack of records within the project locality, a population of Striped Legless Lizard is considered highly unlikely to be present in the study area.

[1] Bureau of Meteorology (BOM) weather for Geelong Racecourse, Victoria (Station 087184 – Dec 2019/Jan 2020), Australian Government, ACT.

Plate 33. Tile grid setup within the study area (Ecology and Heritage Partners Pty Ltd 04/08/2017).

Plate 34. Delicate Skink *Lampropholis delicata* (Ecology and Heritage Partners Pty Ltd 25/10/2017).

Table 19. Summary of Striped Legless Lizard survey results within BMD Land

Check/ Date	Weather Conditions *				SLL	Bougainville's Skink	Delicate Skink	Common Blue-tongue	Eastern Tiger Snake	Unidentified skink
	Temp (°C)	Relative Humidity (%)	Above Tile Temp C°	Under Tile Temp C°						
1 - 28/09/17	14	73	11.9	9.9	-	TG9 x 1	-	-	-	TG1 x 1 TG6 x 1 TG9 x 1
2 - 11/10/17	17.1	35	14.6	13.5	-	TG 16 x 1	TG9 x 2	-	-	TG14 x 1
3 - 20/10/17	12	66	12.7	11.4	-	TG16 x 2 TG1 x 1	-	-	-	TG9 x 1
4 - 6/11/17	10.7	75	11.1	9.8	-	TG17 x 3 TG3 x 1 TG7 x 1	-	TG14 x 1	TG8 x 1	-
5 -17/11/17	18	88	23.3	21.0	-	TG16 x 1	-	-	-	-
6 - 24/11/17	19	69	18.9	19.8	-	TG9 x 2 TG16 x 1	-	-	-	-

Note: * Beginning of tile check; SLL – Striped Legless Lizard; TG = Tile Grid

Other Assessed Land (55 and 95 Oconnells Rd)

Despite the presence of suitable habitat, four grids placed in areas representative of the best quality habitat (Figure 4), and targeted surveys undertaken at an appropriate time of year, no Striped Legless Lizard were detected within 55 and 95 Oconnell Rd during the eight tile grid checks.

The targeted survey recorded an additional three reptile species: Bougainville's Skink, Garden Skink *Lampropholis guichenoti* and Marbled Gecko *Christinus marmoratus*. A detailed summary of the survey results is provided in Appendix 3.4.

Based on targeted survey results, and the lack of records within the project locality, a population of Striped Legless Lizards are considered highly unlikely to be present in 55 and 95 Oconnell Rd.

Long Forest Estate

Despite the presence of suitable habitat, 10 grids placed in areas representative of the best quality habitat (Figure 4), and targeted surveys undertaken at an appropriate time of year, no Striped Legless Lizard were detected within Long Forest Estate during the eight tile grid checks.

No reptiles were recorded at any time during the tile checks. Two Spotted Marsh Frog *Limnodynastes tasmaniensis* and one Common Blue-tongue Lizard *Tiliqua scincoides* were uncovered during incidental checks of rocks and sheet metal, and an unidentified snake was encountered when laying the tile grids. A detailed summary of the survey results is provided in Appendix 3.4.

Based on targeted survey results, and the lack of records within the broader locality, a population of Striped Legless Lizards are considered unlikely to be present in Long Forest Estate.

Removal of native vegetation and cultivation within the Merrimu PSP has contributed to the decline of high-quality habitat for the species. Based on the location of existing records, results of multiple targeted surveys and condition of potential habitat, it is considered highly unlikely that a population of Striped Legless Lizard is present within the Merrimu PSP.

3.2.2.3 Growling Grass Frog

Prior to each survey, a known population of the species located at Cowies Creek, North Geelong, was observed and heard calling. This confirms that the species was active and readily detectible during the survey period.

No Growling Grass Frog were detected during the targeted surveys despite weather conditions being conducive for frogs to be active. Two other frog species – Spotted Marsh Frog *Limnodynastes tasmaniensis* and Common Froglet *Crinia signifera* were recorded calling on both nights (Table 20).

Table 20. Summary of Growling Grass Frog survey results

Survey Date	Weather conditions						Species
	Survey Temp C°	Wind direction	Wind speed (km/hr) *	Relative Humidity (%) *	Cloud Cover (%)	Rain	
23/12/2019	18.5	SW	10	30	15	0	Common Froglet, Spotted Marsh Frog (Sites 1-4, 7)
28/12/2019	24.6	S	11	22	30	0	Common Froglet, Spotted Marsh Frog (Sites 1-4, 5, 7)

Note: 1. Data taken from WillyWeather iPhone app. Other values estimated on-site at 8.30pm.

Habitat Assessment

Habitats favoured by Growling Grass Frogs include permanent or largely permanent still water bodies with extensive emergent and submergent vegetation (DEPI 2013a; Hero *et al*. 1991; Robertson *et al.,* 2002). The species is also associated with swamps, irrigated areas, farm dams, former quarry holes and off-stream habitats (DSE 2012). Suitable terrestrial habitat for post-breeding dispersal and overwintering refuge sites are

also required, these include dense ground-level vegetation, rocks, logs and other ground debris (Robertson *et al.,* 2002). This species can also utilise temporarily inundated waterbodies for breeding purposes providing they contain water over the breeding season (Organ 2003).

Waterbodies within the study area had vegetation and cover that indicated potential habitat for Growling Grass Frogs to be present (Table 21). However, waterbodies may have indicated influences in water quality and signs of possible pollutants due to highly modified surrounding farm land, high road-use and populated townships in close proximity (Table 22).

Based on the findings of detailed survey and habitat assessments, there is a low likelihood that the waterbodies surveyed currently supports a breeding population of Growling Grass Frogs or forms part of an important dispersal corridor for the species. The assessed waterbodies and surrounding areas are considered to provide poor quality habitat for the Growling Grass Frog, with breeding and dispersal opportunities limited by:

- The low cover of aquatic and fringing vegetation in largely permanent still water bodies;
- The fast-moving water in Lerderderg and Werribee River where fringing vegetation is present;
- A high abundance of known predatory species of the species (Red Fox and Feral Cats) known to occur in the locality;
- The high cover of weeds in parts of Parwan Creek and the Lerderderg River, which effectively chokes the waterbody and limits breeding opportunities; and,
- Limited refuge opportunities to facilitate dispersal.

Table 21. Habitat attributes recorded in the site assessment of GGF waterbodies.

GGF #	Hydroperiod	Instream Pools	Offstream Waterbodies	Habitat Value	Refuge Type	Aquatic Veg Cover (%)	Predator Fish
1	2	Channel- dry but evident pooling into waterbody	Agricultural dams present within 1km	Moderate	Exotic- Very few native species	30	Likely
2	3	N/A	Close to GFF 3&4 and large dam(s) downstream toward M8	Moderate	Exotic & Native Vegetation	25	Likely
3	2	Irrigation channel in close proximity- possible periodic filling	Close to GGF4 Lerderderg and large dam(s) SW	Low	Exotic- Hardly any refuge at all	<5	Likely
4	2	Irrigation channel flowing into waterbody	Close to GGF3 Lerderderg and large dam(s) SW	Low	Exotic- Hardly any refuge at all	<5	Likely
5	3	Upstream from Werribee River	Agricultural dams present within 1km	Moderate	Exotic & Native Vegetation	20	Likely

GGF #	Hydroperiod	Instream Pools	Offstream Waterbodies	Habitat Value	Refuge Type	Aquatic Veg Cover (%)	Predator Fish
6	3	Upstream from Werribee River	Agricultural dams present within 1km	Moderate	Exotic & Native Vegetation	15	Likely
7	3	Upstream from Werribee River	Agricultural dams present within 1km	Moderate	Exotic & Native Vegetation	10	Likely

Note: GGF – Survey Site (See Figure 4)

Table 22. Summary of habitat attributes for the 7 surveyed GGF sites.

GGF #	Shelter/Overwintering Sites?	Veg diversity/structure	Pollutants?
1	Sheltering Vegetation- both native and exotic canopy/understory.	Exotic understory and canopy cover with few native trees present (Plate 35)	Likely- close proximity to roads, construction reserve, farming, channel running into waterbody
2	Trees present and lots of habitat values	Good coverage of native veg, exotic scattered throughout, LOT and canopy cover, good refuge species (Plate 36)	Likely- close proximity to roads, reserve, farming
3	Dam - fenced area- birds present but limited sheltering veg species	Dam- low veg cover- mostly exotic -singular tree and fringing veg	Likely- on farming land, channel running into waterbody
4	Dam - unfenced area- birds present but limited sheltering veg species	Manmade dam- low veg cover- mostly exotic - singular tree and fringing veg	Likely- on farming land, channel running into waterbody
5	Trees present and lots of habitat values	Good coverage of native veg, exotic scattered throughout, LOT and canopy cover, good refuge species	Likely- close proximity to roads, reserve, farming
6	Trees present and lots of habitat values	Good coverage of native veg, exotic scattered throughout, LOT and canopy cover, good refuge species	Likely- close proximity to roads, reserve, farming
7	Lots of habitat values- Open- no LOT on this stretch	Good coverage of native veg, exotic scattered throughout, good refuge species	Likely- close proximity to roads, reserve, farming

Plate 35. Site 1 - 100 % fringing vegetation (Ecology and Heritage Partners Pty Ltd 23/12/2019).

Plate 36. Growling Grass Frog survey location at Site 2 (Ecology and Heritage Partners Pty Ltd 23/12/2019

3.2.3 Ecological Communities

Five nationally listed ecological communities are predicted to occur within 10 kilometres of the study area (DAWE 2021a):

- Grassy Eucalypt Woodland of the Victorian Volcanic Plain;
- Natural Temperate Grassland of the Victorian Volcanic Plain;
- Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains;
- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia; and,
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

Extensive survey was undertaken of all areas where it was considered likely that significant ecological communities could occur, with a particular focus on those areas supporting key species or habitat structure that may indicate the presence of a relevant community.

Of the above, one nationally significant ecological community was recorded within the Merrimu PSP - *Natural Temperate Grassland of the Victorian Volcanic Plain* (NTGVVP), with the extent shown on Figure 3. Characteristics of the *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia* community were present within the study area, however potential patches did not meet all the criteria to make patches eligible for listing as the nationally significant community. The below sections provided further information on both the NTGVVP and the Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia communities.

Although the other three nationally listed communities the potential to occur within the broader study area, the on-ground assessment determined them to be absent based on a lack of indicator species, structure, and/or falling outside of the communities distribution.

3.2.3.1 *Natural Temperate Grassland of the Victorian Volcanic Plain*

An assessment of the qualifying patches against the condition thresholds for the *Natural Temperate Grassland of the Victorian Volcanic Plain* ecological community is given below. Some patches did not qualify due to the native tussock cover not comprising a cover of 50% of the patch as a result of the high cover of perennial weeds (e.g. Serrated Tussock).

Step 1 – Determining if the Natural Temperate Grassland ecological community is present:

- Does the patch occur within or near the Victorian Volcanic Plain? YES
- Is the patch dominated by native vegetation? YES
- Are trees absent or sparse? YES
- Is the ground vegetation dominated by native grasses and/or herbs? YES

Step 2 – Determining if the patch is of sufficient quality for national listing:

- Is the patch bigger than or equal to 0.05 hectares in areas of remnant vegetation less than one hectare? YES
- Do the dominant native species represent at least 50% of the native species and the perennial tussock cover? YES

The patches met the condition thresholds for listing as the EPBC Act community due to the high cover of native tussock grasses and herbs present. Across the Merrimu PSP, a total of 91.895 hectares of NTGVVP was recorded (based on past and current mapping), with 17.665 hectares within the BMD Land, 68.51 hectares within Long Forest Estate, and 5.72 hectares within the 'Other Assessed Land' (Figure 3).

3.2.3.2 *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia*

Several patches of Grassy Woodland and Rocky Chenopod Woodland present within the Merrimu PSP contained a canopy dominated by Grey Box, and contained vegetation that is most similar to the condition thresholds that describe the Grey Box community.

Whilst the patches did contain a Grey Box canopy and some native shrubs, the understory of the patches were predominantly exotic, being dominated by species such as Serrated Tussock, Galenia and African Box-thorn.

As the ground layer did not contain at least a 10% cover of perennial native grass species, or a 50% cover in the ground layer of perennial native species, the Grassy Woodland and Rocky Chenopod Woodland patches did not meet the condition thresholds that describe the *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia* ecological community.

3.2.4 Migratory Species

Migratory species listed under the EPBC Act are those protected under international agreements to which Australia is a signatory. These include the Japan Australia Migratory Bird Agreement (JAMBA), the China Australia Migratory Bird Agreement (CAMBA), the Republic of Korea Migratory Bird Agreement (ROKAMBA), and the Bonn Convention on the Conservation of Migratory Species of Wild Animals. Migratory species are considered matters of NES under the EPBC Act.

No species of bird recognised under the migratory provisions of the EPBC Act were recorded during ecological surveys.

While migratory species of bird may occasionally inhabit the broader locality, the study area is not considered to be classed as an 'important habitat' as defined under the *EPBC Act Policy Statement 1.1 Principal Significant Impact Guidelines* (DoE 2013a), in that it does not contain:

- Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species;
- Habitat utilised by a migratory species which is at the limit of the species range; or,
- Habitat within an area where the species is declining.

3.2.5 Other Matters of NES

The study area does not support any other features corresponding with matters of NES protected under the EPBC Act (i.e. World or National Heritage Areas) (DAWE 2021). However, there are several values located within close proximity to the PSP including:

- Commonwealth Land:
    - Defence – RSL Hall.
- Nationally Important Wetland:
    - Lerderderg River
- Wetland of International Importance (Ramsar):
    - Port Phillip Bay (Western Shoreline) and Bellarine Peninsula, located approximately 35-40 kilometres downstream, south of the study area.

3.3 State Significant Values

Biodiversity matters present within the study area that are considered of significance to the State of Victoria are outlined below.

3.3.1 Flora

The VBA contains records of 54 State significant flora species previously recorded within 10 kilometres of the study area (DELWP 2020a) (Appendix 2.2; Figure 7). Most records are located within and adjacent to the Long Forest Flora and Fauna Reserve to the east of the study area, the Lerderderg State Park to the north-west of the study area, and existing road reserves within the local area where survey effort has likely been greater (Figure 4).

Based on the condition of remnant vegetation, landscape context and the proximity of previous records, the following significant flora species have the highest potential to occur within the study area (Table 23) (Appendix 2.2).

Table 23. State significant flora with a high likelihood of occurrence.

Common Name	Conservation Significance	Previous Records
State Significance*		
Fragrant Saltbush *Rhagodia parabolica*	r	There are 695 known records of Fragrant Saltbush within the local area, (DEWLP 2020a; Figure 7).
Bacchus Marsh Wattle *Acacia rostriformis*	L v	A total of 301 records of Bacchus Marsh records have been recorded within 10 kilometres of the study area (DEWLP 2020a; Figure 7).
Werribee Blue-box *Eucalyptus baueriana* subsp. *thalassina*	e	A total of 324 records of Werribee Blue-box have been recorded within 10 kilometres of the study area, with all records located within the Long Forest Flora and Fauna reserve (DEWLP 2020a; Figure 7).
Austral Tobacco *Nicotiana suaveolens*	r	A total of 64 records of Austral Tobacco have been recorded within 10 kilometres of the study area (DEWLP 2020a; Figure 7).
Slender Bindweed *Convolvulus angustissimus* subsp. *omnigracilis*	k	A total of 12 records of Slender Bindweed have been recorded within 10 kilometres of the study area (DEWLP 2020a; Figure 7).
Melbourne Yellow-gum *Eucalyptus leucoxylon* subsp. *connata*	v	A total of 70 records of Melbourne Yellow-gum have been recorded within 10 kilometres of the study area (DEWLP 2020a; Figure 7), with several additional records previously recorded by Ecology and Heritage Partners in the BMD Land within the Merrimu PSP (Ecology and Heritage Partners 2019a).

Note. * Those species with the highest likelihood of occurrence; L = Listed as Threatened under the FFG Act; e/v/r/k = endangered/vulnerable/rare/poorly known on the DELWP Advisory List (DEPI 2014).

Five State significant flora were recorded within Merrimu PSP during the detailed ecological investigations (Figure 5):

- Fragrant Saltbush: Large numbers (over 500 individuals) of Fragrant Saltbush are present throughout the Merrimu PSP, with specimens recorded within Long Forest Estate, the BMD Land and 'Other Assessed Land'. There is also suitable habitat for the species in unassessed areas within the PSP;
- Bacchus Marsh Wattle: Several specimens of Bacchus Marsh Wattle were recorded within the BMD Land in parcels adjacent to Gisborne Road, with many of these being planted as part of revegetation works;
- Slender Bindweed: Several specimens of Slender Bindweed were recorded predominantly within the parcel at 289 Bences Road (BMD Land) and 55 Oconnell Road (Other Assessed Land). There is also suitable habitat for the species in unassessed areas within the PSP;
- Melbourne Yellow-gum: Several specimens of Melbourne Yellow-gum were recorded predominantly within the parcel at 289 Bences Road (BMD Land) and 55 Oconnell Road (Other Assessed Land), as well as other discrete areas within the BMD Land. There is also suitable habitat for the species in unassessed areas within the PSP; and
- Black Roly-poly: Several specimens of Black Roly-poly were recorded within the parcel at 289 Bences Road (BMD Land).

Based on habitat condition, and the proximity of previous records, there is also suitable habitat within the study area for the State-significant Buloke *Allocasuarina luehmannii* and Buloke Mistletoe *Amyema linophylla*

subsp. *orientalis,* as well as Plains Joyweed *Alternanthera* sp. 1 (Plains), Small Scurf-pea *Cullen parvum*, Cane Spear-grass *Austrostipa breviglumis*, Heath Spear-grass *Austrostipa exilis*, Tough Scurf-pea *Cullen tenax* and Austral Tobacco *Nicotiana suaveolens*, particularly in patches of higher quality Plains Grassland EVC.

Given additional State significant species were not detected through ecological surveys, any populations within the study area that may occur are expected to be very small in numbers and possibly represented by only a few individuals. The likelihood of any remaining State significant species occurring within the study area is considered low due to the absence of suitable habitat and/or lack of records within the local area (Appendix 2.2).

However, further targeted surveys may be needed for State significant species to identify important biodiversity values in order to avoid and minimise impacts and prioritise areas for retention or development. The surveys would help to inform the preparation of the PSP and associated NVPP.

Fifteen species recorded within the study area are Protected under the FFG Act (Appendix 2.1) (DELWP 2019b). These species predominately occur in areas of Low Rainfall Plains Grassland, mainly in the higher quality patches (i.e. NTGVVP patches).

3.3.2 Fauna

The VBA contains records of 19 State significant and 11 regionally significant fauna species previously recorded within 10 kilometres of the study area (DELWP 2020a) (Appendix 3.2; Figure 8). Most records are located within and adjacent to the Long Forest Flora and Fauna Reserve to the east of the study area, the Lerderderg State Park to the north-west of the study area, and existing road reserves within the local area where survey effort has likely been greater (Figure 8).

Based on the condition of native vegetation, landscape context and the proximity of previous records, the following State significant fauna species have the highest potential to occur within the study area (Table 24) (Appendix 2.2).

Table 24. State and Regionally significant fauna with a moderate to high likelihood of occurrence.

Common Name	Conservation Significance	Habitat
State Significance *		
Brown Treecreeper *Climacteris picumnus victoriae*	nt	There are 133 records of Brown Treecreeper from the local area, with the most recent taken in 2019 (DELWP 2020a). Habitat is mainly found in woodland areas within the study area, particularly closer to Long Forest Flora and Fauna Reserve.
Hooded Robin *Melanodryas cucullata cucullata*	L nt	There are 12 records of Hooded Robin from the local area. Habitat is mainly found in woodland areas within the study area, particularly closer to Long Forest Flora and Fauna Reserve (DELWP 2020a).
Diamond Firetail *Stagonopleura guttata*	L nt	There are 80 records of Diamond Firetail from the local area, the most recent in 2011 (DELWP 2020a). Diamond Firetail generally prefers woodland habitats, but is also associated with grassland habitats as well.
Bullant *Myrmecia* sp. 17	L v	Although there are only four records listed in the VBA (DELWP 2020a), the species has large areas of suitable habitat within the study area.

Note. * Those species with the highest likelihood of occurrence; L = Listed as Threatened under the FFG Act; v/nt = vulnerable/near threatened on the DELWP Advisory List (DEPI 2013).

No State significant fauna have been recorded as part of the ecological assessments.

Based on habitat condition, and the proximity of previous records, in addition to the species listed in Table 24, there is also potential habitat within the Merrimu PSP for the State-significant Speckled Warbler *Chthonicola sagittatus*, Barking Owl *Ninox connivens connivens* as well as the Regionally significant Fat-tailed Dunnart and Spotted Harrier *Circus assimilis.*

Based on the results of the ecological surveys, habitat assessments and landscape context, the remaining State significant fauna species previously recorded, or considered as having potential habitat within the project locality have been assessed as having a low likelihood of occurrence within the study area (Appendix 3.2). This determination is based on the absence of suitable habitats and the results of the targeted and ecological surveys.

However, further targeted surveys may be needed for State significant species to identify important biodiversity values in order to avoid and minimise impacts and prioritise areas for retention or development. The surveys would help to inform the preparation of the PSP and associated NVPP.

3.3.3 Ecological Communities

Field assessments confirmed the presence of two ecological communities listed as threatened under the FFG Act.

3.3.3.1 Western (Basalt) Plains Grassland

Several habitat zones of Plains Grassland vegetation meet the description of the FFG Act-listed vegetation community *Western (Basalt) Plains Grassland* (Figure 3).

This community was deemed present in higher quality patches of native vegetation, and also other, more disturbed patches in a 'degraded' state. Although there are no specific condition thresholds that defines the community, its presence was mapped based the persistence of perennial native grasses of at least 25% cover, as well as at least a moderate diversity of herb species. Although the 'degraded' version of the community is known to be heavily invaded by introduced grasses and other weedy species, where these patches did not support the presence of at least two native herb species, the community was deemed to be absent.

Although some habitat zones (i.e. PG1, PG2 and PG3 within the 'Other Assessed Land') exhibit moderate diversity or some structural aspects, these zones are mostly dominated by perennial non-native grasses (Serrated Tussock and Chilean Needle-grass) and are not considered to be consistent with the description of the community.

Across the Merrimu PSP, a total of 90.065 hectares of the *Western (Basalt) Plains Grassland* was recorded (based on past and current mapping), with 15.835 hectares within the BMD Land, 68.51 hectares within Long Forest Estate, and 5.72 hectares within the 'Other Assessed Land' (Figure 3).

3.3.3.2 Rocky Chenopod Open Scrub Community

Most habitat zones of the Rocky Chenopod Woodland EVC met the description of the FFG Act-listed vegetation community *Rocky Chenopod Open Scrub Community* (Figure 2b).

This community was deemed present where the broad cover and structure of the community as described by DELWP (DELWP 2020b) was present, and native vegetation cover was dominant. Due to habitat zones RCW1, RCW2 and RCW5 within the BMD Land and 'Other Assessed Land' being dominated in the ground layer by African Box-thorn and Galenia, these habitat zones were not considered to be consistent with the description of the community. All other RCW habitat zones are considered to comprise the FFG Act community.

Across the Merrimu PSP, a total of 34.517 hectares of the *Rocky Chenopod Open Scrub Community* was recorded (based on past and current mapping), with 27.799 hectares within the BMD Land, 3.59 hectares within Long Forest Estate, and 3.128 hectares within the 'Other Assessed Land' (Figure 3).

4 LEGISLATIVE AND POLICY IMPLICATIONS

4.1 *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)

The EPBC Act is administered by the Commonwealth Department of Agriculture, Water and the Environment (DAWE) and provides a national framework for the protection of heritage and the environment, and the conservation of biodiversity. The Act establishes a Commonwealth process for the assessment of proposed actions that are likely to have a significant impact on matters of National Environmental Significance (MNES), or on Commonwealth land. An action (i.e. - project, development, undertaking, activity, or series of activities), requires approval from the Commonwealth Environment Minister if it is likely to have a significant impact on any MNES, described in Table 23.

Table 23. Potential impacts to matters of National Environmental Significance (NES)

Matter of NES	Potential Impacts
World Heritage properties	The proposed action will not impact any properties listed for World Heritage.
National heritage places	The proposed action will not impact any places listed for national heritage.
Ramsar wetlands of international significance	The study area is located approximately 38 kilometres to the north of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site. 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 proposed action is unlikely to impact the ecological character of the Ramsar wetland.
Threatened species and ecological communities	Confirmed presence of one nationally significant flora species: - Spiny Rice-flower (2,653 individuals); Confirmed presence of one nationally significant fauna species: - Golden Sun Moth (190.748 hectares of confirmed habitat); Confirmed presence of one significant ecological community: - Natural Temperate Grassland of the Victorian Volcanic Plain (91.895 hectares).
Migratory and marine species	While a number of species may occasionally forage or fly over habitat within the study areas it would not be classed as an 'important habitat' as defined under the EPBC Act Policy Statement 1.1 Principal Significant Impact Guidelines (DoE 2013).
Commonwealth marine area	The proposed action will not impact any Commonwealth marine areas.
Nuclear actions (including uranium mining)	The proposed action is not a nuclear action.
Great Barrier Reef Marine Park	The proposed action will not impact the Great Barrier Reef Marine Park.
Water resources impacted by coal seam gas or mining development	The proposed action is not a coal seam gas or mining development.

It should be noted that an EPBC Act referral has been submitted by BMD relating to potential impacts to matters of NES present on the BMD Land only (EPBC 2018/8226). This referral has been assessed as a controlled action and will be assessed via Preliminary Documentation. This report does not address the

implications of EPBC 2018/8226 in further detail, with the following implications relating to the Merrimu PSP as a whole.

4.1.1.1 *Spiny Rice-flower*

Spiny Rice-flower surveys recorded a total of 2653 individuals present within the BMD Land. No specimens were recorded within Long Forest Estate, or within the surveyed areas within 55 and 95 Oconnell Road (Other Assessed Land). Additional surveys are recommended within areas of potential habitat where surveys have yet to be undertaken (Figure 6).

If more than five Spiny Rice-flower individuals are proposed to be impacted, the action will constitute a significant impact under the EPBC Act and must be referred to the Commonwealth for further assessment (DEWHA 2009a).

4.1.1.2 *Golden Sun Moth*

Approximately 190.748 hectares of confirmed Golden Sun Moth habitat is present within the assessed areas of the Merrimu PSP (Figure 4). There is the potential for the extent of confirmed habitat to increase, as several parcels supporting similar quality habitat adjacent to areas of confirmed habitat have yet to be surveyed (i.e. Desktop Assessment land only) (Figure 6).

An assessment of the potential impacts against the significant impact guidelines for the Golden Sun Moth (DEWHA 2009b) is provided in Table 25 below.

Table 25. Assessment against the Significant Impact Guidelines for Endangered or Critically Endangered Species: Golden Sun Moth *Synemon plana.*

Significant Impact Guidelines policy statement 3.12 – Significant Impact Criteria for the Critically Endangered Golden Sun Moth	
Ecological Element Affected	**Impact Threshold**
Large or contiguous habitat area (> 10 hectares)	Habitat loss, degradation or fragmentation > 0.5 hectares
Small or fragmented habitat area (< 10 hectares)	Any habitat loss, degradation or fragmentation
Habitat connectivity	Fragmentation of a population through the introduction of a barrier to dispersal

Based on the above significant impact guidelines for the species (DoE 2013a), any impact of 0.5 hectares or greater is likely to constitute a significant impact to Golden Sun Moth under the EPBC Act and must be referred to the Commonwealth for further assessment.

4.1.1.3 *Striped Legless Lizard*

Targeted surveys for Striped Legless Lizard were undertaken in habitat that had the potential to support the species. Despite the efforts of the targeted surveys, no Striped Legless Lizards were detected within the study area. Due to this, the potential presence of the species within the study area is considered low and the proposed action is unlikely to have a significant impact on the species.

4.1.1.4 *Growling Grass Frog*

Targeted surveys for Growling Grass Frog were undertaken in habitat that had the potential to support the species. Despite the efforts of the targeted surveys, no Growling Grass Frog were detected within or adjacent to the Merrimu PSP. Due to this, the potential presence of the species within the study area is considered low and the proposed action is unlikely to have a significant impact on the species.

4.1.1.5 *Natural Temperate Grassland of the Victorian Volcanic Plain*

A total of 91.895 hectares of the nationally significant ecological community Natural Temperate Grassland of the Victorian Volcanic Plain has been recorded within accessible areas of the Merrimu PSP study area.

There is the potential for the extent of the community to increase, as several parcels that have the potential to support the community are yet to be surveyed (i.e. Desktop Assessment land only) (Figure 6).

Potential impacts to the NTGVVP community as a result of future development and an assessment against the significant impact thresholds for the community (DoE 2013a) are provided below (Table 26).

Table 26. Significant Impact Guidelines 1.1 – Significant Impact Criteria for Endangered or Critically Endangered Ecological Communities (NTGVVP).

Significant Impact Guidelines 1.1 – Significant Impact Criteria for Endangered or Critically Endangered Ecological Communities (NTGVVP)	
Significant impact Criteria	**Comment**
1. Reduce the extent of an ecological community.	Any impact to NTGVVP should be referred under the EPBC Act
2. Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines.	Future development of the PSP has the potential to fragment the ecological community
3. Adversely affect habitat critical to the survival of an ecological community.	Future development of the PSP has the potential to adversely affect the ecological community
4. Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.	Future development of the PSP has the potential to alter surface water drainage patterns
5. Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting.	Disturbance associated with proposed future development may cause a substantial change in the composition of the ecological community
6. Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:	Future development of the PSP has the potential reduce the quality of the ecological community
a. assisting invasive species, that are harmful to the listed ecological community, to become established or;	

Significant Impact Guidelines 1.1 – Significant Impact Criteria for Endangered or Critically Endangered Ecological Communities (NTGVVP)	
b. causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.	
7. Interfere with the recovery of an ecological community.	Future development of the PSP may interfere with the recovery of the ecological community

Based on the above significant impact thresholds, any impact to the NTGVVP ecological community is likely to be assessed as a significant impact, and the action should be referred for assessment under the EPBC Act.

4.2 *Environment Effects Act 1978* (Victoria)

The *Environment Effects Act 1978* (EE Act) provides for assessments of proposed actions that are capable of having a significant impact on the environment via the preparation of an Environment Effects Statement (EES). A project with potential adverse environmental effects that, individually or in combination, could be significant in a regional or State context should be referred.

4.2.1 Implications

Actions undertaken in accordance with a prescribed PSP are exempt from the requirements of the EE Act. Provided a PSP is prepared guiding future development within the Precinct, then a referral under the EE Act is not required.

4.3 *Planning and Environment Act 1987*

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, unless an exemption applies.

Clause 12. 01 requires planning authorities to consider Protecting Victoria's Environment – Biodiversity 2037 (DELWP 2017c) and the Flora and Fauna Guarantee Strategy under section 17 of the FFG Act when preparing a PSP and associated Native Vegetation Precinct Plan (NVPP).

4.3.1 Native Vegetation Precinct Plan

An NVPP provides for the strategic management of native vegetation for a defined area or precinct. It is established via a planning scheme amendment to incorporate the NVPP and list it in the schedule to Clause 52.16.

An NVPP identifies the native vegetation that can be removed and the vegetation to be protected, based on the conservation significance and land protection role of the vegetation, the identified values of vegetation within the planning scheme such as amenity and landscape, and the broader strategic planning objectives for the precinct (DELWP 2017a). An NVPP must consider the values of native vegetation described in the Guidelines (DELWP 2017b):

- Biodiversity value of native vegetation:
    - Extent of native vegetation
    - Large trees
    - Native vegetation condition
    - Ecological Vegetation Class
    - Sensitive wetlands and coastal areas
    - Strategic biodiversity value
    - Habitat for rare or threatened species.
- Other values of native vegetation:
    - Land and water protection
    - Identified landscape values
    - Native vegetation protected under the *Aboriginal Heritage Act 2006*.

4.4 Flora and Fauna Guarantee Act 1988 (Victoria)

The FFG Act is the primary legislation dealing with biodiversity conservation and sustainable use of native flora and fauna in Victoria. Proponents are required to apply for an FFG Act Permit to 'take' listed and/or protected 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.

4.5 *Flora and Fauna Guarantee Act Amendment Act 2019* (Victoria)

The *Flora and Fauna Guarantee Amendment Act 2019* (the Amendment Act) came into effect on June 1, 2020. The Amendment Act strengthens the framework for the protection of Victoria's biodiversity, with one of the main amendments now obligating all public authorities to have consideration of biodiversity to ensure decisions and policies are made with proper consideration of the potential impacts on biodiversity.

Further, species will now be considered for listing as threatened under the FFG Act in accordance with the intergovernmental Common Assessment Method (CAM). This may result in the listing status of several species being revised.

4.5.1 Implications

The VPA and Moorabool Shire Council are public authorities under the FFG Act. Public authorities have a duty under the FFG Act to consider potential biodiversity impacts when exercising their functions. The FFG Act listed Spiny Rice-flower and Golden Sun Moth was recorded within the Merrimu PSP. The *Western (Basalt) Plains Grassland* and *Rocky Chenopod Open Scrub* communities were also recorded within the Merrimu PSP. A permit under the FFG Act will be required where impacts to listed FFG Act matters occur on public land. Fifteen species 'protected' under the FFG Act were recorded during the surveys.

4.6 *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. Landowners are responsible for the control of any infestation of noxious weeds and pest fauna species to minimise their spread and impact on ecological values.

Weeds listed as noxious under the CaLP Act were recorded during the assessment (Table 11). Similarly, there is evidence that the study area is currently occupied by several pest fauna species listed under the CaLP Act (Red Fox, European Rabbit and European Hare). Weed management and pest fauna management actions are likely to be required to be incorporated into any future Construction Environmental Management Plan (CEMP) as part of any future development of the study area.

5 MITIGATION MEASURES

As outlined in both Commonwealth and State policy, a project should be designed to take into consideration the three-step approach, which is:

- Avoid environmental impacts;
- Minimise impacts; and,
- Where impacts cannot be avoided or minimised, compensate for the residual impacts using other mitigation measures such as offsets.

5.1 Precinct Design Principles

At a broad scale, the following measures should be considered as part of the detailed design process for the Merrimu PSP:

- Retain areas of high conservation value:
- Large areas of native vegetation should be protected in habitat nodes;
- Provide a variety of flora and fauna habitats to promote and retain biodiversity;
- Undertake habitat creation (i.e. waterways, drainage lines and designated revegetation areas);
- Provide linear corridors of vegetation along walking/cycling tracks;
- Create linear habitat corridors along waterways/drainage lines/tributaries whilst implementing Water Sensitive Urban Design whilst ensuring no off-site impacts;
- Incorporating drainage lines into habitat corridors and open public spaces;
- Interpret/educate residents about values of grasslands through signage;
- Undertaken feral pest animal and plant control;
- Retain native trees in urban active and passive open space areas;
- Feature waterways/landscaping combination of a series of smaller connected basins rather than one large isolated basin.
- Investigate methods to interconnect spaces through Open Space Links to create more complete habitat;
- Rehabilitate and protect significant native vegetation;
- Ensure stormwater treatment is designed to provide habitat(s) for significant flora and fauna species;
- Investigate options to achieve high canopy coverage on public and private land (for example 40-50%); and,
- Connect biodiversity sites with parks/open spaces so they are separated from development.

5.2 Best Practice Mitigation Measures

Recommended measures to mitigate impacts upon terrestrial and aquatic values present within the study area may include:

- Control of noxious weeds within the study area should be an immediate priority to reduce further degrading impacts to the existing remnant ecological values present within the study area and surrounds;
- Consideration of Water Sensitive Urban Design techniques such as stormwater treatment wetlands, bio-retention systems, porous paving or swales;
- Minimise impacts to native vegetation and habitats through construction and micro-siting techniques, including fencing retained areas of native vegetation. If indeed necessary, trees should be lopped or trimmed rather than removed. Similarly, soil disturbance and sedimentation within wetlands should be avoided or kept to a minimum, to avoid, or minimise impacts to fauna habitats;
- Tree Retention Zones (TRZs) should be implemented to prevent indirect losses of native vegetation during construction activities (DSE 2011). 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.
- 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 should be prepared and implemented prior to any construction activities:

- 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.;
- A Kangaroo Management Plan (KMP). The KMP provides a long-term, adaptable strategy for the management of Eastern Grey Kangaroos, and may be required to be prepared to the satisfaction of DELWP;
- Significant Species Conservation Management Plan (CMP). One or more CMP's are likely to be required to detail how areas of retained high value biodiversity are protected, managed and enhanced as part of the PSP process. Any conservation area is likely to contain one or more of Golden Sun Moth and the NTGVVP ecological community. The CMP should specify management actions and timeframes associated with the protection and enhancement of the retained values. Where more than one matter of NES is present within a conservation area, the management actions proposed must be complementary to all relevant matters.

5.3 Protection of Retained Ecological Values

Retained ecological values should be enhanced and managed to assist in creating a more diverse, connected and resilient natural environment through improving ecosystem health, and develop a more ecologically connected urban landscape. It is important that the enhancement of ecological values within the study area are not undermined through unrestricted and uncontrolled public access throughout retained areas.

Public access should be restricted to clearly defined shared community facilities (i.e. BBQ areas, play equipment etc) that are accessible via a connected network of shared paths (walking and cycling shared paths). Access to all other areas of retained high value native vegetation, revegetated areas and/or wetlands should be discouraged, and demarcated with informal signage and/or fencing where practical.

A summary of practically achievable ecological enhancement opportunities available within areas of retained vegetation and fauna habitat is provided below. It should be noted that the below is not intended to be a detailed plan of the works that should be undertaken, but rather a discussion on the key principals and management activities that would guide the future restoration of flora and fauna values within Merrimu PSP that the VPA and Moorabool Shire Council could consider as part of the preparation of the future PSP and associated NVPP.

5.3.1 Revegetation and Enhancement

The ecological assessment of the vegetation and habitat within the woodland areas of the Merrimu PSP recorded several species of birds and habitat features that are absent within the broader study area.

Through strategic revegetation activities, there is an opportunity to reintroduce some of these habitat features to other areas within the PSP and increase the carrying capacity of the broader area, and over time, result in the re-introduction of suitable habitat for avian and arboreal fauna back into the Merrimu PSP.

In order to ensure any revegetation activities most closely represents the indigenous woodland EVCs, it is recommended that the following species list are reviewed (Table 27; Table 28).

Table 27. Species associated with the Grassy Woodland EVC suitable for revegetation.

Life Form	Species Name	Common Name
T	*Eucalyptus camaldulensis*	River Red-gum
T	*Eucalyptus microcarpa*	Grey Box
T	*Eucalyptus leucoxylon*	Yellow Gum
MS	*Acacia pycnantha*	Golden Wattle
MS	*Acacia paradoxa*	Hedge Wattle
MTG	*Dianella admixta*	Black-anther Flax-lily
MTG	*Lomandra filiformis*	Wattle Mat-rush

Note. T = Tree; MS = Medium Shrub; LTG = Large Tufted Graminoid; MTG = Medium Tufted Graminoid;

Table 28. Species associated with the Rocky Chenopod Woodland EVC suitable for revegetation.

Life Form	Species Name	Common Name
T	*Eucalyptus behriana*	Bull Mallee
T	*Eucalyptus microcarpa*	Grey Box
T	*Eucalyptus leucoxylon*	Yellow Gum
T	*Melaleuca lanceolata*	Moonah
MS	*Acacia pycnantha*	Golden Wattle
MS	*Rhagodia parabolica*	Fragrant Saltbush
MS	*Acacia acinacea*	Gold-dust Wattle
MH	*Einadia hastata*	Saloop
SH	*Carpobrotus modestus*	Inland Pigface

Note. T = Tree; MS = Medium Shrub; LTG = Large Tufted Graminoid; MTG = Medium Tufted Graminoid;

Several patches of Plains Grassland EVC are also present throughout the study area. Many of these patches exhibit a low diversity of native flora, and are homogenous throughout in terms of habitat features and species dominance. In areas of Plains Grassland proposed to be retained, there is an opportunity to enhance these grasslands through the reintroduction a wide variety of (formerly) common grasses and herbs, which in turn, will increase the diversity and structure of the grasslands, and result in an increase in habitat suitability for native fauna.

In order to ensure any revegetation activities most closely represents the indigenous Plains Grasslands EVC, it is recommended that the following species list are reviewed (Table 29).

Table 29. Species associated with the Plains Grassland EVC suitable for revegetation.

Life Form	Species Name	Common Name
SS	*Pimelea curviflora*	Curved Rice-flower
PS	*Atriplex semibaccata*	Berry Saltbush
MH	*Maireana enchylaenoides*	*Wingless Bluebush*
MH	*Calocephalus citroides*	Lemon Beauty-heads
MH	*Acaena echinata*	Sheep's Burr

Life Form	Species Name	Common Name
SH	*Goodenia pinnatifida*	Cut-leaf Goodenia
LTG	*Austrostipa bigeniculata*	Kneed Spear-grass
MTG	*Austrostipa scabra*	Rough Spear-grass
MTG	*Rytidosperma caespitosa*	Common Wallaby-grass
MTG	*Themeda triandra*	Kangaroo-grass

Note. SS = Small Shrub; PS = Prostrate Shrub; MH = Medium Herb; SH = Small Herb; LTG = Large Tufted Graminoid; MTG = Medium Tufted Graminoid.

6 SUMMARY OF ECOLOGICAL FEATURES

6.1 Flora

Detailed vegetation mapping completed across the study area recorded four Ecological Vegetation Classes (EVCs) within the study area comprising 195.934 hectares of native vegetation (Table 9) (excluding mapped 'Current Wetlands'), 71 Large Trees in patches, and 120 scattered trees (Table 14). In areas where field assessments were not undertaken, a total of 90.176 hectares of native vegetation is modelled to occur (Table 10).

A total of 157 flora species (83 indigenous and 74 non-indigenous or introduced) were recorded within the study area on accessible parcels during the field assessment. The nationally significant Spiny Rice-flower was identified during the targeted surveys across the BMD Land.

Five State significant flora (Fragrant Saltbush, Black Roly-poly, Slender Bindweed, Melbourne Yellow-gum and Bacchus Marsh) were recorded within the study area.

Based on habitat condition, and the proximity of previous records, there is also suitable habitat within the study area for the State-significant Buloke and Buloke Mistletoe , as well as Plains Joyweed, Small Scurf-pea, Cane Spear-grass, Heath Spear-grass, Tough Scurf-pea and Austral Tobacco, particularly in patches of higher quality Plains Grassland EVC.

Based on the landscape context, highly modified nature of the broader Merrimu PSP and extent of previous vegetation removal, the likelihood of any additional significant flora occurring within the Merrimu PSP is considered low due to the absence of suitable habitat and lack of records in close proximity.

6.2 Fauna

Ecological surveys of the study area recorded 74 species of fauna, including 65 native species and nine introduced species. The nationally significant Golden Sun Moth was confirmed to be present within several properties within the Merrimu PSP (Figure 4).

Despite targeted surveys being undertaken during optimal surveys conditions across multiple years, no Striped Legless Lizard were recorded, and based on the lack of records within the project locality, a population of Striped Legless Lizard is considered highly unlikely to be present in the Merrimu PSP. No Growling Grass Frog were detected during the targeted surveys despite weather conditions being conducive for frogs to be active.

No State significant fauna have been recorded as part of the ecological assessments. Based on habitat condition, and the proximity of previous records, there is potential habitat within the Merrimu PSP for the State-significant Brown Treecreeper, Hooded Robin, Diamond Firetail, Bullant Sp. 17, Speckled Warbler, Barking Owl as well as the Regionally significant Fat-tailed Dunnart and Spotted Harrier.

Based on the results of the ecological surveys, habitat assessments and landscape context, the remaining State significant fauna species previously recorded, or considered as having potential habitat within the project locality have been assessed as having a low likelihood of occurrence within the study area.

6.3 Communities

6.3.1 Natural Temperate Grassland of the Victorian Volcanic Plain

Across the Merrimu PSP, a total of 91.895 hectares of the nationally significant NTGVVP ecological community was recorded (based on past and current mapping), with 17.665 hectares within the BMD Land, 68.51 hectares within Long Forest Estate, and 5.72 hectares within the 'Other Assessed Land'.

6.3.2 Western (Basalt) Plains Grassland

Across the Merrimu PSP, a total of 90.065 hectares of the State significant *Western (Basalt) Plains Grassland* ecological community was recorded (based on past and current mapping), with 15.835 hectares within the BMD Land, 68.51 hectares within Long Forest Estate, and 5.72 hectares within the 'Other Assessed Land'.

6.3.3 Rocky Chenopod Open Scrub Community

Across the Merrimu PSP, a total of 34.517 hectares of the State significant *Rocky Chenopod Open Scrub* ecological community was recorded (based on past and current mapping), with 27.799 hectares within the BMD Land, 3.59 hectares within Long Forest Estate, and 3.128 hectares within the 'Other Assessed Land'.

6.4 Additional Surveys / Recommendations

The Merrimu PSP contains several discrete areas that have been subject to various levels of ecological assessment over recent years. Ecology and Heritage Partners has undertaken a rigorous suite of on-ground ecological investigations (including targeted surveys) within the BMD Land between August 2017 and July 2018. With the exception of recent Spiny Rice-flower and Striped Legless Lizard surveys undertaken within Long Forest and/or 55 and 95 Oconnells Rd, the remainder of land within Merrimu PSP has not been subject to targeted surveys where suitable habitat has been identified.

Based on the quality and extent of known habitats within the study area, it is highly likely that the extent of suitable habitat as shown on Figure 4 and Figure 5 extends beyond areas adequately surveyed to date. In addition, based on visual assessments from roadsides indicating the presence of native vegetation, as well as the presence of modelled extant (2005) native vegetation, it is highly likely that additional patches of native vegetation are present within these unsurveyed areas.

Given the time that has elapsed since the previous habitat hectare assessment within Long Forest Estate , it is recommended an updated assessment is undertaken to confirm the current quality and extent of native vegetation as well as the presence of suitable habitat for any significant flora and fauna.

Areas within the Merrimu PSP that have only been subject to a Desktop Assessment must also subject to on ground assessments to confirm the current quality and extent of native vegetation as well as the presence of suitable habitat for any significant flora and fauna. All roadsides within the PSP will also require a formal habitat hectare assessment to determine the quality and extent of ecological values present.

It is recommended that the VPA and Moorabool Shire Council further investigate the possibility to gain access to parcels that have not been surveyed to enable the quality and extent of native vegetation to be confirmed, as well as to identify the presence of potential habitats for the nationally significant Spiny Rice-flower, Golden Sun Moth and Striped Legless Lizard, as well as State significant flora and fauna. If potential habitat for

significant flora or fauna is observed, then targeted surveys should be undertaken in accordance with the relevant survey guidelines. Recommended timing for additional ecological surveys are provided in Table 30.

Areas within the Merrimu PSP that have been identified as requiring further assessment are shown in Figure 6.

Table 30. Recommended timing for additional ecological surveys within the Merrimu PSP

Ecological Survey	Optimal Survey Timing	PSP Timing
Spiny Rice-flower	Between April - August	Prior to subdivision. Required to confirm EPBC Act implications and approvals.
Striped Legless Lizard	Tile Deployment - June/July Tile Checks - 8 checks between late September - late November	Prior to subdivision. Required to confirm EPBC Act implications and approvals.
Golden Sun Moth	mid November - early January	Prior to subdivision. Required to confirm EPBC Act implications and approvals.
Habitat Hectare Assessments	Year-round.	Prior to subdivision. Required to inform implications under the *Planning and Environment Act 1987*
Significant Flora	Variable. Generally September - December	Prior to subdivision. Required to inform implications under the EPBC Act/ FFG Act

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FIGURES

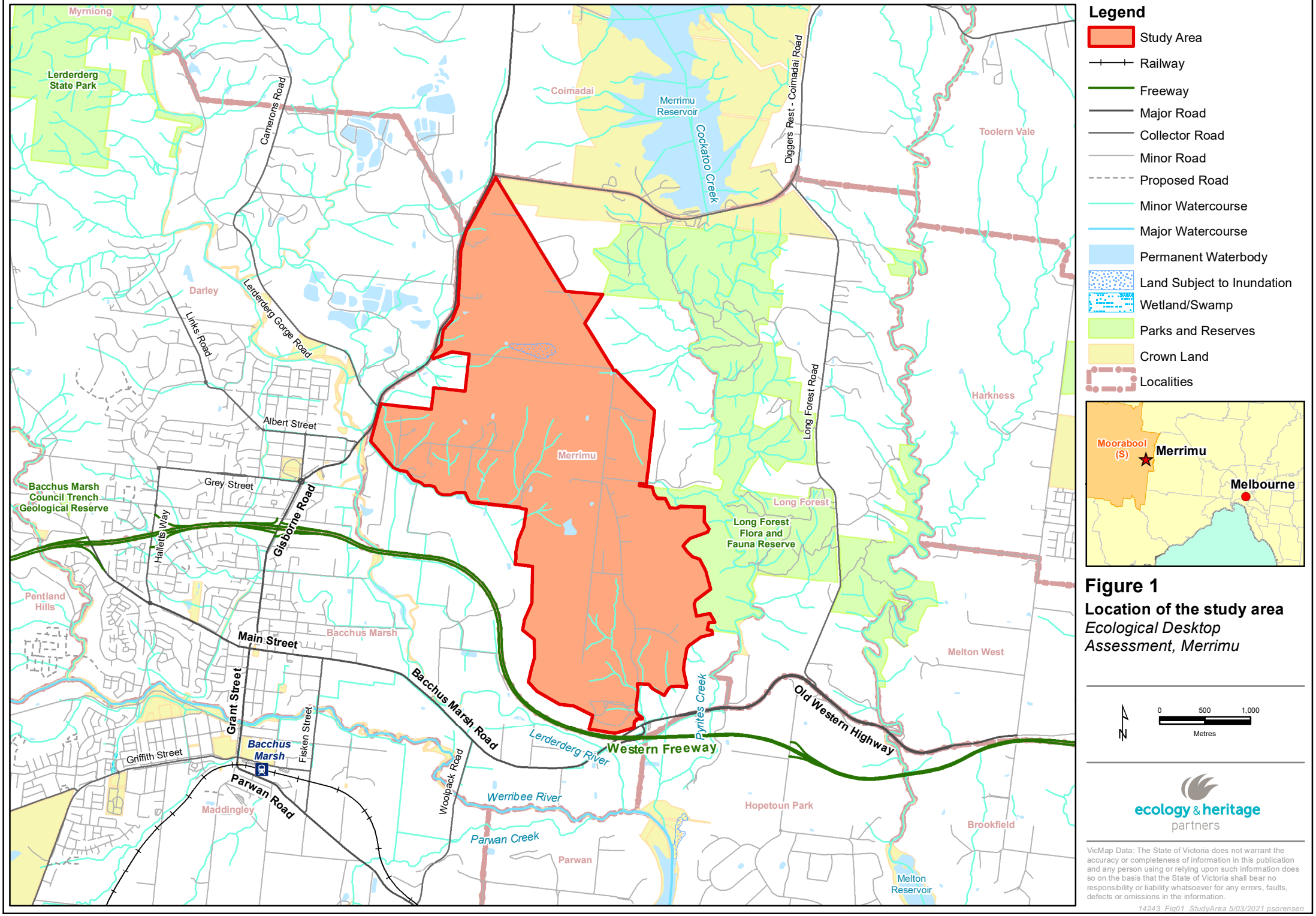


Figure 1

Location of the study area

Ecological Desktop Assessment, Merrimu

ecology & heritage partners

14243_Fig01_StudyArea 5/03/2021 psorensen

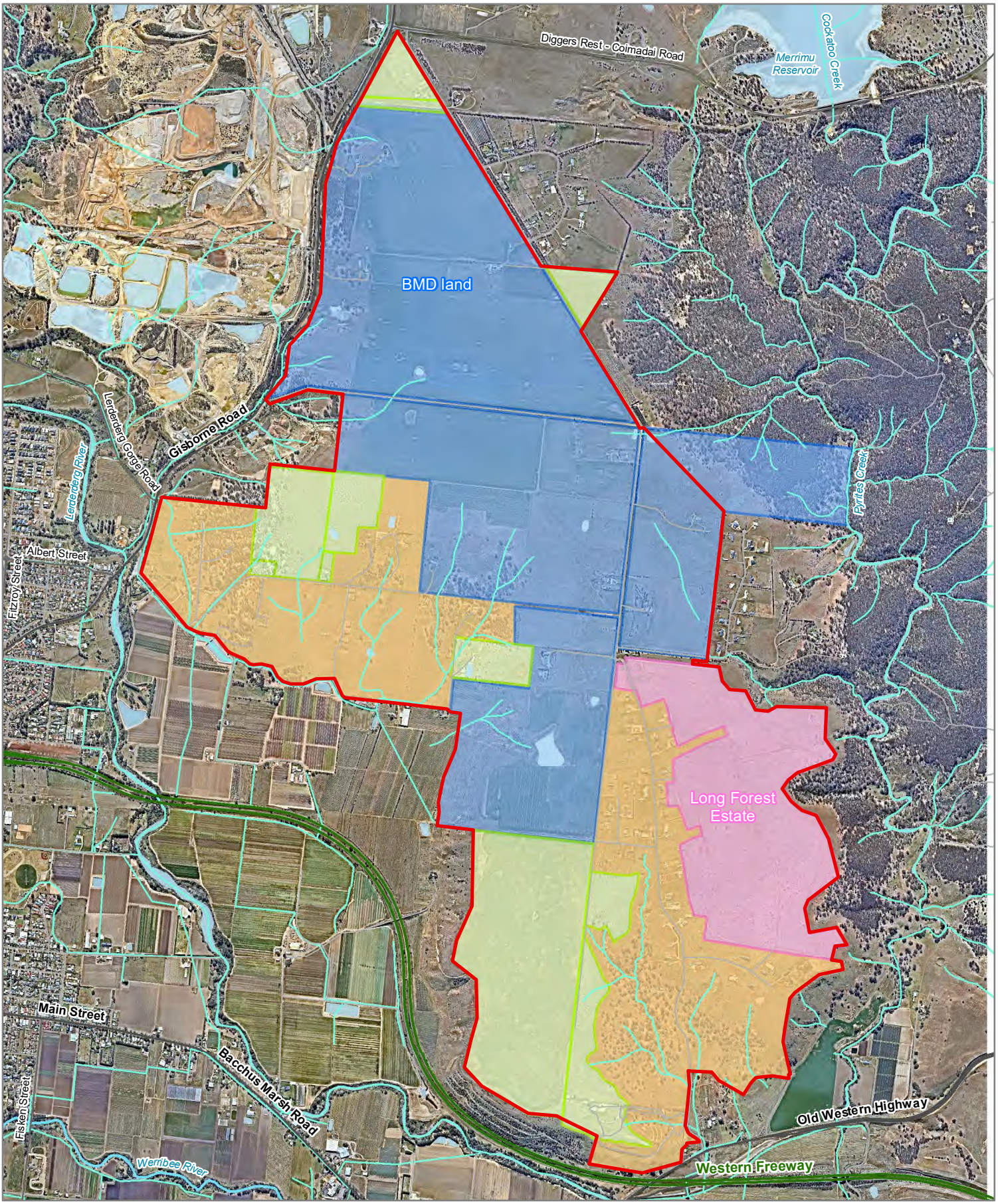


Figure 2
Assessment areas
Ecological Desktop Assessment, Merrimu

Legend
- Study Area
- BMD land
- Long Forest Estate
- Other assessed land
- Desktop assessment only

N

0 250 500
Metres

14243_Fig02_AssessmentAreas_P 9/03/2021 psorensen

ecology & heritage partners

Aerial source: Nearmap 2018

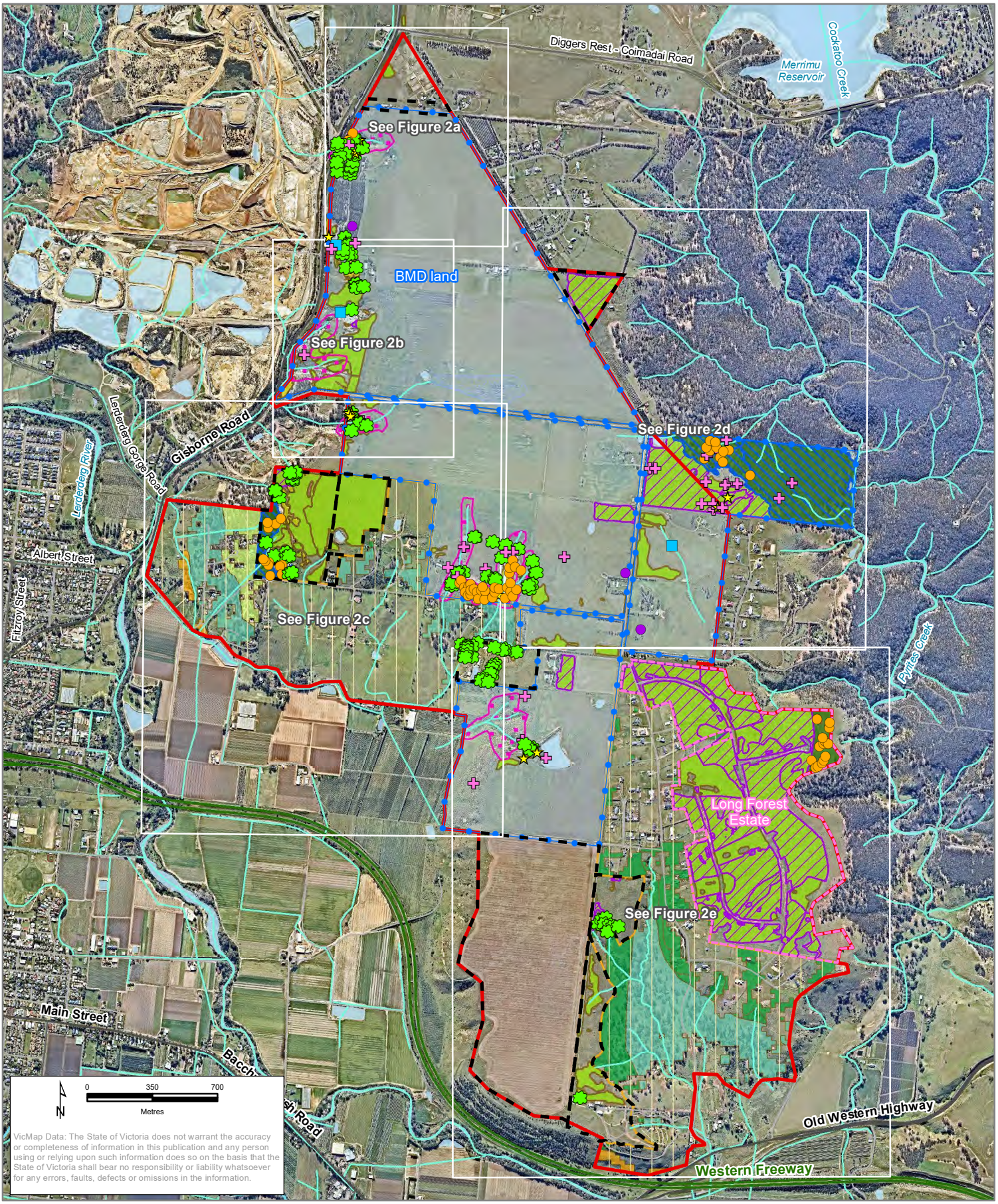


Figure 3 Overview

Ecology and Heritage Partners Data

Ecological Desktop Assessment, Merrimu

ecology & heritage partners

Legend

- Study Area
- BMD land
- Long Forest Estate
- Other assessed land
- Desktop assessment only
- Scattered Tree
- LOT in Patch
- VROT
- Planted tree
- Noxious weed
- Waterbody
- Areas of erosion
- Natural Temperate Grassland of the Victorian Volcanic Plain
- Rocky Chenopod Open Scrub FFG Act community

Ecological Vegetation Classes

- Grassy Woodland (EVC 175)
- Plains Grassland (EVC 132)
- Plains Grassy Wetland (EVC 125)
- Rocky Chenopod Woodland (EVC 64)

Modelled 2005 Ecological Vegetation Classes

- Grassy Woodland (EVC 175)
- Plains Grassland (EVC 132)
- Red Gum Swamp (EVC 292)
- Rocky Chenopod Woodland (EVC 64)

14243_Fig03_ConsEcolFeats_MB 9/03/2021 psorensen

Aerial source: Nearmap 2020

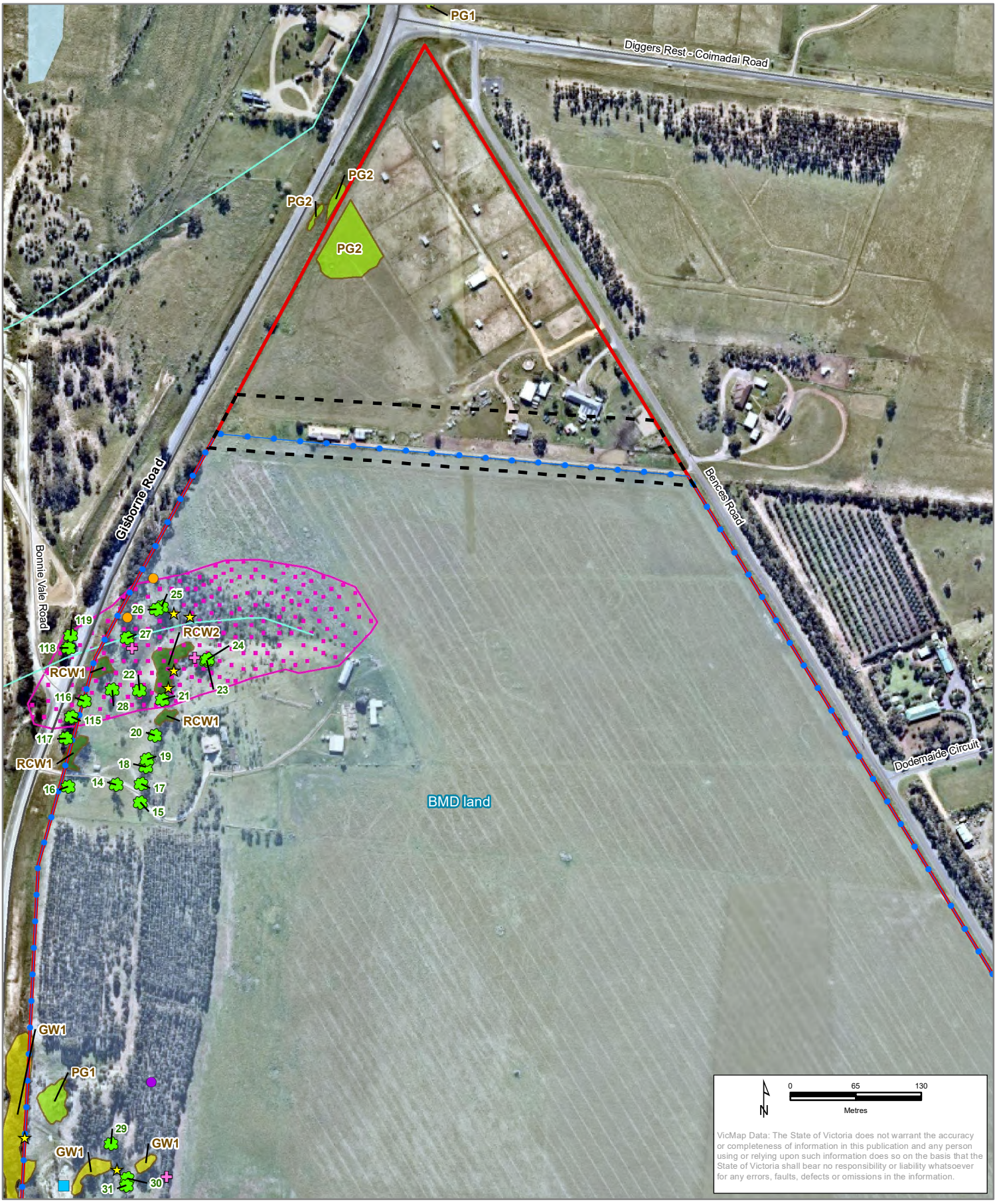


Figure 3a
Ecology and Heritage Partners Data
Ecological Desktop Assessment, Merrimu

ecology & heritage partners

Legend

- Study Area
- BMD land
- Other assessed land
- Scattered Tree
- LOT in Patch
- VROT
- Planted tree
- Noxious weed
- Waterbody
- Areas of erosion

Ecological Vegetation Classes

- Grassy Woodland (EVC 175)
- Plains Grassland (EVC 132)
- Rocky Chenopod Woodland (EVC 64)

14243_Fig03_ConsEcolFeats_MB 9/03/2021 psorensen

Aerial source: Nearmap 2020

Figure 3b
Ecology and Heritage Partners Data
Ecological Desktop Assessment, Merrimu

ecology & heritage partners

Legend

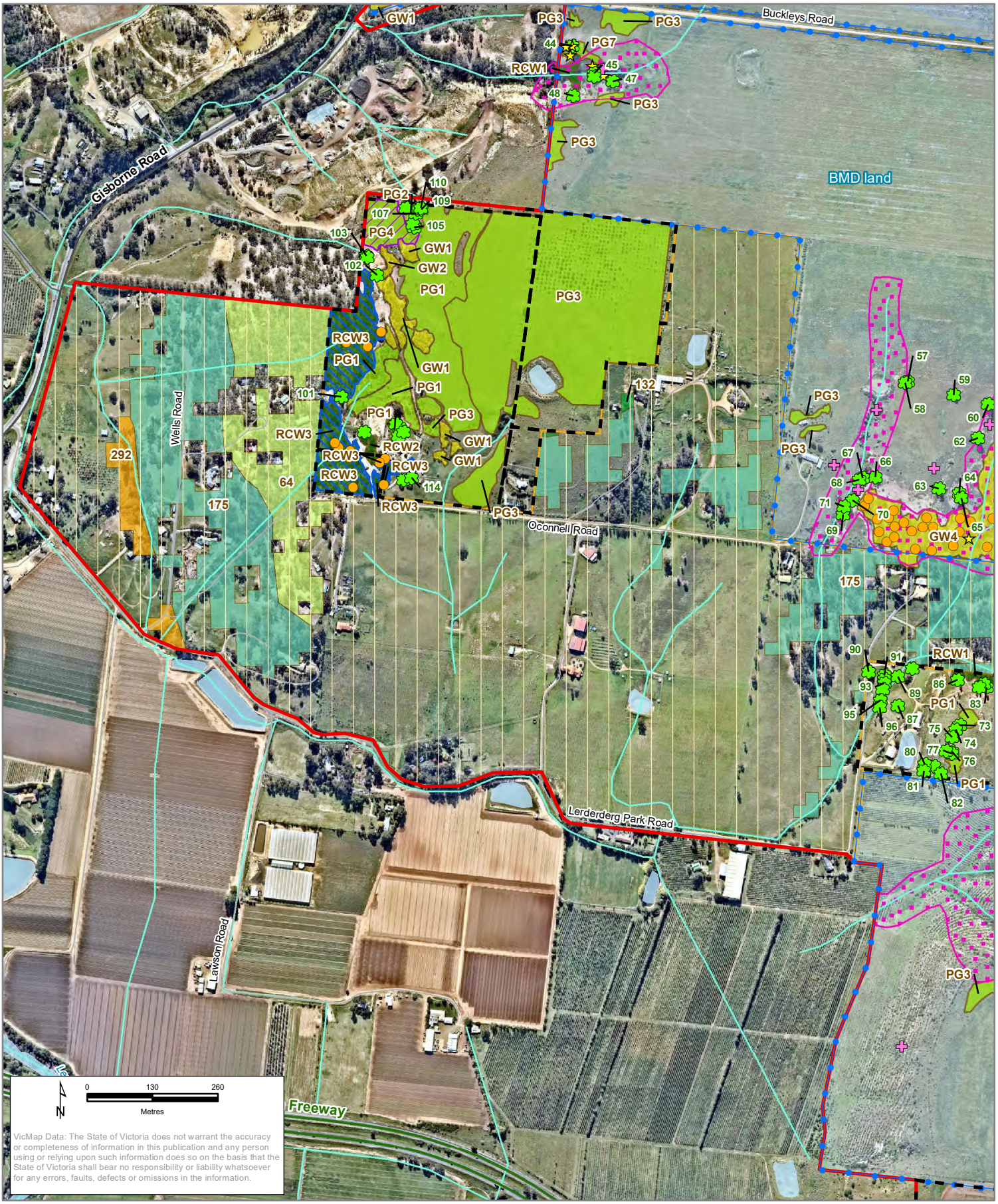
- Study Area
- BMD land
- Scattered Tree
- VROT
- Noxious weed
- Waterbody
- Areas of erosion
- Natural Temperate Grassland of the Victorian Volcanic Plain

Ecological Vegetation Classes

- Grassy Woodland (EVC 175)
- Plains Grassland (EVC 132)
- Plains Grassy Wetland (EVC 125)
- Rocky Chenopod Woodland (EVC 64)

14243_Fig03_ConsEcolFeats_MB 9/03/2021 psorensen

Aerial source: Nearmap 2020



VicMap Data: The State of Victoria does not warrant the accuracy or completeness of information in this publication and any person using or relying upon such information does so on the basis that the State of Victoria shall bear no responsibility or liability whatsoever for any errors, faults, defects or omissions in the information.

Figure 3c

Ecology and Heritage Partners Data

Ecological Desktop Assessment, Merrimu

ecology & heritage partners

Legend

- Study Area
- BMD land
- Other assessed land
- Desktop assessment only
- Scattered Tree
- LOT in Patch
- VROT
- Noxious weed
- Areas of erosion
- Natural Temperate Grassland of the Victorian Volcanic Plain
- Rocky Chenopod Open Scrub FFG Act community

Ecological Vegetation Classes

- Grassy Woodland (EVC 175)
- Plains Grassland (EVC 132)
- Plains Grassy Wetland (EVC 125)
- Rocky Chenopod Woodland (EVC 64)

Modelled 2005 Ecological Vegetation Classes

- Grassy Woodland (EVC 175)
- Plains Grassland (EVC 132)
- Red Gum Swamp (EVC 292)
- Rocky Chenopod Woodland (EVC 64)

14243_Fig03_ConsEcolFeats_MB 9/03/2021 psorensen

Aerial source: Nearmap 2020

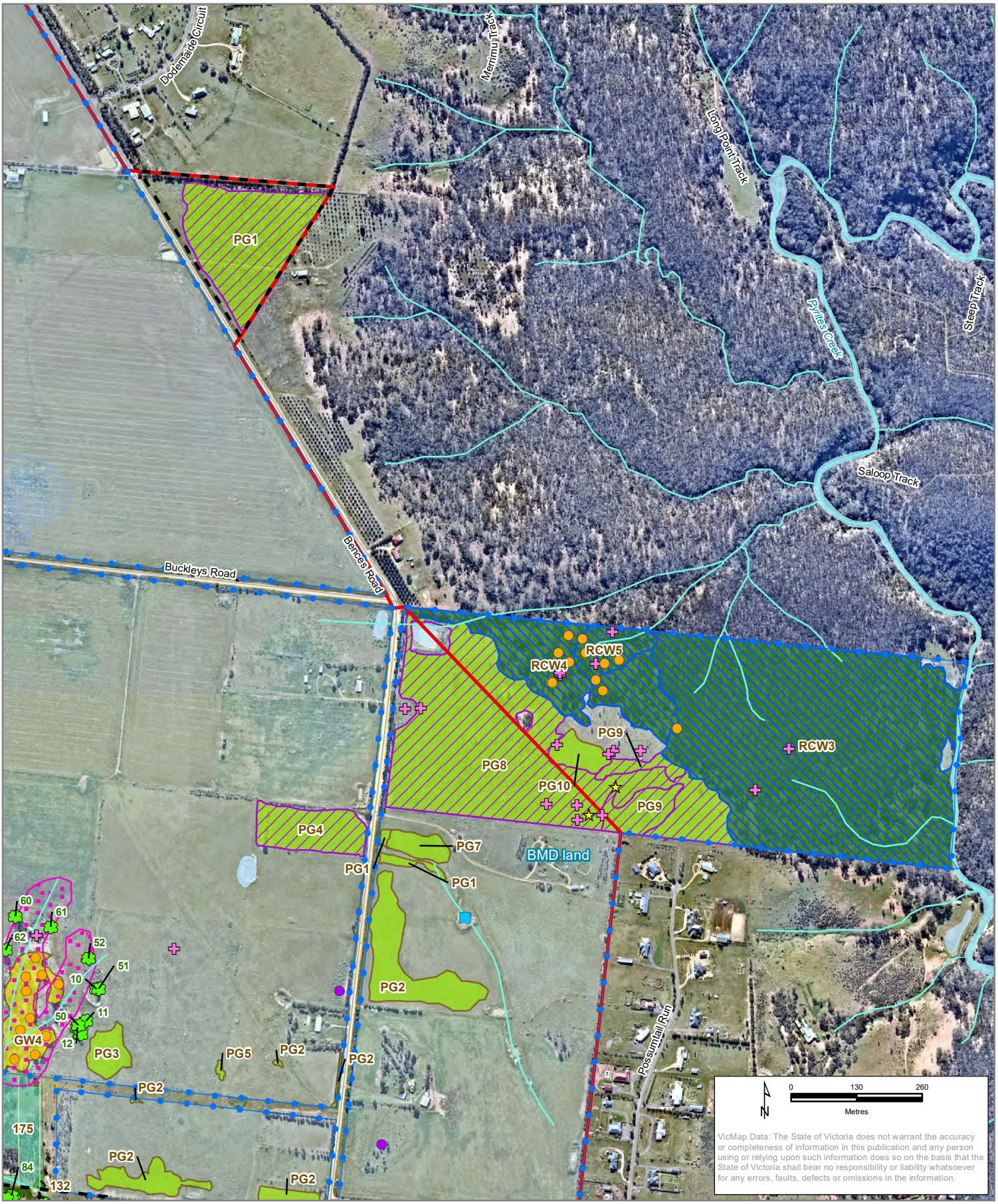


Figure 3d

Ecology and Heritage Partners Data

Ecological Desktop Assessment, Merrimu

ecology & heritage partners

Legend

- Study Area
- BMD land
- Other assessed land
- Desktop assessment only
- Scattered Tree
- LOT in Patch
- VROT
- Planted tree
- Noxious weed
- Waterbody
- Areas of erosion
- Natural Temperate Grassland of the Victorian Volcanic Plain
- Rocky Chenopod Open Scrub FFG Act community

Ecological Vegetation Classes

- Grassy Woodland (EVC 175)
- Plains Grassland (EVC 132)
- Rocky Chenopod Woodland (EVC 64)

Modelled 2005 Ecological Vegetation Classes

- Grassy Woodland (EVC 175)
- Plains Grassland (EVC 132)

14243_Fig03_ConsEcolFeats_MB 9/03/2021 psorensen

Aerial source: Nearmap 2020

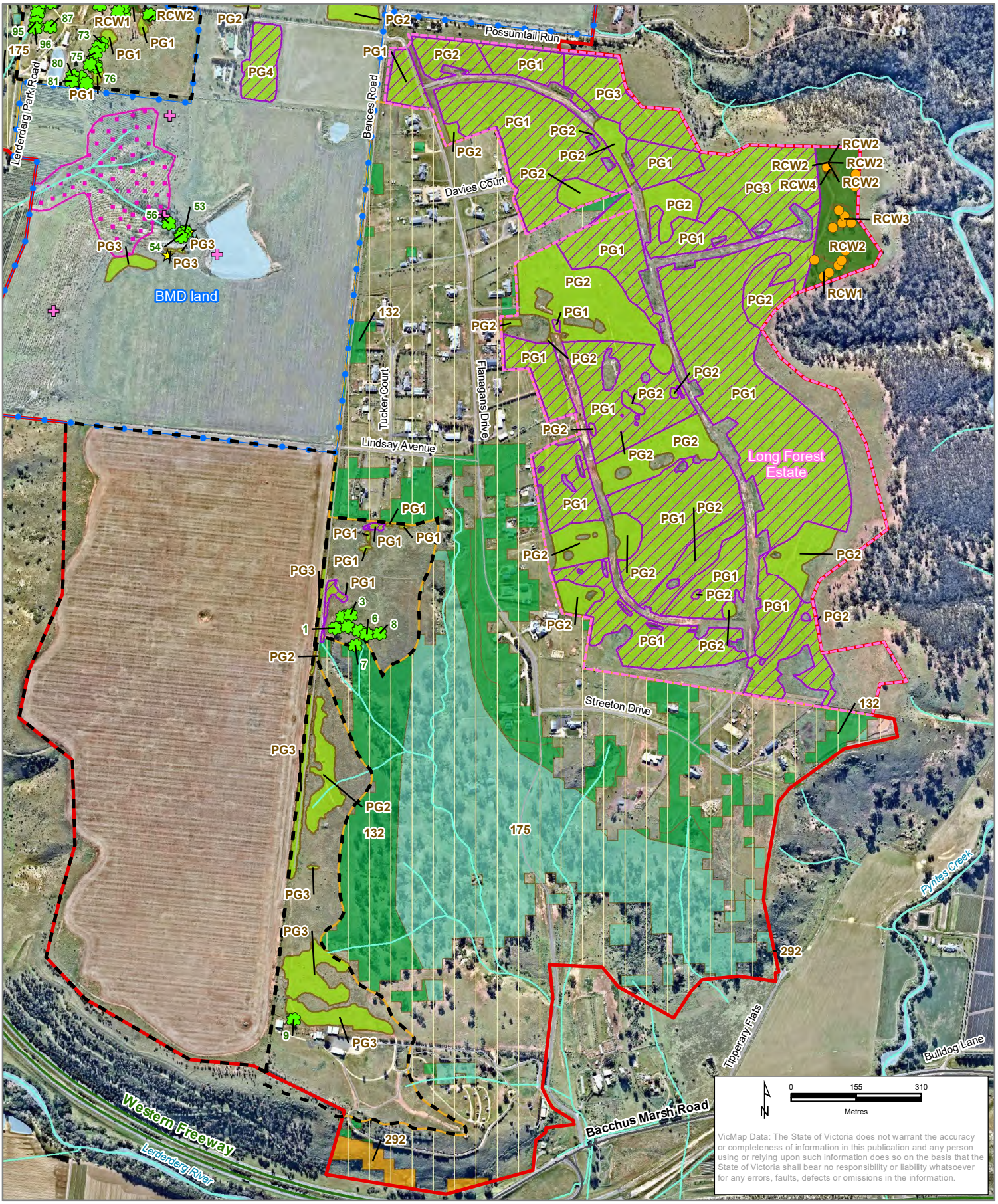


Figure 3e
Ecology and Heritage Partners Data
Ecological Desktop Assessment, Merrimu

ecology & heritage partners

Legend

- Study Area
- BMD land
- Long Forest Estate
- Other assessed land
- Desktop assessment only
- Scattered Tree
- LOT in Patch
- VROT
- Noxious weed
- Areas of erosion
- Natural Temperate Grassland of the Victorian Volcanic Plain

Ecological Vegetation Classes

- Plains Grassland (EVC 132)
- Rocky Chenopod Woodland (EVC 64)

Modelled 2005 Ecological Vegetation Classes

- Grassy Woodland (EVC 175)
- Plains Grassland (EVC 132)
- Red Gum Swamp (EVC 292)

14243_Fig03_ConsEcolFeats_MB 9/03/2021 psorensen

Aerial source: Nearmap 2020

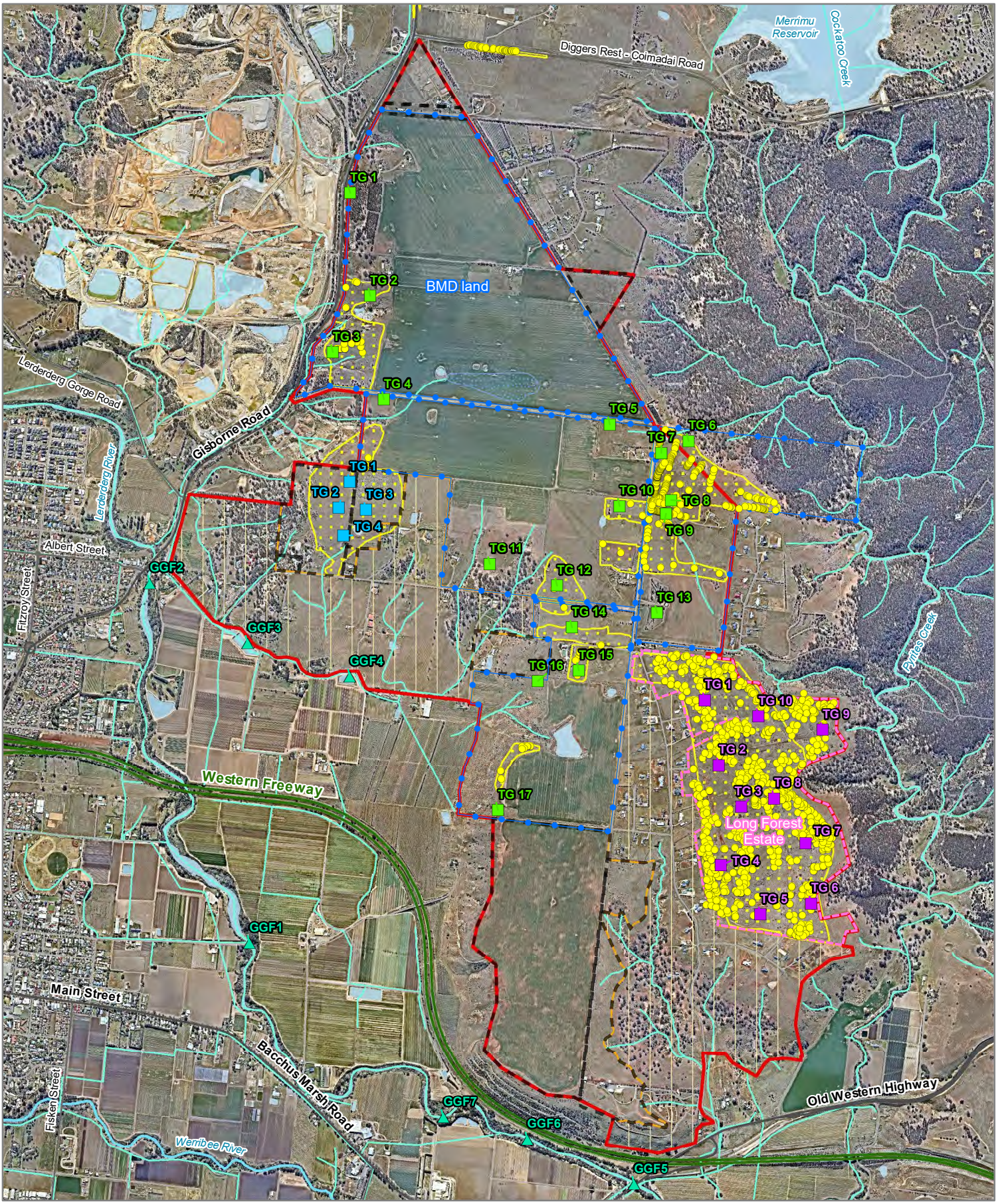


Figure 4

Surveyed Significant Fauna

Ecological Desktop Assessment, Merrimu

DRAFT

ecology & heritage partners

Legend

- Study
- BMD land
- Long Forest Estate
- Other assessed land
- Desktop assessment only
- Golden Sun Moth record
- Growling Grass Frog survey site

Striped Legless Lizard grids

- Other assessed land
- BMD land
- Long Forest Estate

Golden Sun Moth habitat

- Confirmed habitat

N

0 250 500

Metres

14243_Fig04_SigFauna_Surveyed_P 9/03/2021 psorensen

Aerial source: Nearmap 2018

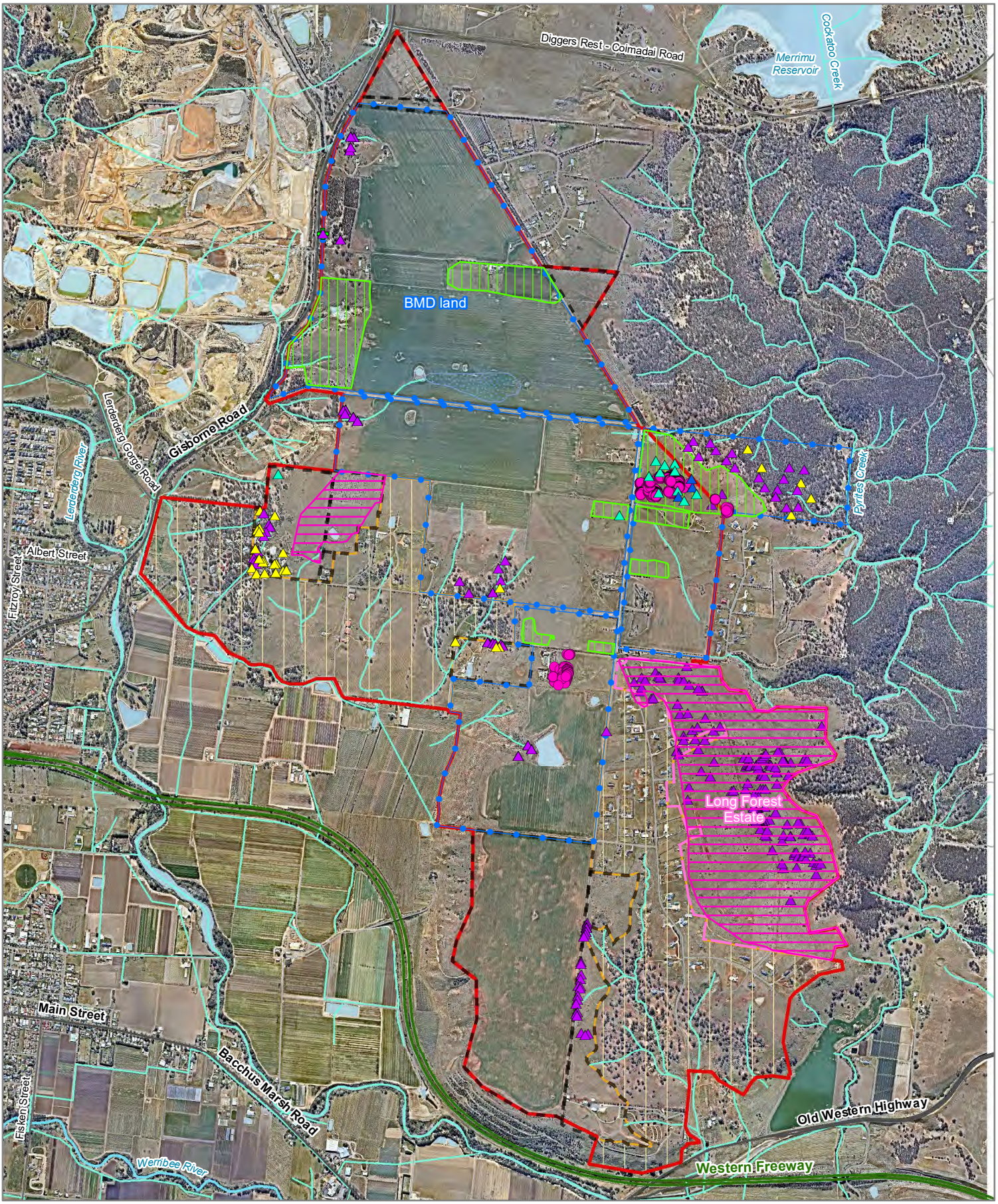


Figure 5
Surveyed Significant Flora
Ecological Desktop Assessment Merrimu

DRAFT

ecology & heritage partners

Legend

- Study Area
- BMD land
- Long Forest Estate
- Other assessed land
- Desktop assessment only
- Spiny Rice-flower surveys (BMD Land)
- Spiny Rice-flower surveys (BMEL Project)

EPBC Act listed species
- Spiny Rice-flower

FFG Act list species
- Bacchus Marsh Vanish Wattle

VROT flora
- Black Roly-Poly
- Fragrant Saltbush
- Melbourne Yellow-Gum
- Slender Bindweed

N

0 250 500
Metres

14243_Fig05_SigFlora_Surveyed_P 9/03/2021 psorensen

Aerial source: Nearmap 2018

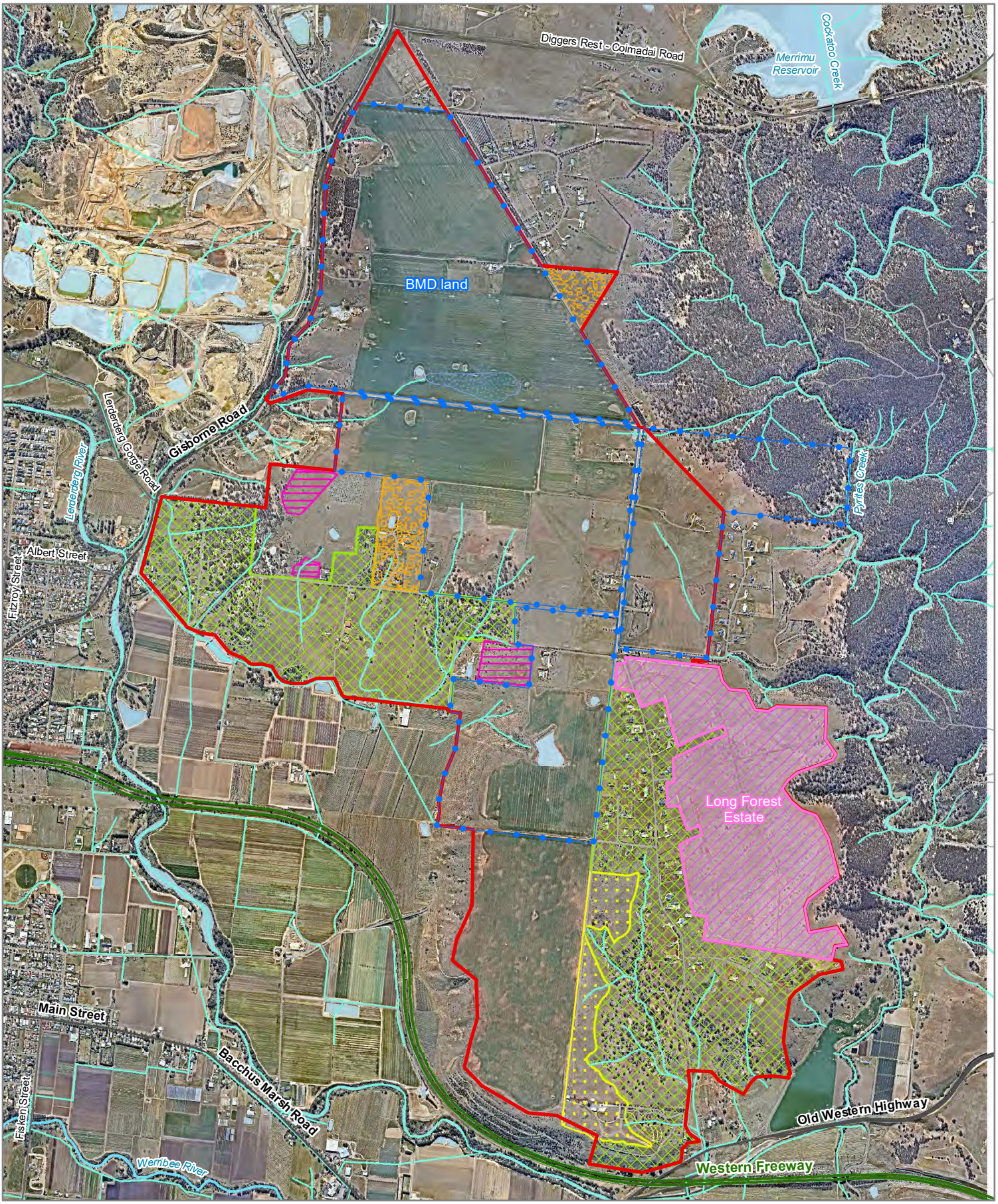


Figure 6
Additional surveys required
Ecological Desktop Assessment Merrimu

DRAFT

ecology & heritage partners

Legend

- Study Area
- BMD land
- Long Forest Estate

Additional survey areas

- Biodiversity Assessment
- GSM survey
- SRF survey
- GSM, SRF, SLL and Spring flora survey
- Habitat Hectare Assessment

N

0 250 500
Metres

14243_Fig06_AdditionalSurveys_P 5/03/2021 psorensen

Aerial source: Nearmap 2018

Legend

- Study Area

Significant flora

- Austral Tobacco
- Bacchus Marsh Wattle
- Black Roly-poly
- Black-tip Greenhood
- Branching Groundsel
- Brittle Greenhood
- Buloke
- Cane Spear-grass
- Coast Twin-leaf
- Flax-lily
- Forked Rice-flower
- Fragrant Saltbush
- Giant Honey-myrtle
- Heath Spear-grass
- Leafless Bluebush
- Leprechaun Greenhood
- Mealy Saltbush
- Melbourne Yellow-gum
- Narrow-leaf Wax-flower
- Rough Wattle
- Rye Beetle-grass
- Slender Bindweed
- Small Golden Moths
- Smooth Nardoo
- Snowy Mint-bush
- Spiny Rice-flower
- Spotted Gum
- Werribee Blue-box
- Western Golden-tip

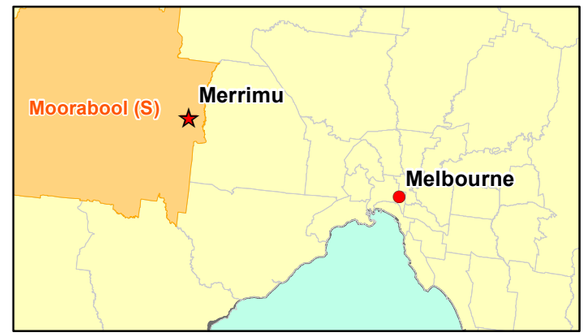


Figure 7

Previously documented significant flora within 5km of the study area

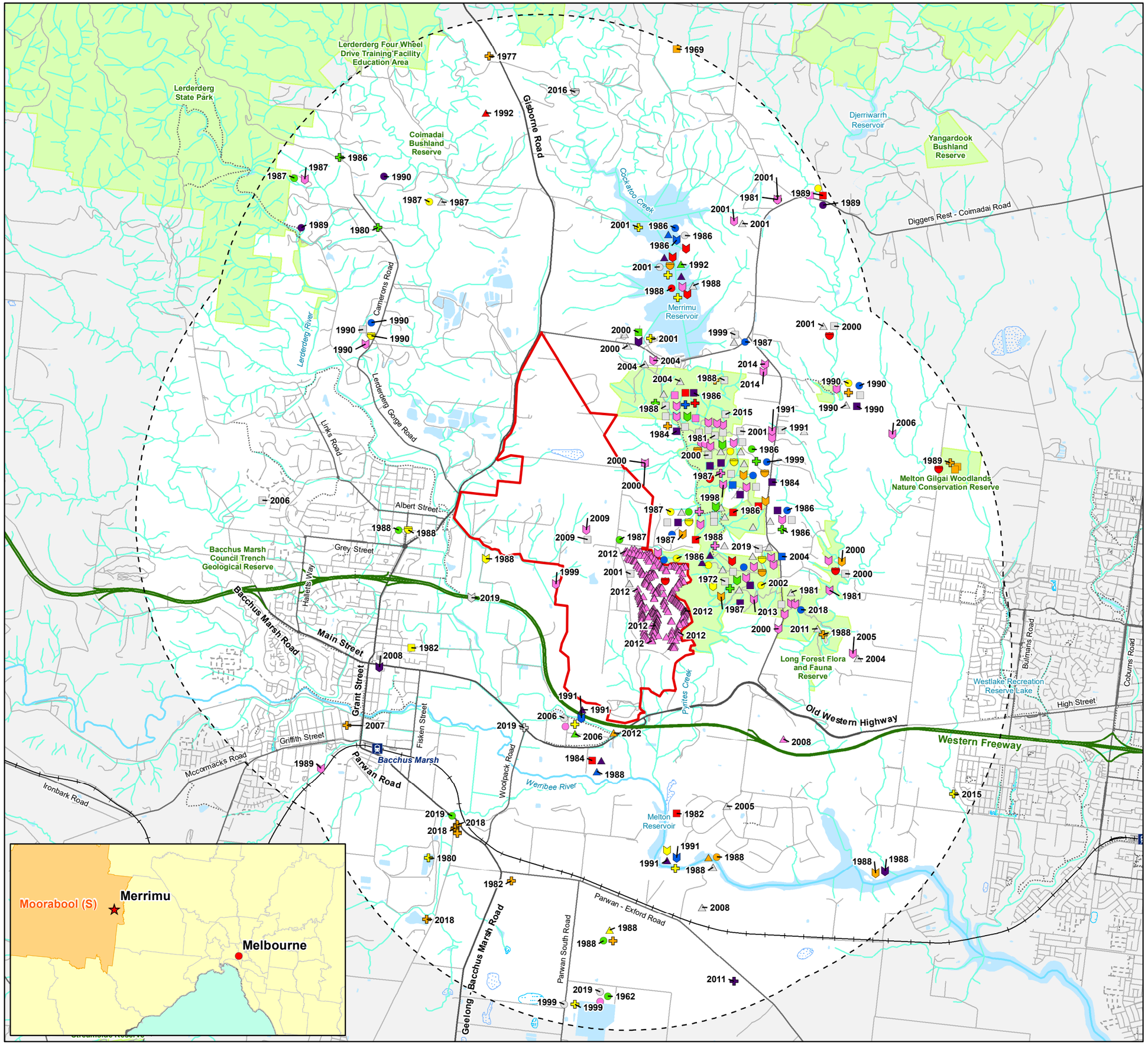
Ecological Desktop Assessment, Merrimu

N

0 1.5 3

Kilometres

ecology & heritage partners



Legend

- Study Area

Significant fauna

- Australasian Shoveler
- Australian Gull-billed Tern
- Azure Kingfisher
- Barking Owl
- Black Falcon
- Black-eared Cuckoo
- Blue-billed Duck
- Brown Toadlet
- Brown Treecreeper
- Brush-tailed Phascogale
- Bullant
- Caddisfly
- Caspian Tern
- Chestnut-rumped Heathwren
- Common Dunnart
- Crested Bellbird
- Diamond Firetail
- Eastern Pygmy-possum
- Eastern Snake-necked Turtle
- Fat-tailed Dunnart
- Freckled Duck
- Glossy Ibis
- Golden Sun Moth
- Great Egret
- Grey Goshawk
- Grey-headed Flying-fox
- Growling Grass Frog
- Hardhead
- Hooded Robin
- Lace Monitor
- Latham's Snipe
- Little Button-quail
- Magpie Goose
- Musk Duck
- Nankeen Night Heron
- Pied Cormorant
- Powerful Owl
- Royal Spoonbill
- Speckled Warbler
- Spotted Harrier
- Striped Legless Lizard
- Swift Parrot
- White-bellied Sea-Eagle
- White-throated Needletail

Figure 8

Previously documented significant fauna within 5km of the study area

Ecological Desktop Assessment, Merrimu

0 1.5 3

Kilometres

ecology & heritage partners

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 DEPI 2014, DSE 2009 or2013)
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: mammals (Woinarski *et al.* 2014), bats (Duncan *et al.* 1999), birds (Garnett *et al.* 2011), 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 (DEPI 2014).
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: mammals (Woinarski *et al.* 2014), bats (Duncan *et al.* 1999), birds (Garnett *et al.* 2011), reptiles (Cogger *et al.* 1993), amphibians (Tyler 1997) and butterflies (Sands and New 2002).
Communities: Ecological communities listed as threatened under the FFG Act (DELWP 2021h). EVC listed as threatened (i.e. endangered, vulnerable) or rare in a Native Vegetation Plan for a particular bioregion 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) 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 2013; DEPI 2014), 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 DEPI 2014; DSE 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 DEPI 2014; DSE 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 DEPI 2014; DSE 2009 or 2013.

Appendix 1.5 – Flora and Fauna Guarantee Act 1988 Protected Species

Protected flora and fauna under the *Flora and Fauna Guarantee Act 1988* (FFG Act) are defined as those that have legal protection under the Act. Protected taxa, includes plants and animals from three sources:

- plant or animal taxa (species, subspecies or varieties) listed as threatened under the FFG Act;
- plant taxa belonging to communities listed as threatened under the FFG Act; and,
- plant taxa which are not threatened but require protection for other reasons.

Note that representative plants of a given community are protected as well as the community itself (for example scattered Wallaby-grasses *Rytidosperma* spp. are protected in degraded areas previously supporting the listed Western [Basalt] Plains Grassland Community.

Table A1.6 provides a list of plant groups protected under the FFG Act. For threatened plant species likely to occur within the study area refer to Appendix and for listed communities (or representative species) likely to occur within the study area refer to Section 3.4.

Table A1.6. Plant groups (Families, Genera and Kingdom Divisions) protected under the FFG Act (DELWP 2016).

Family/Genera	Common Name	Exclusions
Pteridophyta	Clubmosses, ferns and fern allies	Austral Bracken Pteridium esculentum
Asteraceae	Daisies	N/A
Ericaceae (formerly Epacridaceae)	Heaths	N/A
Orchidaceae	Orchids	N/A
Acacia	Wattles	Acacia dealbata, Acacia decurrens, Acacia implexa, Acacia melanoxylon and Acacia paradoxa
Baeckea	Baeckeas	N/A
Boronia	Boronias	N/A
Calytrix	Fringe-myrtles	N/A
Correa	Correas	N/A
Darwinia	Darwinias	N/A
Eremophila	Emu-bushes	N/A
Eriostemon	Wax-flowers	N/A
Gompholobium	Wedge-peas	N/A
Grevillea	Grevilleas	N/A
Prostanthera	Mint-bushes	N/A
Sphagnum	Sphagnum mosses	N/A
Stylidium	Trigger-plants	N/A
Thryptomene	Thryptomenes	N/A
Thysanotus	Fringe-lilies	N/A
Xanthorrhoea	Grass-trees	N/A

APPENDIX 2 - FLORA

Appendix 2.1 – Flora Results

Legend:

I Protected under the FFG Act

L Listed as Threatened under the FFG Act

e/v/r Listed as endangered/vulnerable/rare in Victoria under the Advisory List of Rare or Threatened Plants in Victoria (DEPI 2014);

***** Listed as a noxious weed under the CaLP Act;

W Weed of National Significance;

- Not applicable

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

Scientific Name	Common Name	Comments
NATIVE		
Acacia acinacea s.l.	Gold-dust Wattle	**I**
Acacia implexa	Lightwood	
Acacia paradoxa	Hedge Wattle	
Acacia pycnantha	Golden Wattle	**I**
Acacia rostriformis	Bacchus Marsh Wattle	**L I v**
Acaena echinata	Sheep's Burr	
Asperula conferta	Common Woodruff	
Atriplex semibaccata	Berry Saltbush	

Scientific Name	Common Name	Comments
Austrostipa bigeniculata	Kneed Spear-grass	
Austrostipa densiflora	Foxtail Spear-grass	
Austrostipa elegantissima	Feather Spear-grass	
Austrostipa gibbosa	Spurred Spear-grass	
Austrostipa scabra subsp. *falcata*	Rough Spear-grass	
Austrostipa scabra var. *scabra*	Rough Spear-grass	
Brachyscombe dentata	Lobe-seed Daisy	**I**
Calocephalus citreus	Lemon Beauty-heads	**I**
Carpobrotus modestus	Inland Pigface	
Cassinia arcuata	Drooping Cassinia	**I**
Cassytha glabella	Slender Dodder-laurel	
Centrolepis aristata	Pointed Centrolepis	
Cheilanthes sieberi	Narrow Rock-fern	**I**
Chamaesyce drumondii	Flat Spurge	
Chloris truncata	Windmill grass	
Chrysocephalum apiculatum	Common Everlasting	**I**
Chrysocephalum semipapposum	Clustered Everlasting	**I**
Clematis microphylla	Small-leaved Clematis	
Convolvulus angustissima sp. agg.	Pink Bindweed	
Convolvulus angustissimus subsp. *omnigracilis*	Slender Bindweed	**k**
Crassula decumbens var. *decumbens*	Spreading Crassula	
Crassula sieberiana s.l.	Siebers Crassula	
Dichondra repens	Kidney weed	

Scientific Name	Common Name	Comments
Dodonaea viscosa	Sticky Hop-bush	
Einadia hastata	Saloop	
Einadia nutans subsp. *nutans*	Nodding Saltbush	
Eleocharis acuta	Common Spike-sedge	
Enchylaena tomentosa var. *tomentosa*	Ruby Saltbush	
Erodium crinitum	Blue Herons-bill	
Eucalyptus behriana	Bull Mallee	
Eucalyptus leucoxylon subsp. *connata*	Melbourne Yellow Gum	**v**
Eucalyptus leucoxylon subsp. *pruinosa*	Waxy Yellow-gum	
Eucalyptus melliodora	Yellow Box	
Eucalyptus microcarpa	Grey-box	
Eucalyptus obliqua	Messmate Stringybark	
Euchiton sphaericus	Annual Cudweed	**I**
Eutaxia microphylla	Common Eutaxia	
Goodenia ovata	Hop Goodenia	
Helichrysum luteoalbum	Jersey Cudweed	**I**
Juncus holoschoenus	Joint-leaf Rush	
Juncus pallidus	Pale Rush	
Linum marginale	Native Flax	
Lomandra filiformis	Wattle Mat-rush	
Lythrum hyssopifolia	Small Loosestrife	
Maireana enchylaenoides	Wingless Bluebush	
Melaleuca lanceolata	Moonah	

Scientific Name	Common Name	Comments
Melicytus dentatus s.l.	Tree Violet	
Oxalis exilis	Shady Wood-sorrel	
Oxalis perennans	Grassland Wood-sorrel	
Pimelea curviflora	Curved Rice-flower	
Pimelea spinescens subsp. *spinescens*	Spiny Rice-flower	**CR L e**
Ptilotus spatulatus	Pussy Tails	
Pycnosorus chrysanthes	Golden Billy-buttons	**I**
Rhagodia parabolica	Fragrant Saltbush	**r**
Rumex brownii	Slender Dock	
Rumex conglomeratus	Clustered Dock	
Rytidosperma caespitosum	Common Wallaby-grass	
Rytidosperma duttoniana	Brown-back Wallaby-grass	
Rytidosperma geniculatum	Kneed Wallaby-grass	
Rytidosperma racemosum	Wallaby Grass	
Rytidosperma setacea	Bristly Wallaby-grass	
Rytidosperma setaceum	Bristly Wallaby-grass	
Sclerolaena diacantha	Grey Copperburr	
Sclerolaena muricata var. *muricata*	Black Roly-poly	**k**
Sclerolaena muricata var. *villosa*	Grey Roly-poly	
Senecio pinnatifolius	Variable Groundsel	**I**
Senecio quadridentalis	Cotton Fireweed	**I**
Senna form taxon *'filifolia'*	Fine-leaf Desert Cassia	
Themeda triandra	Kangaroo Grass	

Scientific Name	Common Name	Comments
Typha spp.	Bulrush	
Vittadinia cuneata	Fuzzy New Holland Daisy	**I**
Wahlenbergia gracilis	Sprawling Bluebell	
Wahlenbergia luteola	Bronze Bluebell	
Walwhalleya proluta	Rigid Panic	
Xerochrysum viscosum	Sticky Everlasting	**I**
INTRODUCED		
Acetosella vulgaris	Sheep Sorrel	
Aira caryophyllea subsp. *caryophyllea*	Silvery Hair-grass	
Arctotheca calendula	Cape Weed	
Arpentia cordifolia	Heart-leaf Ice plant	
Asparagus asparagoides	Bridal Creeper	**W ***
Avena spp.	Oat	
Brassica spp.	Turnip	
Brassica tournefortii	Mediterranean Turnip	
Briza minor	Lesser Quaking-grass	
Bromus catharticus	Prairie Grass	
Bromus diandrus	Great Brome	
Bromus hordeaceus subsp. hordeaceus	Soft Brome	
Bromus rubens	Red Brome	
Centaurium erythraea	Common Centaury	
Cirsium vulgare	Spear Thistle	*
Conyza bonariensis	Flaxleaf Fleabane	

Scientific Name	Common Name	Comments
Conyza spp.	Fleabane	
Coprosma repens	Mirror Bush	
Cupressus macrocarpa	Monterey Cypress	
Cynara cardunculus subsp. *flavescens*	Artichoke Thistle	*
Cynodon dactylon var. *dactylon*	Couch	
Cyperus eragrostis	Drain Flat-sedge	
Dactylis glomerata	Cocksfoot	
Dittrichia graveolens	Stinkwort	*
Ehrharta erecta var. *erecta*	Panic Veldt-grass	
Ehrhata longifolia	Annual Veldt-grass	
Erodium circutarium	Common Stork-bill	
Eucalyptus botryoides	Southern Mahogany	
Eucalyptus cladocalyx	Sugar Gum	
Galenia pubescens var. *pubescens*	Galenia	
Gazania linearis	Gazania	
Helminthotheca echioides	Ox-tongue	
Hirschfeldia incana	Buchan Weed	
Holcus lanatus	Yorkshire Fog	
Hypericum perforatum	St John's Wort	
Hordeum spp.	Barley	
Hypochoeris radicata	Flatweed	
Lepidum africanum	Common Peppercress	
Linaria pelisseriana	Pelisser's Toad-flax	

Scientific Name	Common Name	Comments
Lolium perenne	Perennial Rye-grass	
Lycium ferocissimum	African Box-thorn	**W ***
Madiola caroliniana	Red-flower Mallow	
Marrubium vulgare	Horehound	*
Medicago minima	Burr Medic	
Medicago polymorpha	Burr Medic	
Nassella neesiana	Chilean Needle-grass	**W ***
Nassella trichotoma	Serrated Tussock	**W ***
Olea europaea	Olive	
Opuntia spp.	Prickly Pear	**W ***
Oxalis pes-caprae	Soursob	*
Paspalum dilatatum	Paspalum	
Petrohagia dubia	Velvety Pink	
Phalaris aquatica	Toowoomba Canary-grass	
Physalis hederifolia	Sticky Ground-cherry	
Plantago coronopus	Buck's-horn Plantain	
Plantago lanceolata	Ribwort	
Prunus spp.	Prunus	
Rapistrum rugosum	Giant Mustard	
Romulea rosea	Onion Grass	
Rosa rubiginosa	Sweet Briar	*
Rubus fruticosus spp. agg.	Blackberry	**W ***
Rumex crispus	Curled Dock	

Scientific Name	Common Name	Comments
Salvia verbenaca	Wild Sage	
Schinus molle	Pepper Tree	
Sherardia arvensis	Field Madder	
Solanum nigrum s.l.	Black Nightshade	
Sonchus asper s.l.	Rough Sow-thistle	
Sonchus oleraceus	Common Sow-thistle	
Taraxacum sp. agg.	Dandelion	
Tribulus terrestris	Caltrop	
Trifolium angustifolium var. *angustifolium*	Narrow-leaf Clover	
Trifolium spp.	Clover	
Vulpia bromoides	Squirrel-tail Fescue	
Vulpia myuros	Rat's-tail Fescue	

Appendix 2.2 – Significant Flora

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

Key:

EPBC	*Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
FFG	*Flora and Fauna Guarantee Act 1988* (FFG Act)
DEPI	Advisory List of Threatened Flora in Victoria (DEPI 2014)

EX	Extinct	X	Extinct
CR	Critically endangered	e	Endangered
EN	Endangered	v	Vulnerable
VU	Vulnerable	r	Rare
K	Poorly Known (Briggs and Leigh 1996)	k	Poorly Known
#	Records identified from EPBC Act Protected Matters Search Tool.	L	Listed
*	Records identified from the FIS		

Scientific name	Common name	Total # of documented records	Last documented record	EPBC	FFG	DEPI	Likely occurrence in study area	Rationale for occurrence likelihood (Post ecological survey program)
NATIONAL SIGNIFICANCE								
Amphibromus fluitans #	River Swamp Wallaby-grass	-	-	VU	-	-	4	No previous records within close proximity to study area and limited suitable habitat.
Dianella amoena #	Matted Flax-lily	-	-	EN	L	e	4	No previous records within close proximity to study area and limited suitable habitat.
Diuris basaltica	Small Golden Moths	6	2011	EN	L	e	4	Limited suitable habitat and species not recorded during flora assessments.

Scientific name	Common name	Total # of documented records	Last documented record	EPBC	FFG	DEPI	Likely occurrence in study area	Rationale for occurrence likelihood (Post ecological survey program)
Diuris fragrantissima	Sunshine Diuris	1	1770	EN	L	e	5	Outside known distribution for species and limited suitable habitat.
Dodonaea procumbens #	Trailing Hop-bush	-	-	VU	-	v	4	Outside known distribution for species and limited suitable habitat.
Eucalyptus aggregata #	Black Gum	-	-	VU	L	e	5	Outside known distribution, species restricted to Woodend in Victoria.
Glycine latrobeana #	Clover Glycine	-	-	VU	L	v	4	Areas of suitable habitat however no recent records within close proximity of study area and species not observed during flora assessments.
Lachnagrostis adamsonii #	Adamson's Blown-grass	-	-	EN	L	v	5	No suitable habitat within study area (i.e. Saline Depressions).
Lepidium hyssopifolium #	Basalt Peppercress	-	-	EN	L	e	4	Areas of suitable habitat however no recent records within close proximity of study area and species not observed during flora assessments.
Leucochrysum albicans var. *tricolor #*	Hoary Sunray	-	-	EN	-	e	5	Outside known distribution for species and limited suitable habitat.
Pimelea spinescens subsp. *spinescens*	Spiny Rice-flower	5	2003	CR	L	e	1	Confirmed to be present in two locations. Suitable habitat present in unsurveyed parcels
Prasophyllum frenchii #	Maroon Leek-orchid	-	-	EN	L	e	5	No records previously recorded within close proximity to study area and limited suitable habitat.
Rutidosis leptorhynchoides #	Button Wrinklewort	-	-	EN	L	e	4	Limited suitable habitat and species not recorded during flora assessments.
Senecio macrocarpus #	Large-headed Fireweed	-	-	VU	L	e	4	Limited suitable habitat and species not recorded during flora assessments.

Scientific name	Common name	Total # of documented records	Last documented record	EPBC	FFG	DEPI	Likely occurrence in study area	Rationale for occurrence likelihood (Post ecological survey program)
Senecio psilocarpus #	Swamp Fireweed	-	-	VU	-	v	5	No records previously recorded within close proximity to study area and limited suitable habitat.
Xerochrysum palustre #	Swamp Everlasting	-	-	VU	L	v	5	No records previously recorded within close proximity to study area and limited suitable habitat.
STATE SIGNIFICANCE								
Acacia aspera subsp. *parviceps*	Rough Wattle	3	2000	-	-	r	3	Limited suitable habitat and few past records.
Acacia rostriformis	Bacchus Marsh Wattle	301	2019	-	L	v	1	Species known to occur within study area and surrounds.
Allocasuarina luehmannii	Buloke	21	2018	-	L	e	2	Species known to occur within locality, however was not recorded within the study area during the site assessments. Potential to occur in areas where access was restricted.
Alternanthera sp. 1 (Plains)	Plains Joyweed	5	2018	-	-	k	2	Potential to occur within Plains Grassland habitats within the study area
Amyema linophylla subsp. *orientalis*	Buloke Mistletoe	2	2010	-	-	v	2	Species potential to occur within Buloke, however was not recorded within the study area during the site assessments. Potential to occur in areas where access was restricted.
Atriplex pseudocampanulata	Mealy Saltbush	2	2016	-	-	r	3	Potential habitat, but limited local records within locality
Austrostipa breviglumis	Cane Spear-grass	22	2018	-	-	r	2	Potential to occur within Plains Grassland habitats within the study area

Scientific name	Common name	Total # of documented records	Last documented record	EPBC	FFG	DEPI	Likely occurrence in study area	Rationale for occurrence likelihood (Post ecological survey program)
Austrostipa exilis	Heath Spear-grass	19	2009	-	-	r	2	Potential to occur within Plains Grassland habitats within the study area
Bossiaea cordigera	Wiry Bossiaea	1	1980	-	-	r	3	Limited suitable habitat and few past records.
Calotis anthemoides	Cut-leaf Burr-daisy	1	1984	-	L	-	3	Limited suitable habitat and few past records.
Calotis lappulacea	Yellow Burr-daisy	2	1910	-	-	r	3	Limited suitable habitat and few past records.
Cardamine papillata	Forest Bitter-cress	1	1898	-	-	v	3	Limited suitable habitat and few past records.
Convolvulus angustissimus subsp. *omnigracilis*	Slender Bindweed	12	2018	-	-	k	1	Species known to occur within study area and surrounds.
Coronidium gunnianum	Pale Swamp Everlasting	1	2012	-	-	v	3	Limited suitable habitat and few past records.
Corymbia maculata	Spotted Gum	1	2010	-	-	v	4	Study area located outside species natural range
Cullen parvum	Small Scurf-pea	5	2012	-	L	e	2	Potential to occur within Plains Grassland habitats within the study area
Cullen tenax	Tough Scurf-pea	1	1853	-	L	e	2	Potential to occur within Plains Grassland habitats within the study area
Desmodium varians	Slender Tick-trefoil	3	2010	-	-	k	3	Limited suitable habitat and few past records.
Dianella longifolia var. *grandis*	Flax-lily	8	2016	-	-	v	3	Limited suitable habitat and few past records.
Eucalyptus aff. *ignorabilis* (Lerderderg)	Lerderderg Scentbark	5	2011	-	-	e	3	Not recorded within study area. Potential habitat in Lerderderg Flora and Fauna Reserve outside of study area.

Scientific name	Common name	Total # of documented records	Last documented record	EPBC	FFG	DEPI	Likely occurrence in study area	Rationale for occurrence likelihood (Post ecological survey program)
Eucalyptus baueriana subsp. *thalassina*	Werribee Blue-box	324	2019	-	-	e	3	Not recorded within study area. Potential habitat in Lerderderg Flora and Fauna Reserve outside of study area.
Eucalyptus leucoxylon subsp. *connata*	Melbourne Yellow-gum	70	2019	-	X	v	1	Species known to occur within study area and surrounds.
Euphrasia collina subsp. *trichocalycina*	Purple Eyebright	1	1963	-	-	r	3	
Gahnia microstachya	Slender Saw-sedge	6	2011	-	-	r	3	Limited suitable habitat and few past records.
Goodia medicaginea	Western Golden-tip	4	2008	-	-	r	3	Limited suitable habitat and few past records.
Grevillea rosmarinifolia	Rosemary Grevillea	2	1959	-	-	P	3	Limited suitable habitat and few past records.
Grevillea steiglitziana	Brisbane Range Grevillea	2	1980	-	-	r	3	Limited suitable habitat and few past records.
Leionema lamprophyllum subsp. *obovatum*	Shiny Leionema	1	1980	-	-	r	3	Limited suitable habitat and few past records.
Lepidium pseudohyssopifolium	Native Peppercress	2	2008	-	-	k	3	Limited suitable habitat and few past records.
Leucopogon microphyllus var. *pilibundus*	Hairy Beard-heath	10	2011	-	-	r	3	Limited suitable habitat and few past records.
Maireana aphylla	Leafless Bluebush	7	2006	-	-	k	3	Limited suitable habitat and few past records.
Marsilea mutica	Smooth Nardoo	1	2000	-	-	k	3	Limited suitable habitat and few past records.
Melaleuca armillaris subsp. *armillaris*	Giant Honey-myrtle	2	2018	-	-	r	4	Study area located outside species natural range

Scientific name	Common name	Total # of documented records	Last documented record	EPBC	FFG	DEPI	Likely occurrence in study area	Rationale for occurrence likelihood (Post ecological survey program)
Nicotiana suaveolens	Austral Tobacco	64	2018	-	-	r	2	Potential to occur within Plains Grassland habitats within the study area
Philotheca angustifolia subsp. *montana*	Narrow-leaf Wax-flower	1	1987	-	-	v	3	Limited suitable habitat and few past records.
Pimelea hewardiana	Forked Rice-flower	16	2018	-	-	r	3	Limited suitable habitat and not recorded during flora surveys.
Poa amplexicaulis	Red-sheath Tussock-grass	1	2011	-	-	r	3	Limited suitable habitat and few past records.
Podolepis linearifolia	Basalt Podolepis	3	2000	-	-	e	3	Limited suitable habitat and few past records.
Poranthera corymbosa	Clustered Poranthera	1	1982	-	-	r	3	Limited suitable habitat and few past records.
Prostanthera decussata	Dense Mint-bush	2	1980	-	-	r	3	Limited suitable habitat and few past records.
Prostanthera nivea var. *nivea*	Snowy Mint-bush	6	2011	-	-	r	3	Limited suitable habitat and few past records.
Prostanthera saxicola var. *bracteolata*	Slender Mint-bush	1	2011	-	-	r	3	Limited suitable habitat and few past records.
Pseudanthus orbicularis	Tangled Pseudanthus	13	2011	-	-	r	3	Limited suitable habitat and few past records.
Pterostylis bicolor	Black-tip Greenhood	1	1996	-	-	k	3	Limited suitable habitat due to ground disturbance and weed invasion. Records in the Long Forest Nature Conservation Reserve where vegetation condition is higher.

Scientific name	Common name	Total # of documented records	Last documented record	EPBC	FFG	DEPI	Likely occurrence in study area	Rationale for occurrence likelihood (Post ecological survey program)
Pterostylis conferta	Leprechaun Greenhood	2	1996	-	L	e	4	Limited suitable habitat due to past disturbance. Only known to two sites, both outside of the study area.
Pterostylis truncata	Brittle Greenhood	86	2013	-	L	e	3	Limited suitable habitat due to ground disturbance and weed invasion. Records in the Long Forest Nature Conservation Reserve where vegetation condition is higher.
Ptilotus erubescens	Hairy Tails	1	1984	-	L	v	3	Limited suitable habitat and few past records.
Pultenaea weindorferi	Swamp Bush-pea	1	1980	-	X	r	3	Limited suitable habitat and few past records.
Rhagodia parabolica	Fragrant Saltbush	695	2019	-	-	r	1	Species confirmed to occur within study area and surrounds.
Roepera billardierei	Coast Twin-leaf	2	2008	-	-	r	3	Limited suitable habitat and few past records.
Sclerolaena muricata var. *muricata*	Black Roly-poly	9	2018	-	-	k	1	Species known to occur within study area in high quality patches of Plains Grassland.
Senecio cunninghamii var. *cunninghamii*	Branching Groundsel	6	2008	-	-	r	3	Limited suitable habitat and few past records.
Tripogonella loliiformis	Rye Beetle-grass	2	2008	-	-	r	3	Potential habitat, but few past records.
Westringia glabra	Violet Westringia	5	1980	-	-	r	3	Limited suitable habitat and few past records.

Data source: Victorian Biodiversity Atlas (DELWP 2018a); Protected Matters Search Tool (DAWE 2020a). **Taxonomic order:** Alphabetical.

Appendix 2.3 – Habitat Hectare Results

Table A2.3.1 Habitat Hectares results for native vegetation recorded within the BMD Land.

Vegetation Zone		GW1	GW2	GW3	GW4	PG1	PG2	PG3	PG4	PG5	PG6	PG7
Bioregion		CVU	CVU	CVU	CVU	VVP	VVP	VVP	VVP	VVP	VVP	VVP
EVC / Tree		GW	GW	GW	GW	PG(LR)	PG(LR)	PG(LR)	PG(LR)	PG(LR)	PG(LR)	PG(LR)
EVC Number		175	175	175	175	132_63	132_63	132_63	132_63	132_63	132_63	132_63
EVC Conservation Status		En	En	En	En	En	En	En	En	En	En	En
Patch Condition	Large Old Trees /10	7	7	0	5	0	0	0	0	0	0	0
	Canopy Cover /5	5	3	4	5	0	0	0	0	0	0	0
	Under storey /25	5	5	5	5	10	5	5	10	10	5	10
	Lack of Weeds /15	4	2	6	2	4	4	0	4	4	2	6
	Recruitment /10	3	1	1	3	3	1	0	3	0	6	6
	Organic Matter /5	5	5	0	3	4	2	2	5	4	5	5
	Logs /5	2	0	0	0	0	0	0	0	0	0	0
	Treeless EVC Multiplier	1.00	1.00	1.00	1.00	1.36	1.36	1.36	1.36	1.36	1.36	1.36
	Subtotal =	31.00	23.00	16.00	23.00	28.56	16.32	9.52	29.92	24.48	24.48	36.72
Landscape Value /25		4	4	4	4	4	4	4	4	4	4	4
Habitat Points /100		35	27	20	27	33	20	14	34	28	28	41
Habitat Score		0.35	0.27	0.20	0.27	0.33	0.20	0.14	0.34	0.28	0.28	0.41

Vegetation Zone		PG8	PG9	PG10	RCW1	RCW2	RCW3	RCW4	RCW5	PGWe1
Bioregion		VVP	VVP	VVP	CVU	CVU	CVU	CVU	CVU	CVU
EVC / Tree		PG(LR)	PG(LR)	PG(LR)	RCW	RCW	RCW	RCW	RCW	PGWe
EVC Number		132_63	132_63	132_63	64	64	64	64	64	125
EVC Conservation Status		En	En	En	Vu	Vu	Vu	Vu	Vu	En
Patch Condition	Large Old Trees /10	0	0	0	10	9	10	9	9	0
	Canopy Cover /5	0	0	0	4	4	5	5	5	0
	Under storey /25	15	10	10	5	10	15	15	15	10
	Lack of Weeds /15	9	6	2	2	4	11	9	0	4
	Recruitment /10	10	10	10	0	1	6	6	6	3
	Organic Matter /5	5	5	5	5	5	3	3	3	3
	Logs /5	0	0	0	0	0	4	4	4	0
	Treeless EVC Multiplier	1.36	1.36	1.36	1.00	1.00	1.00	1.00	1.00	1.36
	Subtotal =	53.04	42.16	36.72	26.00	33.00	54.00	51.00	42.00	27.20
Landscape Value /25		16	16	16	4	4	17	17	17	4
Habitat Points /100		69	58	53	30	37	71	68	59	31
Habitat Score		0.69	0.58	0.53	0.30	0.37	0.71	0.68	0.59	0.31

Table A2.3.2 - Condition Scores recorded during the field assessment for the 'Other Assessed Land'.

Vegetation Zone		GW1	GW2	RCW1	RCW2	RCW3	PG1	PG2	PG3	PG4
Bioregion		CVU	CVU	CVU	CVU	CVU	CVU	CVU	CVU	CVU
EVC / Tree		GW	GW	RCW	RCW	RCW	PG	PG	PG	PG
EVC Number		175	175	64	64	64	132	132	132	132
EVC Conservation Status		En	En	Vu	Vu	Vu	En	En	En	En
Patch Condition	Large Old Trees /10	0	2	2	0	4	0	0	0	0
	Canopy Cover /5	0	4	4	2	5	0	0	0	0
	Under storey /25	10	10	10	10	15	10	5	5	15
	Lack of Weeds /15	7	7	0	9	11	0	4	0	7
	Recruitment /10	5	5	6	3	3	10	1	0	10
	Organic Matter /5	5	5	3	3	3	3	2	2	3
	Logs /5	0	3	4	0	2	0	0	0	0
	Treeless EVC Multiplier	1.00	1.00	1.00	1.00	1.00	1.36	1.36	1.36	1.36
	Subtotal =	27.00	36.00	29.00	27.00	43.00	31.28	16.32	9.52	47.60
Landscape Value /25		5	5	4	10	10	10	10	10	10
Habitat Points /100		32	41	33	37	53	41	26	20	58
Habitat Score		0.32	0.41	0.33	0.37	0.53	0.41	0.26	0.20	0.58

Notes: VVP = Victorian Volcanic Plain bioregion; Vu = Vulnerable; En = Endangered; CGW = Creekline Grassy Woodland; PG = Plains Grassland; FRW= Floodplain Riparian Woodland

Table A2.3.3. Habitat Hectares results for native vegetation recorded within Long Forest Estate

Vegetation Zone		PG1a	PG1b	PG1c	PG1d	PG1e	PG2a	PG2b	PG2c	PG2d	PG2e	PG3
Bioregion		VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP
EVC / Tree		PG(LR)	PG(LR)	PG(LR)	PG(LR)	PG(LR)	PG(LR)	PG(LR)	PG(LR)	PG(LR)	PG(LR)	PG(LR)
EVC Number		132_63	132_63	132_63	132_63	132_63	132_63	132_63	132_63	132_63	132_63	132_63
EVC Conservation Status		En	En	En	En	En	En	En	En	En	En	En
Patch Condition	Large Old Trees /10	0	0	0	0	0	0	0	0	0	0	0
	Canopy Cover /5	0	0	0	0	0	0	0	0	0	0	0
	Under storey /25	15	15	15	15	15	15	15	15	15	15	15
	Lack of Weeds /15	6	6	6	6	6	4	4	4	4	4	9
	Recruitment /10	6	6	6	6	6	6	6	6	6	6	6
	Organic Matter /5	4	4	4	4	4	4	4	4	4	4	4
	Logs /5	0	0	0	0	0	0	0	0	0	0	0
	Treeless EVC Multiplier	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36
	Subtotal =	42.16	42.16	42.16	42.16	42.16	39.44	39.44	39.44	39.44	39.44	46.24
Landscape Value /25		4	6	8	12	16	4	6	8	12	16	16
Habitat Points /100		46	48	50	54	58	43	45	47	51	55	62
Habitat Score		0.46	0.48	0.50	0.54	0.58	0.43	0.45	0.47	0.51	0.55	0.62

Vegetation Zone		PG4	PG5	RCW1	RCW2	RCW3	RCW4	RCW5
Bioregion		VVP	VVP	VVP	VVP	VVP	VVP	VVP
EVC / Tree		PG(LR)	PG(LR)	RCW	RCW	RCW	RCW	RCW
EVC Number		132_63	132_63	64	64	64	64	64
EVC Conservation Status		En	En	Vu	Vu	Vu	Vu	Vu
Patch Condition	Large Old Trees /10	0	0	9	2	9	9	6
	Canopy Cover /5	0	0	4	2	4	4	4
	Under storey /25	15	5	15	15	5	5	15
	Lack of Weeds /15	4	0	6	9	0	0	7
	Recruitment /10	6	3	3	3	1	1	3
	Organic Matter /5	5	4	5	5	4	4	5
	Logs /5	0	0	2	2	5	2	2
	Treeless EVC Multiplier	1.36	1.36	1.00	1.00	1.00	1.00	1.00
	Subtotal =	40.80	16.32	44.00	38.00	28.00	25.00	42.00
Landscape Value /25		16	16	16	16	16	16	16
Habitat Points /100		57	32	60	54	44	41	58
Habitat Score		0.57	0.32	0.60	0.54	0.44	0.41	0.58

Appendix 2.4 – Scattered Trees

Table A2.4.1. Scattered trees within the assessed land of the Merrimu PSP

Tree ID	Species Name	Common Name	DBH	Size Class	Study Area
1	*Eucalyptus microcarpa*	Grey Box	93	Large	Other Assessed Land
2	*Eucalyptus microcarpa*	Grey Box	62	Small Tree	Other Assessed Land
3	*Eucalyptus microcarpa*	Grey Box	72	Large	Other Assessed Land
4	*Eucalyptus microcarpa*	Grey Box	68	Small	Other Assessed Land
5	*Eucalyptus microcarpa*	Grey Box	65	Small	Other Assessed Land
6	*Eucalyptus microcarpa*	Grey Box	63	Small Tree	Other Assessed Land
7	*Eucalyptus microcarpa*	Grey Box	66	Small	Other Assessed Land
8	*Allocasuarina verticillata*	Drooping Sheoak	38	Small	Other Assessed Land
9	*Eucalyptus microcarpa*	Grey Box	82	Large	Other Assessed Land
10	*Eucalyptus microcarpa*	Grey Box	103	Large	Other Assessed Land
11	*Eucalyptus camaldulensis*	River Red-gum	72	Large	Other Assessed Land
12	*Eucalyptus microcarpa*	Grey Box	103	Large	Other Assessed Land
13	*Eucalyptus microcarpa*	Grey Box	80	Large	Other Assessed Land
14	*Eucalyptus microcarpa*	Grey Box	78	Large	BMD Land
14	*Eucalyptus microcarpa*	Grey Box	73	Large	BMD Land
15	*Eucalyptus microcarpa*	Grey Box	110	Large	BMD Land
15	*Eucalyptus microcarpa*	Grey Box	14	Small	BMD Land
16	*Eucalyptus microcarpa*	Grey Box	34	Small	BMD Land
17	*Eucalyptus microcarpa*	Grey Box	77	Large	BMD Land
18	*Eucalyptus microcarpa*	Grey Box	64	Small	BMD Land
19	*Eucalyptus microcarpa*	Grey Box	62	Small	BMD Land

Tree ID	Species Name	Common Name	DBH	Size Class	Study Area
20	*Eucalyptus microcarpa*	Grey Box	79	Large	BMD Land
21	*Eucalyptus microcarpa*	Grey Box	56	Small	BMD Land
22	*Eucalyptus microcarpa*	Grey Box	76	Large	BMD Land
23	*Eucalyptus microcarpa*	Grey Box	102	Large	BMD Land
24	*Eucalyptus microcarpa*	Grey Box	97	Large	BMD Land
25	*Eucalyptus microcarpa*	Grey Box	87	Large	BMD Land
26	*Eucalyptus microcarpa*	Grey Box	79	Large	BMD Land
27	*Eucalyptus microcarpa*	Grey Box	105	Large	BMD Land
28	*Eucalyptus microcarpa*	Grey Box	41	Small	BMD Land
29	*Eucalyptus microcarpa*	Grey Box	105	Large	BMD Land
30	Stag		74	Large	BMD Land
31	*Eucalyptus obliqua*	Messmate	110	Large	BMD Land
32	*Eucalyptus microcarpa*	Grey Box	88	Large	BMD Land
33	*Eucalyptus microcarpa*	Grey Box	112	Large	BMD Land
34	*Eucalyptus microcarpa*	Grey Box	9	Small	BMD Land
35	*Eucalyptus microcarpa*	Grey Box	91	Large	BMD Land
36	*Eucalyptus microcarpa*	Grey Box	88	Large	BMD Land
37	*Eucalyptus microcarpa*	Grey Box	14	Small	BMD Land
38	*Eucalyptus microcarpa*	Grey Box	71	Large	BMD Land
39	*Eucalyptus microcarpa*	Grey Box	54	Small	BMD Land
40	*Eucalyptus microcarpa*	Grey Box	61	Small	BMD Land
41	*Eucalyptus microcarpa*	Grey Box	50	Small	BMD Land
42	*Eucalyptus microcarpa*	Grey Box	65	Small	BMD Land
43	*Eucalyptus microcarpa*	Grey Box	75	Large	BMD Land

Tree ID	Species Name	Common Name	DBH	Size Class	Study Area
44	*Eucalyptus microcarpa*	Grey Box	117	Large	BMD Land
45	*Eucalyptus camaldulensis*	River Red-gum	68	Small	BMD Land
46	*Eucalyptus camaldulensis*	River Red-gum	59	Small	BMD Land
47	*Eucalyptus camaldulensis*	River Red-gum	75	Large	BMD Land
48	*Eucalyptus microcarpa*	Grey Box	60	Small	BMD Land
49	*Eucalyptus microcarpa*	Grey Box	92	Large	BMD Land
50	*Eucalyptus microcarpa*	Grey Box	106	Large	BMD Land
51	*Eucalyptus microcarpa*	Grey Box	95	Large	BMD Land
52	*Eucalyptus melliodora*	Yellow Box	21	Small	BMD Land
53	*Eucalyptus camaldulensis*	River Red-gum	55	Small	BMD Land
54	*Eucalyptus camaldulensis*	River Red-gum	61	Large	BMD Land
55	Stag		55	Small	BMD Land
56	*Eucalyptus melliodora*	Yellow Box	17	Small	BMD Land
57	*Eucalyptus microcarpa*	Grey Box	27	Small	BMD Land
58	*Eucalyptus microcarpa*	Grey Box	25	Small	BMD Land
59	*Eucalyptus melliodora*	Yellow Box	81	Large	BMD Land
60	*Eucalyptus camaldulensis*	River Red-gum	97	Large	BMD Land
61	*Eucalyptus microcarpa*	Grey Box	49	Small	BMD Land
62	*Eucalyptus microcarpa*	Grey Box	71	Large	BMD Land
63	*Eucalyptus melliodora*	Yellow Box	75	Large	BMD Land
64	*Eucalyptus microcarpa*	Grey Box	73	Large	BMD Land
65	*Eucalyptus microcarpa*	Grey Box	10	Small	BMD Land
66	*Eucalyptus microcarpa*	Grey Box	78	Large	BMD Land
67	*Eucalyptus melliodora*	Yellow Box	55	Small	BMD Land

Tree ID	Species Name	Common Name	DBH	Size Class	Study Area
68	*Eucalyptus melliodora*	Yellow Box	45	Small	BMD Land
69	*Eucalyptus microcarpa*	Grey Box	37	Small	BMD Land
70	*Eucalyptus microcarpa*	Grey Box	51	Small	BMD Land
71	Stag		40	Small	BMD Land
72	*Eucalyptus melliodora*	Yellow Box	86	Large	Other Assessed Land
73	*Eucalyptus microcarpa*	Grey Box	55	Small	Other Assessed Land
74	*Eucalyptus microcarpa*	Grey Box	57	Small	Other Assessed Land
75	*Eucalyptus microcarpa*	Grey Box	36	Small	Other Assessed Land
76	*Eucalyptus microcarpa*	Grey Box	23	Small	Other Assessed Land
77	*Eucalyptus microcarpa*	Grey Box	22	Small	Other Assessed Land
78	*Eucalyptus microcarpa*	Grey Box	75	Large	Other Assessed Land
79	*Eucalyptus microcarpa*	Grey Box	85	Large	Other Assessed Land
80	*Eucalyptus microcarpa*	Grey Box	60	Small	Other Assessed Land
81	*Eucalyptus melliodora*	Yellow Box	39	Small	Other Assessed Land
82	*Eucalyptus microcarpa*	Grey Box	62	Small	Other Assessed Land
83	*Eucalyptus leucoxylon* subsp. *pruinosa*	Yellow Gum	7	Small	Other Assessed Land
84	*Eucalyptus microcarpa*	Grey Box	5	Small	Other Assessed Land
85	*Eucalyptus leucoxylon* subsp. *pruinosa*	Yellow Gum	7	Small	Other Assessed Land
86	*Eucalyptus microcarpa*	Grey Box	9	Small	Other Assessed Land
87	*Eucalyptus microcarpa*	Grey Box	37	Small	Other Assessed Land
88	*Eucalyptus melliodora*	Yellow Box	35	Small	Other Assessed Land
89	*Eucalyptus microcarpa*	Grey Box	30	Small	Other Assessed Land
90	*Eucalyptus leucoxylon* subsp. *pruinosa*	Yellow Gum	107	Large	Other Assessed Land
91	*Eucalyptus microcarpa*	Grey Box	40	Small	Other Assessed Land

Tree ID	Species Name	Common Name	DBH	Size Class	Study Area
92	*Eucalyptus microcarpa*	Grey Box	26	Small	Other Assessed Land
93	*Eucalyptus microcarpa*	Grey Box	30	Small	Other Assessed Land
94	*Eucalyptus microcarpa*	Grey Box	88	Large	Other Assessed Land
95	*Eucalyptus microcarpa*	Grey Box	51	Small	Other Assessed Land
96	*Eucalyptus microcarpa*	Grey Box	79	Large	Other Assessed Land
97	*Eucalyptus microcarpa*	Grey Box	77	Large	Other Assessed Land
98	*Eucalyptus microcarpa*	Grey Box	19	Small	Other Assessed Land
99	*Eucalyptus microcarpa*	Grey Box	20	Small	Other Assessed Land
100	*Eucalyptus microcarpa*	Grey Box	44	Small	Other Assessed Land
101	*Eucalyptus microcarpa*	Grey Box	81	Large	Other Assessed Land
102	*Eucalyptus microcarpa*	Grey Box	15	Small	Other Assessed Land
103	*Eucalyptus melliodora*	Yellow Box	49	Small	Other Assessed Land
104	*Eucalyptus microcarpa*	Grey Box	27	Small	Other Assessed Land
105	*Eucalyptus melliodora*	Yellow Box	12	Small	Other Assessed Land
106	*Eucalyptus melliodora*	Yellow Box	14	Small	Other Assessed Land
107	*Eucalyptus microcarpa*	Grey Box	15	Small	Other Assessed Land
108	*Eucalyptus microcarpa*	Grey Box	9	Small	Other Assessed Land
109	*Eucalyptus microcarpa*	Grey Box	10	Small	Other Assessed Land
110	*Eucalyptus microcarpa*	Grey Box	13	Small	Other Assessed Land
111	*Eucalyptus microcarpa*	Grey Box	95	Large	Other Assessed Land
112	*Eucalyptus leucoxylon* subsp. *pruinosa*	Yellow Gum	83	Large	Other Assessed Land
113	*Eucalyptus leucoxylon* subsp. *pruinosa*	Yellow Gum	51	Small	Other Assessed Land
114	*Eucalyptus leucoxylon* subsp. *pruinosa*	Yellow Gum	47	Small	Other Assessed Land
115	*Eucalyptus microcarpa*	Grey Box	75	Large	Other Assessed Land

Tree ID	Species Name	Common Name	DBH	Size Class	Study Area
116	*Eucalyptus microcarpa*	Grey Box	46	Small	Other Assessed Land
117	*Eucalyptus microcarpa*	Grey Box	61	Small	Other Assessed Land
118	*Eucalyptus microcarpa*	Grey Box	54	Small	Other Assessed Land
119	*Eucalyptus microcarpa*	Grey Box	42	Small	Other Assessed Land
120	*Eucalyptus microcarpa*	Grey Box	57	Small	Other Assessed Land

APPENDIX 3 - FAUNA

Appendix 3.1 – Fauna Results

Table A3.1. Fauna species recorded during the ecological survey.

Common Name	Scientific Name	Native / Introduced
Mammals		
Common Ringtail Possum	*Pseudocheirus peregrinus*	Native
European Hare	*Lepus europaeus*	Introduced
European Rabbit	*Oryctolagus cuniculus*	Introduced
Eastern Grey Kangaroo	*Macropus giganteus*	Native
House Mouse	*Mus musculus*	Introduced
Red Fox	*Vulpes vulpes*	Introduced
Birds		
Australasian Pipit	*Anthus novaeseelandiae*	Native
Australasian Swamphen	*Porphyrio melanotus*	Native
Australian Magpie	*Gymnorhina tibicen*	Native
Australian White Ibis	*Threskiornis moluccus*	Native
Banded Lapwing	*Vanellus tricolor*	Native
Black-shouldered Kite	*Elanus axillaris*	Native
Blue-winged Parrot	*Neophema chrysostoma*	Native
Brown Falcon	*Falco berigora*	Native
Brown Goshawk	*Accipiter fasciatus*	Native

Common Name	Scientific Name	Native / Introduced
Brown Quail	*Coturnix ypsilophora australis*	Native
Brown Songlark	*Cincloramphus cruralis*	Native
Cattle Egret	*Ardea ibis*	Native
Collared Sparrowhawk	*Accipiter cirrhocephalus*	Native
Common Blackbird	*Turdus merula*	Native
Common Myna	*Acridotheres tristis*	Introduced
Common Starling	*Sturnus vulgaris*	Introduced
Crimson Rosella	*Platycercus elegans*	Native
Darter	*Anhinga novaehollandiae*	Native
Dusky woodswallow	*Artamus cyanopterus*	Native
Eastern Great Egret	*Ardea modesta*	Native
Eastern Rosella	*Platycercus eximius*	Native
Eurasian Coot	*Fulica atra*	Native
European Goldfinch	*fam. Fringillidae gen. Carduelis*	Introduced
European Skylark	*Alauda arvensis*	Introduced
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	Native
Galah	*Eolophus roseicapilla*	Native
Golden-headed Cisticola	*Cisticola exilis*	Native
Grey Fantail	*Rhipidura albiscarpa*	Native
Grey Teal	*Anas gracilis*	Native
House Sparrow	*Passer domesticus*	Introduced
Little Raven	*Corvus mellori*	Native
Long-billed Corella	*Cacatua tenuirostris*	Native

Common Name	Scientific Name	Native / Introduced
Magpie-lark	*Grallina cyanoleuca*	Native
Masked Lapwing	*Vanellus miles*	Native
Nankeen Kestrel	*Falco cenchroides*	Native
Pacific Black Duck	*Anas superciliosa*	Native
Red Wattlebird	*Anthochaera carunculata*	Native
Red-rumped Parrot	*Psephotus haematonotus*	Native
Southern Boobook	*Ninox novaeseelandiae*	Native
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*	Native
Straw-necked Ibis	*Threskiornis spinicollis*	Native
Striated Pardalote	*Pardalotus striatus*	Native
Striated Thornbill	*Acanthiza lineata*	Native
Stubble Quail	*Coturnix pectoralis*	Native
Sulphur-crested Cockatoo	*Cacatua galerita*	Native
Superb Fairy-wren	*Malurus cyaneus*	Native
Tawny Frogmouth	*Podargus strigoides*	Native
Wedge-tailed Eagle	*Aquila audax*	Native
Welcome Swallow	*Hirundo neoxena*	Native
Whistling kite	*Haliastur sphenurus*	Native
White-browed woodswallow	*Artamus superciliosus*	Native
White-faced heron	*Egretta novaehollandiae*	Native
White-necked Heron	*Ardea pacifica*	Native
Willie Wagtail	*Rhipidura leucophrys*	Native
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	Native

Common Name	Scientific Name	Native / Introduced
Reptiles		
Bougainville's Skink	*Lerista bougainvillii*	Native
Common Blue-tongued Lizard	*Tiliqua scincoides scincoides*	Native
Delicate Skink	*Lampropholis delicata*	Native
Eastern Blue-tongue Lizard	*Tiliqua scincoides*	Native
Garden Skink	*Lampropholis guichenoti*	Native
Marbled Gecko	*Christinus marmoratus*	Native
Tiger Snake	*Notechis scutatus*	Native
Frogs		
Common Froglet	*Crinia signifera*	Native
Eastern Banjo frog	*Limnodynastes dumerilii*	Native
Eastern Froglet	*Crinia signifera*	Native
Growling Grass Frog	*Litoria raniformis*	Native
Spotted Marsh Frog	*Limnodynastes tasmaniensis*	Native
Invertebrates		
Golden Sun Moth	*Synemon plana*	Native

Appendix 3.2 – Significant Fauna Species

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

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 for each of the threatened species are:

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 (VBA 2011); 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 (DSE 2011b); 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.

EPBC	*Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
FFG	*Flora and Fauna Guarantee Act 1988* (FFG Act)
DSE	Advisory List of Threatened Vertebrate Fauna in Victoria (DSE 2013); Advisory List of Threatened Invertebrate Fauna in Victoria (DSE 2009)
NAP	National Action Plan (Cogger et al 1993; Duncan et al. 1999; Garnet and Crowley 2000; Lee 1995; Maxwell et al. 1996; Sands and New 2002; Tyler 1997)

EX	Extinct
RX	Regionally extinct
CR	Critically endangered
EN	Endangered
VU	Vulnerable
RA	Rare
NT	Near threatened
CD	Conservation dependent
LC	least concern

DD	Data deficient (insufficiently or poorly known
L	Listed as threatened under FFG Act
I	Invalid or ineligible for listing under the FFG Act
#	Listed on the Protected Matters Search Tool
*	Additional information from the Victorian Fauna Database

Common Name	Scientific Name	Last Documented Record (VBA)	# Records (VBA)	EPBC Act	FFG Act	DSE (2013)	Likelihood	Rationale for occurrence likelihood
NATIONAL SIGNIFICANCE								
Australasian Bittern	*Botaurus poiciloptilus*	1970	2	EN	L	EN	4	No suitable habitat present.
Australian Grayling	*Prototroctes maraena*	#	-	VU	L	VU	4	No suitable habitat present.
Australian Painted Snipe	*Rostratula australis*	1989	2	VU	L	CR	4	No suitable habitat present.
Curlew Sandpiper	*Calidris ferruginea*	#	-	CR	-	EN	4	No suitable habitat present.
Dwarf Galaxias	*Galaxiella pusilla*	#	-	VU	L	EN	4	No suitable habitat present.
Eastern Barred Bandicoot	*Perameles gunnii*	-	15	EN	L	WX	4	No suitable habitat present.
Eastern Curlew	*Numenius madagascariensis*	#	-	CR	-	VU	4	No suitable habitat present.
Golden Sun Moth	*Synemon plana*	2014	361	CR	L	CR	1	Recorded within study area.
Grassland Earless Dragon	*Tympanocryptis pinguicolla*	#	-	EN	L	CR	4	No suitable habitat present (extinct in Victoria).
Greater Glider	*Petauroides volans*	1845	2	VU	-	VU	4	No suitable habitat present.
Grey-headed Flying-fox	*Pteropus poliocephalus*	1968	3	VU	L	VU	3	Likely to fly over and temporarily reside within the study area on occasions.
Growling Grass Frog	*Litoria raniformis*	2018	32	VU	L	EN	3	Minimal suitable habitat present and species not recorded during targeted surveys undertaken.
Painted Honeyeater	*Grantiella picta*	#	-	VU	L	VU	3	Some habitat present (i.e. woodland), however species likely to use nearby areas of higher quality habitat (e.g. conservation reserves).
Pink-tailed Worm-Lizard	*Aprasia parapulchella*	#	-	VU	L	EN	4	No suitable habitat present.
Plains-wanderer	*Pedionomus torquatus*	#	-	CR	L	CR	3	No suitable habitat present.

Common Name	Scientific Name	Last Documented Record (VBA)	# Records (VBA)	EPBC Act	FFG Act	DSE (2013)	Likelihood	Rationale for occurrence likelihood
Regent Honeyeater	*Anthochaera phrygia*	#	-	CR	L	CR	3	Some habitat present (i.e. woodland), however species is locally extinct with its stronghold in Victoria is at Chiltern-Mt Pilot National Park.
Spot-tailed Quoll	*Dasyurus maculatus maculatus*	#	-	EN	L	EN	4	No suitable habitat present.
Striped Legless Lizard	*Delma impar*	2016	2	VU	L	EN	3	Species not recorded during targeted surveys, nor previously recorded within the study area.
Superb Parrot	*Polytelis swainsonii*	1881	1	VU	L	EN	4	No suitable habitat present.
Swift Parrot	*Lathamus discolor*	2016	15	CR	L	EN	3	Some habitat present (i.e. woodland), however species likely to use nearby areas of higher quality habitat (e.g. conservation reserves).
STATE SIGNIFICANCE								
Australian Bustard	*Ardeotis australis*	1911	1	-	L	CR	4	No suitable habitat present.
Barking Owl	*Ninox connivens connivens*	2002	25	-	L	EN	2	May use the study area on occasion, however higher quality habitat in nearby Long Forest Nature Conservation Reserve.
Black Falcon	*Falco subniger*	2019	13	-	-	VU	3	Potential habitat, but not recorded.
Blue-billed Duck	*Oxyura australis*	2019	5	-	L	EN	3	Limited suitable habitat (i.e. aquatic habitat).
Brown Toadlet	*Pseudophryne bibronii*	2004	6	-	L	EN	4	Limited suitable habitat (i.e. aquatic habitat).
Brown Treecreeper (south-eastern ssp.)	*Climacteris picumnus victoriae*	2019	133	-	-	NT	2	May use the study area on occasion, however higher quality habitat in nearby Long Forest Nature Conservation Reserve.

Common Name	Scientific Name	Last Documented Record (VBA)	# Records (VBA)	EPBC Act	FFG Act	DSE (2013)	Likelihood	Rationale for occurrence likelihood
Brush-tailed Phascogale	*Phascogale tapoatafa*	2018	10	-	L	VU	3	Limited suitable habitat (i.e. dry sclerophyll forests), likely to use higher quality habitat in nearby Long Forest Nature Conservation Reserve.
Bullant	*Myrmecia sp. 17*	2009	4	-	L	VU	2	Potential to occur, however likely to occupy higher quality habitat to east of study area adjacent to Long Forest Flora and Fauna Reserve.
Caspian Tern	*Hydroprogne caspia*	2000	1	-	L	NT	3	Limited suitable habitat (i.e. wetlands/river systems) and few recent records.
Chestnut-rumped Heathwren	*Calamanthus pyrrhopygius*	2004	9	-	L	VU	3	Potential habitat, but not recorded. Higher quality habitat in nearby Long Forest Nature Conservation Reserve.
Common Bent-wing Bat	*Miniopterus schreibersii GROUP*	1999	5	-	L	-	3	Minimal suitable habitat and no recent records of species near study area.
Common Dunnart	*Sminthopsis murina murina*	1990	3	-	-	VU	4	Limited suitable habitat (i.e. dry sclerophyll forests) and few recent records.
Diamond Firetail	*Stagonopleura guttata*	2018	80	-	L	NT	2	May use the study area on occasions, however higher quality habitat in nearby Long Forest Nature Conservation Reserve.
Freckled Duck	*Stictonetta naevosa*	2006	6	-	L	EN	4	Limited suitable habitat (i.e. wetlands/river systems) and few recent records.
Hardhead	*Aythya australis*	2015	21	-	-	VU	4	The presence of low quality habitat (i.e. wetlands/river systems) and few recent records.

Common Name	Scientific Name	Last Documented Record (VBA)	# Records (VBA)	EPBC Act	FFG Act	DSE (2013)	Likelihood	Rationale for occurrence likelihood
Hooded Robin	*Melanodryas cucullata cucullata*	1999	12	-	L	NT	2	May use the study area on occasions, however higher quality habitat in nearby Long Forest Nature Conservation Reserve. The species is primarily restricted to woodland area throughout central and northern Victoria.
Lace Goanna	*Varanus varius*	1987	2	-	-	EN	4	Limited suitable habitat (i.e. forests/open woodlands) and few recent records.
Magpie Goose	*Anseranas semipalmata*	2019	1	-	L	NT	4	Limited suitable habitat (i.e. wetlands/river systems) and few recent records.
Musk Duck	*Biziura lobata*	2003	20	-	-	VU	4	Limited suitable habitat (i.e. wetlands/river systems) and few recent records.
Powerful Owl	*Ninox strenua*	2011	9	-	L	VU	3	Limited suitable habitat (i.e. forests/open woodlands) and past records confined to areas of higher quality habitat (Long Forest Nature Conservation Reserve).
Speckled Warbler	*Chthonicola sagittatus*	2014	82	-	L	VU	2	May use the study area on occasion, however higher quality habitat in nearby Long Forest Nature Conservation Reserve.
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	2017	13	-	L	VU	4	Study area contains limited characteristics of the species' preferred habitat.
White-throated Needletail	*Hirundapus caudacutus*	2016	11	-	-	VU	3	May visit the study area occasionally or on an opportunistic basis.
REGIONAL SIGNIFICANCE								
Black-eared Cuckoo	*Chrysococcyx osculans*	2018	15	-	-	NT	4	May visit the study area occasionally or on an opportunistic basis.

Common Name	Scientific Name	Last Documented Record (VBA)	# Records (VBA)	EPBC Act	FFG Act	DSE (2013)	Likelihood	Rationale for occurrence likelihood
Eastern Pygmy-possum	*Cercartetus nanus*	1992	3	-	-	NT	4	Potential habitat, although very unlikely due to agricultural disturbance. Records are also not recent.
Emu	*Dromaius novaehollandiae*	2016	1	-	-	NT	3	May visit the study area occasionally or on an opportunistic basis.
Fat-tailed Dunnart	*Sminthopsis crassicaudata*	1988	1	-	-	NT	2	Limited suitable habitat. Not recorded during targeted surveys.
Glossy Ibis	*Plegadis falcinellus*	1986	2	-	-	NT	4	Limited suitable habitat (i.e. wetlands/river systems) and few recent records.
Latham's Snipe	*Gallinago hardwickii*	2018	9	-	-	NT	3	Limited suitable habitat (i.e. wetlands).
Little Button-quail	*Turnix velox*	2011	1	-	-	NT	4	Limited suitable habitat (i.e. dense grasslands) and few recent records.
Pied Cormorant	*Phalacrocorax varius*	2003	5	-	-	NT	4	Limited suitable habitat (i.e. wetlands/river systems) and few recent records.
Royal Spoonbill	*Platalea regia*	1991	6	-	-	NT	4	Limited suitable habitat (i.e. wetlands/river systems) and few recent records.
Spotted Harrier	*Circus assimilis*	2019	9	-	-	NT	2	May use the study area for foraging on occasion, however higher quality breeding habitat located in nearby Long Forest Nature Conservation Reserve.
Spotted Quail-thrush	*Cinclosoma punctatum*	2010	4	-	-	NT	3	Potential habitat, although very unlikely due to agricultural disturbance.

Data source: Victorian Biodiversity Atlas (DELWP 2020a); Protected Matters Search Tool (DAWE 2021).

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

Appendix 3.3 – Striped Legless Lizard Survey Results

Table A3.3.1. Striped Legless Lizard Survey Results at 55 and 95 Oconnell Road, Merrimu (Other Assessed Land).

Tile Check #	Date	Time		Weather Conditions						SLL	Other
			Grid #	Temp (°C)	Wind Speed	Relative Humidity (%)	Above Tile Temp C°	Under Tile Temp C°	Soil Temp C°		
1	2/10/2020	11:25	1	20	NNW(48)		42	27.3	19	0	
	2/10/2020	11:42	2	21	NNW(48)		42	28.4	19	0	HM
	2/10/2020	12:05	3	22	NNW(48)		44	29.3	19	0	
	2/10/2020	12:26	4	23	NNW(48)		44.1	291	19	0	BS
2	9/10/2020	14:00	1	14.8	W(33)		26	18.4	19	0	
	9/10/2020	14:17	2	14.8	W(33)		26	16.5	17	0	BS, MG
	9/10/2020	14:35	3	14.8	W(33)		33.4	12.2	17	0	
	9/10/2020	14:51	4	15.1	W(33)		34.1	14.6	16	0	
3	16/10/2020	12:40	1	16.3	W(11)	46%	40.2	26.2	26	0	
	16/10/2020	12:55	2	16.3	W(11)	46%	43.5	25.8	23	0	MG
	16/10/2020	13:15	3	16.3	W(11)	46%	43.2	27.9	24	0	
	16/10/2020	13:30	4	16.3	W(11)	46%	41.3	25.4	25	0	MG
4	23/10/2020	10:35	1	14.8	SW(17)		34.6	13.3	15	0	BS
	23/10/2020	10:51	2	14.8	SW(17)		35.7	12.7	16	0	GS
	23/10/2020	11:06	3	15	SW(17)		34.5	12.9	16	0	
	23/10/2020	11:21	4	15.1	SW(17)		34.1	13.1	16	0	
5	29/10/2020	10:05	1	20	NNE(24)		17.5	6.9	16	0	
	29/10/2020	10:20	2	20	NNE(24)		34.7	16.6	17	0	
	29/10/2020	10:35	3	20	N(24)		41.6	24.5	18	0	GS
	29/10/2020	10:55	4	20	NNE(24)		46.2	31.2	21	0	
6	5/11/2020	11:10	1	13.6	S(44.5)		14.7	13.2	17	0	
	5/11/2020	10:35	2	13	S(38.9)		22.4	19	16	0	MGx2
	5/11/2020	10:45	3	13	S(38.9)		19	11.3	17	0	HM
	5/11/2020	10:30	4	13	S(38.9)		16.7	14.7	16	0	HM
7	12/11/2020	9:50	1	22	N(31)		38	30.4	22	0	HM
	12/11/2020	9:30	2	20.7	W(26)		31.1	21.4	21	0	MG, BS
	12/11/2020	9:40	3	20.7	W(26)		30.8	24.8	23	0	
	12/11/2020	9:25	4	20.7	W(26)		29.2	23.8	19	0	MG, GS
8	19/11/2020	13:10	1	32	NNE(30)	16%	50.8	35.5	34	0	
	19/11/2020	12:40	2	32	NNE(30)	16%	58.5	50	32	0	
	19/11/2020	12:55	3	32	NNE(30)	16%	56.5	47.5	32	0	

Tile Check #	Date	Time	Grid #	Weather Conditions						SLL	Other
				Temp (°C)	Wind Speed	Relative Humidity (%)	Above Tile Temp C°	Under Tile Temp C°	Soil Temp C°		
	19/11/2020	12:30	4	32	NNE(30)	16%	65.6	45.3	31	0	

Note: HM = House Mouse, BS = Boulengers Skink; MG = Marbled Gecko; GS = Garden Skink.

Table A3.3.3. Striped Legless Lizard Survey Results at Long Forest Estate

Date	Time	Tile grid no.	Temp.	Sun	Cloud	Rain	Temp. under tile	Temp. above tile	Soil temp.
22/10/12	9.30am	1	15.1	Breaks	Patchy	No	16.6	14.8	13.9
	9.51am	10	15.6	Breaks	Patchy	No	13.7	20.0	12.1
	10.02am	2	19.1	Breaks	Patchy	No	15.0	17.8	12.1
	10.37am	9	17.1	Breaks	Patchy	No	19.2	26.1	13.0
	10.55am	8	16.1	Breaks	Patchy	No	13.8	18.8	11.2
	11.20am	7	24.5	Breaks	Patchy	No	15.7	24.2	17.9
	11.45am	6	18.8	Breaks	Patchy	No	13.6	22.2	16.8
	12.02pm	5	24.2	Breaks	Patchy	No	19.3	19.8	15
	12.40pm	4	21.3	Breaks	Patchy	No	29.8	38.0	16.4
	12.55pm	3	21.4	Breaks	Patchy	No	29.5	36.2	16.5
30/10/12	7.20am	4	18.2	Full	Clear	No	12.8	14.7	14.2
	8.00am	3	21.1	Full	Clear	No	19.5	19.5	15.8
	8.40am	2	26.8	Full	Clear	No	21.8	22.5	15.6
	9.12am	1	26.3	Full	Clear	No	22.0	26.7	16.1
	9.30am	10	26.7	Full	Clear	No	29.9	29.7	15.6
	9.40am	9	27.2	Full	Clear	No	32.3	33.0	15.5
	9.54am	8	28.7	Full	Clear	No	24.1	32.3	14.1
	10.05am	7	30.5	Full	Clear	No	26.8	30.5	15.2
	10.40am	6	31.3	Full	Clear	No	31.5	36.8	18.5
	10.55am	5	30.0	Full	Clear	No	28.3	37.5	18.3
07/11/12	7.40am	4	14.2	Filtered	Patchy	No	13.8	13.3	15.5
	8.00am	5	15.4	Filtered	Patchy	No	18.2	17.4	16.3
	8.30am	6	18.0	Filtered	Patchy	No	17.3	16.6	17.3
	8.53am	7	17.8	Filtered	Patchy	No	15.5	15.3	15.2
	9.02am	8	19.5	Filtered	Patchy	No	17.8	19.3	15.0
	9.30am	9	19.2	Filtered	Patchy	No	19.3	19.7	17.6
	9.55am	10	19.1	Filtered	Patchy	No	19.3	19.0	16.6
	10.20am	1	18.6	Filtered	Patchy	No	19.4	18.7	18.2

Date	Time	Tile grid no.	Temp.	Sun	Cloud	Rain	Temp. under tile	Temp. above tile	Soil temp.
	10.34am	3	18.4	Filtered	Patchy	No	20.0	18.7	18.4
	10.42am	2	20.7	Filtered	Patchy	No	20.5	20.4	16.6
13/11/12	8.10am	1	13.7	Filtered	Patchy	No	15.0	14.4	15.3
	8.30am	2	13.5	Filtered	Patchy	No	13.4	12.9	13.8
	9.00am	3	12.5	Filtered	Patchy	No	13.7	13.3	15.5
	9.10am	10	14.2	Filtered	Patchy	No	15.8	14.3	15.0
	9.25am	9	14.7	Filtered	Patchy	No	15.5	15.1	14.6
	9.40am	8	15.3	Filtered	Patchy	No	16.3	15.4	13.7
	10.02am	7	14.3	Filtered	Patchy	No	16.4	17.3	13.6
	10.20am	6	17.1	Filtered	Patchy	No	20.9	17.6	17.4
	10.32am	5	18.0	Filtered	Patchy	No	19.8	19.7	16.4
	10.43am	4	19.5	Filtered	Patchy	No	26.6	22.4	16.7
19/11/12	8.15am	4	16.2	Breaks	Patchy	No	15.7	15.7	14.1
	8.26am	7	17.0	Breaks	Patchy	No	20.6	19.7	14.0
	8.50am	5	16.9	Breaks	Patchy	No	18.3	18.6	15.6
	9.10am	6	18.6	Breaks	Patchy	No	19.8	20.1	16.3
	9.38am	6	20.3	Breaks	Patchy	No	23.2	25.0	13.3
	9.50am	9	19.5	Breaks	Patchy	No	26.3	22.8	16.0
	10.03am	10	23.4	Breaks	Patchy	No	22.7	25.1	15.7
	10.21am	1	21.3	Breaks	Patchy	No	27.9	26.3	17.7
	10.48am	2	23.9	Breaks	Patchy	No	25.4	26.2	16.7
	11.05am	3	24.0	Breaks	Patchy	No	29.4	26.2	19.0
26/11/12	8.00am	5	14.4	Filtered	Patchy	No	15.9	16.1	18.0
	8.22am	6	14.4	Filtered	Patchy	No	16.5	15.3	20.2
	8.40am	7	14.8	Filtered	Patchy	No	15.6	15.2	17.0
	9.01am	8	16.9	Filtered	Patchy	No	16.5	16.6	16.2
	9.20am	9	14.9	Filtered	Patchy	No	18.8	19.1	18.2
	9.40am	3	15.7	Filtered	Patchy	No	20.3	20.4	19.9
	10.04am	2	16.2	Filtered	Patchy	No	21.6	23.0	18.5
	10.20am	10	21.7	Filtered	Patchy	No	22.5	22.9	20.0
	10.32am	1	16.8	Filtered	Patchy	No	25.9	23.6	22.4
	11.00am	4	18.6	Filtered	Patchy	No	29.1	31.3	22.1
07/12/12	7.08am	5	18.3	Breaks	Patchy	No	17.8	17.5	17.2
	7.45am	6	19.1	Breaks	Patchy	No	18.9	19.0	18.3
	8.05am	7	21.9	Breaks	Patchy	No	19.0	20.2	16.6
	8.30am	8	20.2	Breaks	Patchy	No	16.8	20.6	16.3

Date	Time	Tile grid no.	Temp.	Sun	Cloud	Rain	Temp. under tile	Temp. above tile	Soil temp.
	8.54am	9	22.7	Breaks	Patchy	No	21.0	22.9	17.5
	9.15am	10	24.2	Breaks	Patchy	No	22.2	26.0	17.3
	9.28am	1	24.0	Breaks	Patchy	No	22.0	25.7	18.7
	9.48am	2	26.0	Breaks	Patchy	No	22.1	28.0	19.3
	10.01am	3	25.7	Breaks	Patchy	No	27.0	28.0	21.4
	10.15am	4	29.6	Breaks	Patchy	No	30.5	33.0	21.0
20/12/12	7.22am	1	15.4	Breaks	Patchy	No	16.5	14.0	18.0
	7.43am	2	17.3	Breaks	Patchy	No	17.1	15.7	17.7
	8.00am	3	17.3	Breaks	Patchy	No	17.4	17.8	19.1
	8.15am	10	16.1	Breaks	Patchy	No	16.5	16.7	17.9
	8.35am	9	19.4	Breaks	Patchy	No	18.3	20.0	18.9
	9.02am	8	17.1	Breaks	Patchy	No	17.5	18.2	17.9
	9.21am	7	18.7	Breaks	Patchy	No	18.4	20.9	18.1
	9.45am	6	23.0	Breaks	Patchy	No	24.5	24.4	20.3
	10.05am	5	21.5	Breaks	Patchy	No	20.1	22.3	19.9
	10.33am	4	23.1	Breaks	Patchy	No	24.2	23.9	21.0

APPENDIX 4 – APPROVAL TO REMOVE CURRENT WETLAND

Department of Environment,
Land, Water and Planning

PO Box 500, East Melbourne,
Victoria 8002 Australia
delwp.vic.gov.au

Shannon LeBel
Senior Ecologist
Ecology and Heritage Partners
230 Latrobe Terrace
Geelong West, Vic 3218

Dear Mr LeBel,

RE: INDEX OF WETLAND CONDITION ASSESSMENT: MERRIMU, VICTORIA

Thank you for your application received 16 August 2019 requesting written agreement to use a hydrological assessment to inform the removal of Mapped Wetland 70121 from consideration under the native vegetation removal regulations.

As required under the *Guidelines for the removal, destruction or lopping of native vegetation*, you have provided evidence (hydrological assessment, Index of Wetland Condition assessment) that Mapped Wetland 70121 does not currently support any wetland values and is highly unlikely to support wetland values in the future due to current legal land uses.

The Department of Environment, Land, Water and Planning (DELWP) has assessed your proposal and confirms that Mapped Wetland 70121 can be removed from consideration in the assessment of native vegetation removal.

You must include this letter when requesting a Native vegetation removal report from DELWP or submitting a planning application to the responsible authority to remove native vegetation.

Contact Native Vegetation Regulation by email at nativevegetation.support@delwp.vic.gov.au if you have any further questions.

Yours sincerely

James Todd
Executive Director Biodiversity, for and on behalf of John Bradley, Secretary to the Department of Environment, Land, Water and Planning

04 / 09 / 2019