ecology & heritage partners

FINAL REPORT:

Flora and Fauna Assessment and Net Gain Analysis, Horseshoe Bend Precinct, Armstrong Creek Growth Area, Victoria

ON BEHALF OF:

St Quentin Consultants Pty Ltd

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Ecology and Heritage Partners Pty Ltd

HEAD OFFICE: 420 Victoria Street Brunswick VIC 3056 MELBOURNE: PO Box 298, Brunswick VIC 3056 GEELONG: PO Box 8048 Newtown VIC 3220

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Project #2300

SUMMARY

Introduction

Ecology and Heritage Partners Pty Ltd was engaged by the St Quentin Consulting Pty Ltd to undertake a flora and fauna assessment and Net Gain analysis of the Horseshoe Bend Precinct, Armstrong Creek, Victoria.

The Horseshoe Bend Precinct forms the central part of the Armstrong Creek Urban Growth Area and is located approximately 6 kilometres south of Geelong. Information within this report will inform the Native Vegetation Precinct Plan and the Horseshoe Bend Precinct Structure Planning process.

The flora and fauna assessment was undertaken to ascertain the likely occurrence of National and State listed threatened flora and fauna species within the study area. The Net Gain analysis was undertaken to address implications under *Victoria's Native Vegetation Management – A Framework for Action* for the potential removal of native vegetation.

The flora and fauna assessment and Net Gain analysis were also undertaken in accordance with the Department of Sustainability and Environment's *Biodiversity Precinct Structure Planning Kit* guidelines.

Study Area

The Horseshoe Bend Precinct covers approximately 683 hectares and forms the central section of the Armstrong Creek Urban Growth Area. The study area is bound by Reserve Road and the North East Industrial Precinct to the north, private property to the east, the Armstrong Creek East Precinct to the south and Surf Coast Highway and the Armstrong Creek Activity Centre to the west. The study area also includes a 200 metre buffer on the north east and eastern boundary of the study area. The study area occurs within the Victorian Volcanic Plain and Otway Plain bioregions.

The majority of the land within study area has been subject to modification through agricultural use, and supports highly modified exotic dominated vegetation (i.e. crops and pasture). Native vegetation is generally limited to scattered indigenous trees and remnant patches in paddocks or along road reserves. Current land use includes agriculture (cropping and grazing) within the undeveloped areas, and low-density residential use and hobby farms.

Methods

Flora

A flora assessment was undertaken on 6-7, 16-18 and 21 December 2010, to obtain information on terrestrial flora values within the study area. An additional flora investigation was undertaken on 24 November 2011. The study area was assessed on foot, with all observed flora species recorded, any significant records mapped and the overall condition of

vegetation noted. Remnant vegetation in the local area was also reviewed to assist in determining the original vegetation within the study area.

Habitat Hectare Assessment

A habitat hectare assessment was undertaken in conjunction with the flora survey between 6-7, 16-18 and on 21 December, 2010. Vegetation within the study area was assessed according to the habitat hectare methodology, which is described in the *Vegetation Quality Assessment Manual*.

Fauna

The fauna survey was undertaken between 16-18 and 23 December 2010, to obtain information on terrestrial fauna values within the study area. Binoculars were used to scan the area for birds, and the observer also listened for calls and searched for other incidental signs such as nests, remains of dead animals, droppings and footprints. Habitat features including ground cover composition and structure, and the presence of hollows and fallen ground debris was noted. The presence of hollows in isolated trees was also noted, and any other features likely to be important for fauna.

Targeted surveys for Growling Grass Frog *Litoria raniformis* were undertaken on 13 and 24 January 2011, and included two nights of spotlighting, with call identification and active searching for metamorphs. A diurnal habitat assessment was undertaken on 21 January 2011 at each accessible waterbody (i.e. farm dams) to record habitat data including water quality, presence of predatory fish such as Plague Minnow *Gambusia holbrooki* and levels of aquatic and semi-aquatic vegetation.

Results

Ecological Significance

Based on the available information and the results of the site assessment, remnant vegetation within the study area is considered of at least high local conservation significance due to the presence of:

- Remnant vegetation associated with three Ecological Vegetation Classes (Grassy Woodland, Plains Grassland and Plains Grassy Woodland) listed as Endangered in the Victorian Volcanic Plain and Otway Plain bioregions;
- Two nationally listed ecological communities (*Natural Temperate Grassland of the Victorian Volcanic Plain* and *Grassy Eucalypt Woodland of the Victorian Volcanic Plain*);
- One state listed floristic community (*Western (Basalt) Plains Grassland* listed as threatened under the *Flora and Fauna Guarantee Act 1988*.

- One state listed flora species (Melbourne Yellow-Gum *Eucalyptus leucoxylon* subsp. *connata*) listed as Endangered in Victoria
- One nationally listed fauna species (Grey-headed Flying-fox *Pteropus poliocephalus*).
- Potential suitable habitat for one national listed fauna species (Growling Grass Frog *Litoria raniformis*).

Vegetation Condition

The study area contains several vegetation types ranging from highly modified areas dominated by exotic vegetation (i.e. open pasture) in poor condition. Native vegetation within the study area generally comprised isolated and fragmented patches and scattered trees within private property, with more intact linear strips along road reserves. Numerous planted native (non-indigenous) and exotic trees and shrubs were also present within road reserves, shelterbelts and around property boundaries.

Flora

One hundred and forty two flora species (67 indigenous and 75 exotic) were recorded in the study area during the assessment. No nationally listed significant flora species was recorded within the study area. One state listed flora species (Melbourne Yellow-Gum *Eucalyptus leucoxylon* subsp. *connata*) was recorded within the study area.

Two nationally listed ecological communities, *Natural Temperate Grassland of the Victorian Volcanic Plain* and *Grassy Eucalypt Woodland of the Victorian Volcanic Plain* were recorded in the north eastern section of the study area. One state listed floristic community (*Western (Basalt) Plains Grassland*) listed as Threatened under the *Flora and Fauna Guarantee Act 1988*, was also recorded within the Victorian Volcanic Plain section of the study area and has been mapped as Plains Grassland.

Fauna

Eighty fauna species were recorded during the field survey, comprising 64 birds (56 native and eight introduced), seven mammals (three native and four introduced), six frog species (all native), two native reptiles and one introduced fish species. One nationally significant fauna species (Grey-headed Flying-fox) was recorded within the study area.

Targeted surveys and Habitat Assessment

Growling Grass Frog (including tadpoles or metamorphs) was not recorded within the study area during targeted surveys. The majority of waterbodies within the study area were highly modified as a result of grazing and the prevalence of exotic vegetation and did not support suitable habitat characteristics for Growling Grass Frog. Of the 28 sites assessed, 11 provided suitable habitat for Growling Grass Frog (i.e. good water quality and high levels of aquatic and semi-aquatic vegetation).

Legislative and Policy Implications

No *Environment Protection and Biodiversity Conservation Act 1999* listed flora species were recorded within the study area and none are considered likely to occur due to the modified condition of habitat. Grey-headed Flying-fox is only considered likely to occur within the study area on an occasional basis for foraging purposes. There is a low likelihood of occurrence for Growling Grass Frog within the study area for breeding or foraging purposes.

The study area contains two ecological communities, *Natural Temperate Grassland of the Victorian Volcanic Plain* and *Grassy Eucalypt Woodland of the Victorian Volcanic Plain* listed as critically endangered under the *Environment Protection and Biodiversity Conservation Act 1999*.

Once detailed development plans are available, an assessment about the requirement for an *Environment Protection and Biodiversity Conservation Act 1999* referral to the Commonwealth Environment Minister referral should be made to determine the potential impacts on matters of National Environmental Significance (i.e. *Natural Temperate Grassland of the Victorian Volcanic Plain* and *Grassy Eucalypt Woodland of the Victorian Volcanic Plain* ecological communities), from future development of the Horseshoe Bend Precinct.

A *Flora and Fauna Guarantee Act 1988* permit will be required for the removal of protected flora species located on public land (i.e. road reserves). A *Flora and Fauna Guarantee Act 1988* permit is generally not required on private property.

A Native Vegetation Precinct Plan is considered appropriate to inform the planning process and provide a clear direction about the extent of native vegetation removal within the Horseshoe Bend Precinct.

Net Gain Assessment

In summary, the study area consists of **4.25 habitat hectares** and **85 Large Old Trees** within remnant patches and 214 scattered trees, comprising:

Victorian Volcanic Plain bioregion

- **0.01 habitat hectares** of Very High conservation significance Plains Grassland;
- **0.10 habitat hectares** of High conservation significance Plains Grassland;
- **0.06 habitat hectares** of High conservation significance Plains Grassy Woodland;
- **1 Large Old Tree** in a habitat zone; and,
- **60** scattered indigenous trees comprising 4 Very Large Old Trees, 19 Large Old Trees, 15 Medium Old Trees and 22 small trees.

Otway Plain bioregion

- **2.34 habitat hectares** of Very High conservation significance Grassy Woodland;
- **1.66 habitat hectares** of High conservation significance Grassy Woodland;
- **0.08 habitat hectares** of High conservation significance Plains Grassland; and,
- **84 Large Old Trees** in habitat zones; and,
- **154** scattered indigenous trees comprising 5 Very Large Old Trees, 71 Large Old Trees, 39 Medium Old Trees and 39 small trees.

Vegetation Losses

No detailed development plans of the Horseshoe Bend Precinct were available at the time of the assessment. Therefore, the losses and associated gain targets are based on the potential removal of all remnant vegetation from within the study area.

Avoidance and Minimisation

In previous development proposals from adjacent modified areas, the Department of Sustainability and Environment's has identified that 90% of remnant vegetation can be avoided through initial planning and design. Any future development of the study area should aim to avoid the loss of remnant native vegetation, through the strategic placement of the development footprint. Trees can only be considered retained if they are fenced off to at least the drip line, and do not become a public risk (i.e. under the tree it is landscaped to prevent human access).

To minimise the loss of vegetation within the study area the following should be considered:

- Appropriate consideration in planning processes and expert input into project design and management.
- Temporary fencing should be installed around remnant vegetation to minimise disturbance (i.e. designated 'no-go' areas) prior to construction.
- Tree Retention Zones should be implemented to prevent indirect losses of native vegetation during construction activities.

Net Gain Targets

The Net Gain targets for removal of native vegetation and large old trees in remnant patches within the study area consists of a total of **7.55 habitat hectares**, comprising:

Victorian Volcanic Plain bioregion

- **0.02 habitat hectares** of Very High conservation significance Plains Grassland;
- **0.15 habitat hectares** of High conservation significance Plains Grassland;

- **0.09 habitat hectares** of High conservation significance Plains Grassy Woodland; and,

- Protect **4 large old trees** and recruit **20 new trees**.

To offset for the loss of 60 scattered trees using the 'protect and recruit' option there is a requirement to protect to 16 Very Large Old Trees, 38 Large Old Trees, 15 Medium Old Trees and 22 small trees and recruit 1455 new trees. Alternatively, the 'recruitment only' option would require a total of 4550 new trees or plants to be recruited.

Otway Plain bioregion

- **4.68 habitat hectares** of Very High conservation significance Grassy Woodland;

- **2.49 habitat hectares** of High conservation significance Grassy Woodland;

- **0.12 habitat hectares** of High conservation significance Plains Grassland; and,

- Protect **648 large old trees** and recruit **3240 new trees**.

To offset for the loss of 154 scattered trees using the 'protect and recruit' option there is a requirement to protect to 20 Very Large Old Trees, 142 Large Old Trees, 39 Medium Old Trees and 39 small trees and recruit 2955 new trees. Alternatively, the 'recruitment only' option would require a total of 12,000 new trees or plants to be recruited.

All gains are required to be generated from the Victorian Volcanic Plain and Otway Plain bioregions in order meet the objectives of the Net Gain policy.

Potential impacts and mitigation measures

No nationally listed significant flora or fauna species are likely to be directly affected as a result of any development of the study area. Future development has the potential to impact a population of the state significant Melbourne Yellow Gum, areas comprising two nationally listed ecological communities (*Natural Temperate Grassland of the Victorian Volcanic Plain* and *Grassy Eucalypt Woodland of the Victorian Volcanic Plain*), and remnant vegetation associated with Grassy Woodland, Plains Grassland and Plains Grassy Woodland, listed as Endangered in the Victorian Volcanic Plain and Otway Plain bioregions.

Measures to mitigate/ameliorate potential impacts on the ecological values in the study area include:

- Any future development should address the first two principles of three-step approach of the Framework to 'avoid' and 'minimise' impacts to remnant native vegetation, which reduces the requirement for vegetation removal, and can reduce the Net Gain targets;

- A Construction Environment Management Plan should be developed prior to any works commencing on the project. This plan should include:

  - A Weed Management Plan to control listed noxious and environmental weeds during each construction phase;
  - Best practice sedimentation and pollution control measures to the satisfaction of Environmental Protection Authority to minimise/avoid sedimentation and deterioration in water quality;
  - Where construction is identified adjacent to areas of ecological value, these sites should be fenced and identified as 'no go' areas to avoid disturbance during the construction phase of the project;
  - Where possible, construction stockpiles, machinery, roads, and other infrastructure should be placed away from areas supporting native vegetation, large old trees and/or wetlands; and,

- Where revegetation works may be required, use indigenous plants associated with the relevant Ecological Vegetation Class as part of any landscaping works to increased habitat for native fauna.

1 INTRODUCTION

1.1 Background

Ecology and Heritage Partners Pty Ltd was engaged by the St Quentin Consulting Pty Ltd to undertake a Flora and Fauna Assessment and Net Gain Analysis of the Horseshoe Bend Precinct, Armstrong Creek, Victoria.

The Horseshoe Bend Precinct forms the central part of the Armstrong Creek Urban Growth Area and is located approximately 6 kilometres south of Geelong. Information within this report will inform the Native Vegetation Precinct Plan and the Horseshoe Bend Precinct Structure Planning process.

The flora and fauna assessment was undertaken to ascertain the likely occurrence of National and State listed threatened flora and fauna species within the study area. The Net Gain analysis was undertaken to address implications under *Victoria's Native Vegetation Management – A Framework for Action* (NRE 2002) for the potential removal of native vegetation.

The flora and fauna assessment and Net Gain analysis were also undertaken in accordance with the Department of Sustainability and Environment's (DSE) *Biodiversity Precinct Structure Planning Kit* guidelines (DSE 2010a).

1.2 Objectives

The objectives of this report were to:

- Identify terrestrial flora and fauna and Net Gain values within the study area.
- Ensure ecological values identified are integrated with the planning and development stages of the Horseshoe Bend Precinct planning process.
- Determine any potential impacts on ecological values at a National and State level associated with the Princess Highway duplication.
- Provide advice on mitigation measures that may reduce the impacts of the development on significant flora or fauna species known or likely to occur within the study area.

1.3 Scope of Assessment

Tasks for the ecological assessment included:

- Review of relevant environmental databases and available literature;
- A site assessment by a qualified botanist and zoologist to identify flora and fauna values within the study area;

- Targeted Growling Grass Frog *Litoria raniformis* surveys the during the active survey period (October to February) in accordance with DSE's *Biodiversity Precinct Structure Planning Kit* guidelines (DSE 2010a);
- Classification of any flora and fauna species identified or considered likely to occur within the study area in accordance with Commonwealth and State legislation;
- Provision of map(s) showing areas of remnant native vegetation, locations of any significant flora and fauna species, and/or important fauna habitat; and,
- Liaise with any key stakeholders (as required).

Tasks undertaken to address the requirements under the Framework (NRE 2002) included:

- A habitat hectare and scattered tree assessment by two qualified botanists, deemed competent by DSE in the Vegetation Quality Assessment method;
- Complete Vegetation Quality Field Assessment sheets for each vegetation polygon;
- Provide maps of the study area depicting habitat hectare polygons, and where relevant any Large Old Trees from patches, and scattered trees;
- Document how the three step approach of the Net Gain policy, avoid, minimise and offset, has been addressed;
- Determine the Net Gain targets based upon the proposed vegetation losses; and,
- Liaise with any key stakeholders (as required).

1.4 Study Area

The Horseshoe Bend Precinct (the study area) covers approximately 683 hectares and forms the central section of the ACUGA (Plate 1). The study area is bound by Reserve Road and the North East Industrial Precinct to the north, private property to the east, the Armstrong Creek East Precinct to the south and Surf Coast Highway and the Armstrong Creek Activity Centre to the west. The study area also includes a 200 metre buffer extending from the north east and eastern boundary of the study area (Figure 1).

According to DSE's Biodiversity Interactive Map (DSE 2011) the study area occurs within the Victorian Volcanic Plain and Otway Plain bioregions. The study area also falls within the Corangamite Catchment Management Authority and the City of Greater Geelong municipality.

The majority of the land within study area has been subject to modification through agricultural use, and supports highly modified exotic dominated vegetation (i.e. crops and pasture). Native vegetation was generally limited to scattered trees and remnant patches in paddocks and road reserves. Current land use includes agriculture (cropping and grazing) within the undeveloped areas, and low-density residential use and hobby farms.

The majority of the study area is zoned Urban Growth (UGZ), with several small Public Use Zone areas (PUZ1 – Service and Utility, PUZ3 – Health Community and PUZ4 – Transport).

There are also five areas subject to Environmental Significance Overlay – Schedule 1 (ESO1). Remant vegetation within four road reserves along Boundary Road, Barwarre Road, Horseshoe Bend Road and Burvilles Road, are wholly or partially subject to a Vegetation Protection Overlay – Schedule 1 (VPO1) (DPCD 2011).

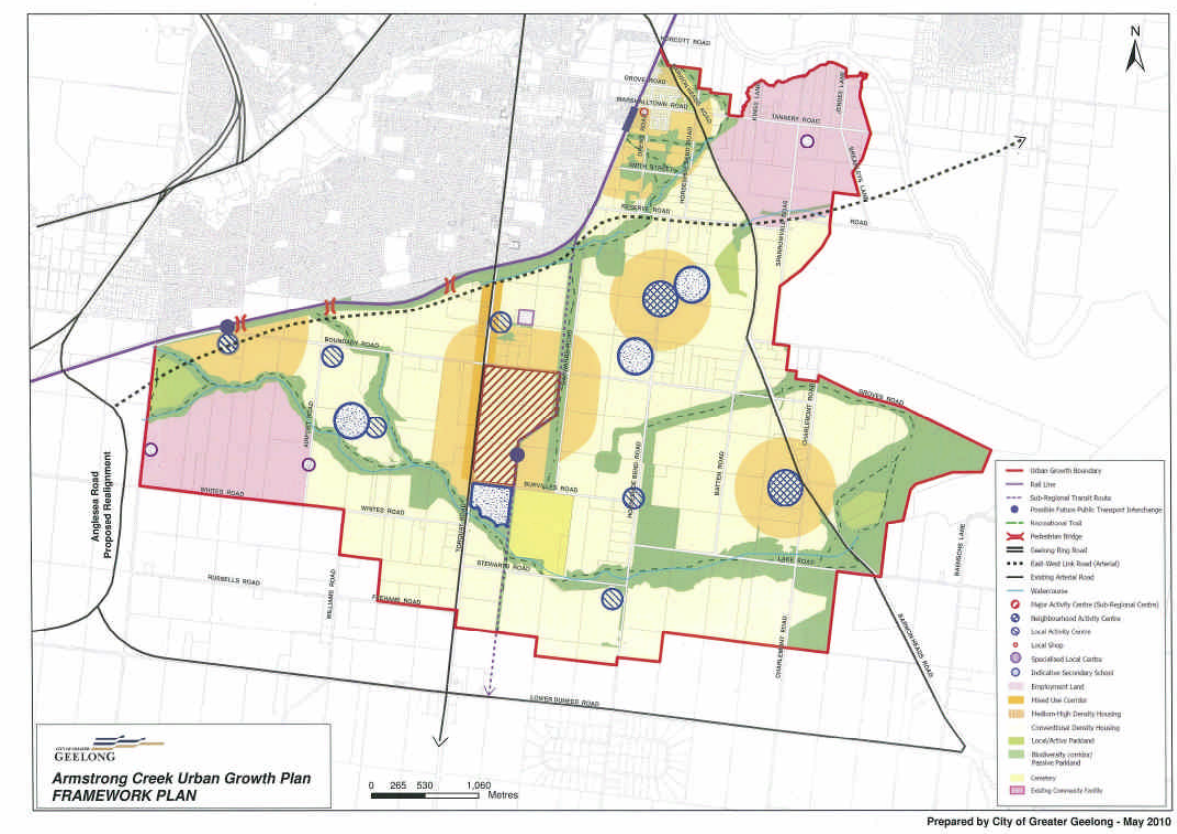


Plate 1: Armstrong Creek Urban Growth Area Precincts Map (CoGG 2011).

2 METHODS

2.1 Nomenclature

Common and scientific names of vascular plants follow the Flora Information System (FIS) (FIS 2011) and the Census of Vascular Plants of Victoria (Walsh and Stajsic 2007). Vegetation community names follow DSE's Ecological Vegetation Class (EVC) benchmarks (DSE 2011) and VicRFASC (2000). The names of terrestrial vertebrate fauna (mammals, birds, reptiles, amphibians) follow the Victorian Biodiversity Atlas (VBA 2010).

2.2 Desktop Assessment

The following resources and databases were reviewed:

- The FIS (2011) and VBA (2010) databases for historic flora and fauna records;
- DSE's Biodiversity Interactive Maps showing historic and current EVCs (DSE 2011);
- Information relating to matters of National Environmental Significance (NES) (listed taxa and ecological communities) protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) was obtained from the Protected Matters Search Tool (SEWPaC 2011);
- Planning Schemes Online to ascertain current zoning and environmental overlays (DPCD 2011);
- Relevant environmental legislation and policies; and,
- Previous ecological assessments within the study area (Ecology Australia 2006; Ecology Partners 2008, 2011; SMEC 2009; CPG 2010).

2.3 Flora Assessment

A flora assessment was undertaken on 6-7, 16-18 and 21 December 2010, to obtain information on terrestrial flora values within the study area. An additional flora investigation was undertaken on 24 November 2011. The study area was assessed on foot, with all observed flora species recorded, any significant records mapped and the overall condition of vegetation noted. Remnant vegetation in the local area was also reviewed to assist in determining the original vegetation within the study area.

EVCs were determined by reference to DSE pre-1750 and extant EVC mapping and their published descriptions (DSE 2011). The significance assessment criteria of taxa and vegetation communities are presented in Appendix 1.

2.4 Fauna Assessment

The fauna survey was undertaken between 16-18 and 23 December 2010, to obtain information on terrestrial fauna values within the study area. Binoculars were used to scan the area for birds, and the observer also listened for calls and searched for other incidental signs such as nests, remains of dead animals, droppings and footprints. Habitat features including ground cover composition and structure, and the presence of hollows and fallen ground debris was noted. The presence of hollows in isolated trees was also noted, and any other features likely to be important for fauna.

2.4.1 Targeted Surveys and Habitat Assessment

Targeted surveys for Growling Grass Frog were undertaken on 13 and 24 January 2011, and included two nights of spotlighting, with call identification and active searching for metamorphs in accordance with the *Biodiversity Precinct Structure Planning Kit* guidelines (DSE 2010a). A diurnal habitat assessment was undertaken on 21 January 2011 at each accessible waterbody (i.e. farm dams) to record habitat data including water quality, presence of predatory fish such as Plague Minnow *Gambusia holbrooki* and levels of aquatic and semi-aquatic vegetation.

In situ water quality data was collected at targeted surveys sites using a calibrated Horiba™ multi-probe and meter for the following parameters: dissolved oxygen, pH, electrical conductivity, temperature and turbidity. A summary of the habitat assessment (i.e. analysis of basic water chemistry and vegetation cover) for each survey site is provided in Appendix 5.

2.5 Habitat Hectare Assessment

A habitat hectare assessment was undertaken in conjunction with the flora survey between 6, 7, 16-18 and 21 December 2010. Vegetation within the study area was assessed according to the habitat hectare methodology, which is described in the *Vegetation Quality Assessment Manual* (DSE 2004).

Under the DSE guidelines, three categories of vegetation have been defined (DSE 2007a). The three categories are 'remnant patches', 'scattered trees' and 'degraded treeless vegetation'. Habitat hectare assessments were only undertaken in areas of vegetation considered to be remnant patches or scattered trees.

- A remnant patch is defined as:
    - An area of vegetation, with or without trees, where less than 75% of the total understorey plant cover is weeds or non-native plants (i.e. at least 25% understorey cover is indigenous); or,
    - A group (i.e. three or more) of trees where the tree canopy cover is at least 20%.
- Scattered Trees are defined as canopy trees within an area where at least 75% of the total understorey plant cover are non-native and the overall canopy cover for a group (i.e. three or more) of trees is less than 20%.

- Degraded treeless vegetation is all other vegetation that does not meet the thresholds for a remnant patch or scattered trees (DSE 2007a).

DSE (2010b) has further defined degraded treeless vegetation into two categories:

- Minor Treeless Vegetation – Vegetation comprising less than 25% native understorey cover. No offset or habitat hectare assessment is required.

- Modified Treeless Vegetation – Vegetation comprising greater than 25% native understorey cover, it does not support habitat for rare or threatened species, and the native species present are unlikely to have originally dominated the site. No offset or habitat hectare assessment is required.

The decision as to whether vegetation qualifies as Modified Treeless Vegetation is determined by DSE. If DSE consider that the vegetation is not Modified Treeless Vegetation or it is Modified Treeless Vegetation that provides habitat for rare or threatened species, then assessments and offsets are required. No formal offsets are required for the proposed removal of Minor Treeless Vegetation or Modified Treeless Vegetation. However, a planning permit is required for the removal of any native vegetation associated with Minor Treeless Vegetation or Modified Treeless Vegetation unless an exemption clause under 52.17-6 of the Victorian Planning Schemes applies.

Where losses are permitted, the definition of conservation significance and offset objectives is guided by the Framework (Appendices 3 and 4, Tables 5 and 6; NRE 2002) and the Corangamite Native Vegetation Plan (CCMA 2005).

Tree Assessment

The Framework (NRE 2002) recognises that old trees are important environmental assets and these can be found in habitat zones, or as relicts of vegetation that formerly occupied the site (scattered trees). The Framework (NRE 2002) includes minimum protection/replacement ratios for trees that are to be removed as part of permitted clearing, based on the Diameter at Breast Height (DBH). Ratios apply to large old trees in 'habitat zones' and to scattered old trees where the indigenous understorey cover is less than 25% of the total understorey cover (Table 1). Small scattered trees (i.e. not old trees) are also considered to be environmental assets, and any permitted clearance would require offset ratios.

The removal of scattered trees that are reproductively mature, but that are smaller in diameter than medium old trees for that EVC, will also require replacement ratios. Regardless of the Conservation Status of the EVC to which these trees belong, they are considered to have a Conservation Significance of "Low", unless the tree species itself is a threatened species (DSE 2007a).

Table 1. Benchmark tree measurements for EVCs within the study area.

Bioregion	Ecological Vegetation Class	Canopy cover	Very Large Old Tree (cm)	Large Old Tree DBH (cm)	Medium Old Tree DBH (cm)	Large Old Tree density hectare
OP	Grassy Woodland (EVC 175)	15%	105	70	52.5	15/ha
OP	Grassy Woodland (EVC 175) (*Allocasuarina* spp.)	15%	60	40	30	15/ha
VVP	Plains Grassy Woodland (EVC 55)	10%	120	80	60	8/ha

Key: DBH = Diameter at Breast Height

Trees within Habitat Zones

In relation to habitat zones that contain large old trees, the Framework states:

> *For each large old tree removed as part of permitted clearing a certain number of other large old trees have to be protected and a certain number recruited* (NRE 2002).

Net Gain is the overall outcome where native vegetation and habitat gains are greater than the losses and where losses are avoided, where possible.

Scattered Trees

In relation to scattered old trees in parcels of land the Framework states:

> *For each medium or large old tree removed as part of permitted clearing an appropriate number of new trees must be recruited. The number of new trees that must be recruited will be specified in regional Native Vegetation Plans and may be graded according to conservation significance….However where it better suits their circumstances, landholders may use the 'protect other trees and ensure supplementary recruitment' approach to meet this criteria* (NRE 2002).

The Corangamite Native Vegetation Plan (CCMA 2005) contains offset ratios for losses of scattered trees, which are:

- protect and recruit options for Very Large, Large and Medium Old Trees; or,
- recruit only options for Very Large, Large, Medium Old Trees and other/small scattered trees.

It should be noted that DSE's preference in the first instance is to apply the 'protect and recruit option' for the potential removal of scattered indigenous trees.

2.6 Best or Remaining 50% of Habitat for Threatened Species

In order to determine the best or remaining 50% of habitat for rare and threatened flora and fauna, species that are considered likely to be present within each EVC were assessed

according to the steps outlined in Table 2 in the *Guide for Assessment of Referred Planning Permit Applications* (DSE 2007a).

Threatened flora species considered likely to be present (i.e. species given a likelihood rating of at least 2 in Appendix 1) within each EVC, was based on previous records, habitat type present and the requirements of each flora species.

Threatened fauna species considered likely to use the study area for foraging and/or breeding due to the high quality of habitat (i.e. species given likelihood rating of at least 2 in Appendix 2 and are listed as endangered, vulnerable or rare).

For significant flora and fauna species not recorded within the study area but recorded in the local area (Figures 5 and 6) or with potential habitat present in the local area (Appendices 2 and 3), if they were not considered to be a 'resident' or to 'make significant use of the study area', there was no further consideration given to these flora and fauna species in regards to determining best or remaining 50% habitat (Table 2, DSE 2007a).

2.7 Assessment Qualifications and Limitations

The assessment was undertaken during a period considered adequate for a general flora and fauna survey (summer). As with any assessment, a greater amount of time on the site would increase the likelihood of recording additional flora species. The short duration of the survey meant that migratory, transitory or uncommon fauna species may also have been missed.

It should be noted that at finer scales DSE's bioregion and EVC mapping becomes less clear and accurate due to the inherently broad environmental and ecological parameters used in the mapping process, and as a result of site-specific factors such as disturbance and modification. Where a vegetation type observed in the study area was not reflective of what would be expected from EVC mapping, and did not clearly fit within the EVC classification systems, it was apportioned to the 'best-fit' EVC based on its physical growing environment, structural and floristic attributes and with reference to regional EVC descriptions. Similarly, the bioregion boundaries have been adjusted to reflect the corresponding soil and vegetation types observed within the study area.

Targeted surveys for Growling Grass Frog were undertaken by two experienced personal during the active period (October to February), in accordance with the Biodiversity Precinct Structure Planning Kit guidelines (DSE 2010a).

Biodiversity Precinct Structure Planning Kit guidelines states that Growling Grass Frog surveys (i.e. spotlighting) can be undertaken up until February. Weather conditions during January 2011, were considered to have extended the mating season for Growling Grass Frog throughout greater Melbourne. Growling Grass Frog were actively calling and were detected during both diurnal and nocturnal surveys (using spotlights) at several locations throughout Melbourne on the same days as the Horseshoe Bend survey (A Taylor per. comm.).

Given that the survey effort was consistent with the standards provided within DSE (2010a) survey guidelines, the results of the habitat assessments and targeted survey is therefore considered appropriate to meet the objectives of this assessment.

Notwithstanding the above, terrestrial flora and fauna data collected during the field assessment, and information obtained from relevant sources (e.g. biological databases and relevant literature) provides an accurate assessment of the ecological values within the study area and the implications of future proposed development.

3 RESULTS

3.1 Ecological Vegetation Classes

DSE modelled (pre-1750) EVC mapping for the region shows that the study area and immediate surrounds would have predominantly contained Plains Grassland (EVC 132) and Grassy Woodland (EVC 175) (DSE 2011). Extant DSE mapping shows a scattered occurrence of Plains Grassland and Grassy Woodland throughout the study area and the immediate surrounds (Figure 2).

Three EVCs were recorded during the assessment: Grassy Woodland, Plains Grassland and Plains Grassy Woodland (EVC 55) predominantly within road reserves, with several patches scattered throughout areas of private property.

The division between Plains Grassland and Grassy Woodland is largely consistent with the boundary of the Victorian Volcanic Plain and Otway Plain bioregions. Plains Grassy Woodland in the northwest corner of the study area occurs within the Victorian Volcanic Plain bioregion; and, areas of Grassy Woodland occur within the Otway Plain bioregion (Figure 2).

3.2 Vegetation Condition

The study area contains several vegetation types ranging from highly modified areas dominated by exotic vegetation (i.e. open pasture) in poor condition. Native vegetation within the study area generally comprised isolated and fragmented patches and scattered trees within private property, with more intact linear strips along road reserves. Numerous planted native (non-indigenous) and exotic trees and shrubs were also present within road reserves, shelterbelts and around property boundaries.

Ecological features (i.e. EVCs, threatened species) recorded within the study area during the field assessment are shown in Figures 3a to 3i.

Grassy Woodland

Grassy Woodland (EVC 175) is described as a variable open eucalypt woodland to 15 metres tall or occasionally Sheoak woodland to 10 metres tall over a diverse ground layer of grasses and herbs, with a sparse shrub layer (DSE 2004).

Grassy Woodland was recorded along roadsides and in private property in the western section of the study area, and ranged from modified treeless patches in poor condition to more intact woodland in moderate condition. Where present, the overstorey was typically dominated by Melbourne Yellow Gum *Eucalyptus leucoxylon* subsp. *connata* and Drooping Sheoak *Allocasuarina verticillata*. The understorey comprised a sparse shrub layer, including Black Wattle *Acacia mearnsii*, Hedge Wattle *Acacia paradoxa*, Golden Wattle *Acacia pycnantha* and Cherry Ballart *Exocarpos cupressiformis*. The ground layer included a range of graminoids including Kangaroo Grass *Themeda triandra*, Common Swamp Wallaby-grass *Amphibromus nervosus*, Black-anther Flax-lily *Dianella admixta*, Wattle Matt-rush *Lomandra*

filiformis, Weeping Grass *Microlaena stipoides*, Common Wallaby-grass *Austrodanthonia caespitosa* and Veined Spear-grass *Austrostipa rudis*.

Areas of Grassy Woodland north of Burvilles Road (Figure 3h) comprised several small (approx 2 m²) depressions that become temporarily inundated with water. These areas support a modified cover of the native Common Spike-sedge *Eleocharis acuta*), with weed species such as Yorkshire Fog *Holcus lanatus* and Toowoomba Canary-grass *Phalaris aquatic* also present.

Plains Grassy Woodland

Plains Grassy Woodland (EVC 55) is described as eucalypt dominated woodland to 15 metres tall with a few sparse shrubs over a species-rich grassy and herbaceous ground layer (DSE 2004).

Plains Grassy Woodland occurs in the north east section around Sparrowvale Road and Barwon Heads Road (Figure 3f). Vegetation was characterised by an overstorey dominated by large old River Red-gums *Eucalyptus camaldulensis* with sparse cover of understorey shrubs such as Hedge Wattle and Golden Wattle. Ground cover vegetation consisted of Kangaroo Grass and Black-anther Flax-lily as well as several Spear-grasses and Wallaby-grasses. Introduced flora species including, Toowoomba Canary-grass, Yorkshire Fog, Wild Oat *Avena barbata*, Cocksfoot *Dactylis glomerata* and Sweet Briar *Rosa rubiginosa* were also present within these areas.

Plains Grassland

Plains Grassland (EVC 132) is described as treeless vegetation dominated by largely graminoid and herb life forms (DSE 2004). Areas of Plains Grassland mapped within the study area were separated from modified forms of Grassy Woodland, based on species diversity and composition (compared to the EVC Benchmark), the absence of trees and shrubs, and close proximity to the Victorian Volcanic Plain bioregion.

Plains Grassland vegetation was restricted to roadside reserves throughout the study area (Figure 3), of varying quality and condition. A small patch of higher quality Plains Grassland was present along Charlemont Road (Figure 3i) which included several graminoid and herb species including Black-anther Flax-lily, Weeping Grass, Kangaroo Grass, Silvertop Wallaby-grass *Joycea pallida*, Kneed Spear-grass *Austrostipa bigeniculata*, Sheep's Burr *Acaena echinata*, Grassland Wood Sorrel *Oxalis perennans*, Pink Bindweed *Convolvulus erubescens*, Curved Pimelea *Pimelea curviflora*, Yellow Rush-lily *Tricoryne elatior* and Austral Stork's-bill *Pelargonium australe*. Exotic species present included Kikuyu *Pennisetum clandestinum*, Paspalum *Paspalum dilatatum*, Serrated Tussock, Galenia *Galenia pubescens* and Hare's-foot Clover *Trifolium arvense*.

Modified patches of Plains Grassland present within the road reserves along Boundary and Batten Road (Figure 3e), consisted of mostly Kangaroo Grass, Bristly Wallaby-grass, Kneed Spear-grass, Sheep's Burr and Pink Bindweed. These areas contained a higher cover of exotic

weed species such as Toowoomba Canary Grass, Wild Oat, Chilean Needle Grass *Nassella neesiana*, Perennial Ryegrass *Lolium perenne* and Ribwort *Plantago lanceolata*.

Modified Vegetation

Areas of open pasture comprised predominantly introduced vegetation, including exotic grass species such as Perennial Ryegrass, Toowoomba Canary Grass, Yorkshire Fog, Wild Oat and Barley-grass *Hordeum murinum*. Listed noxious weeds present included Chilean Needle-grass, Serrated Tussock *Nassella trichotoma*, Spear Thistle *Cirsium vulgare*, Paterson's Curse *Echium plantaginea* Bridal Creeper *Asparagus asparagoides* and Gorse *Ulex europaeus*.

Indigenous grasses were also common in open areas, often in small isolated patches, but also included colonising native grass species (i.e. Bristly Wallaby-grass *Austrodanthonia setacea*) covering entire paddocks. However, this vegetation was highly simplified with few or no other indigenous species present. Areas supporting colonised native grasses (i.e. Bristly Wallaby-grass) were not considered representative of the original vegetation type (i.e. Plains Grassland), and do not support habitat for rare or threatened flora or fauna species. It is recommended that DSE considers these areas as Modified Treeless Vegetation, and that no habitat hectare assessment or Net Gain offset is required.

Areas of planted Sugar Gum *Eucalyptus cladocalyx*, Giant Honey-myrtle *Melaleuca armillaris*, Monterey Cypress *Cupressus macrocarpa* and Radiata Pine *Pinus radiata* were also recorded within paddocks and along shelterbelts.

Adjacent Precinct Vegetation

The Horseshoe Bend Precinct is located adjacent to the Armstrong Creek East Precinct. Vegetation along the precinct boundary consisting mostly of open pasture dominated by exotic vegetation and planted shelter belts with scattered indigenous trees, shrubs and grasses persisting in areas which have not been previously cropped or intensely grazed (Figure 3).

Indigenous vegetation within the road reserves on Burvilles Road, Batten Road, Horseshoe Bend Road and Barwarre Road, to the east and south of the study area typically contained the highest quality areas remnant vegetation, with moderate quality patches of Grassy Woodland and Plains Grassland. Remnant vegetation within properties to the west and north of the study area are likely to contain species and remnant patches characteristic of floodplain and wetland vegetation communities as the Barwon River and associated Lake Connewarre system are located within two kilometres of the study area (SMEC 2009).

3.3 Flora

One hundred and forty two flora species (67 indigenous and 75 exotic) were recorded in the study area during the assessment (Appendix 2.1). No nationally listed significant flora species was recorded within the study area. One state listed flora species (Melbourne Yellow Gum) was recorded within the study area.

3.4 Significant Flora Species and Communities

3.4.1 National

The FIS (2011) contains records of four nationally listed flora species within the local area (10 kilometre radius of study area); and an additional six species have habitat that either occurs or is predicted to occur in the local area (SEWPaC 2010) (Figure 4). An assessment of the likelihood of occurrence within the study area is outlined in Appendix 2.2.

3.4.2 State

One state significant flora species, Melbourne Yellow Gum, listed as Endangered in Victoria, was recorded within the study area during the assessment. The FIS (2011) contains four records of Bellarine Yellow Gum within the study area and an additional seven records within the local area (i.e. within 10 kilometres of the study area). However, targeted surveys for Bellarine Yellow Gum were undertaken throughout the study area on 24 November 2011. Numerous specimens were collected throughout the study area (including several trees previously identified as Bellarine Yellow Gum) were sent to the Melbourne Herbarium for analysis, and were identified as Melbourne Yellow Gum (*Eucalyptus leucoxylon* subsp. *connata*) (K. Rule per comm.).

The FIS (2011) also contains records of 33 additional state listed species within the local area (Figure 4, Appendix 2.1). The likelihood of occurrence of state listed flora species within the study area is outlined in Appendix 2.1.

3.4.3 Significant Communities

Two nationally listed ecological communities, *Natural Temperate Grassland of the Victorian Volcanic Plain* (NTGVVP) and *Grassy Eucalypt Woodland of the Victorian Volcanic Plain* (GEWVVP), were recorded within the north eastern section of the study area and have been mapped as Plains Grassland (PG 1-3) (NTGVVP), and Plains Grassy Woodland (PGW 1-4) (GEWVVP), respectively (Figures 3c; 3f; 3i).

One state listed floristic community (*Western (Basalt) Plains Grassland*) listed as Threatened under the FFG Act, was also recorded within the Victorian Volcanic Plain section of the study area and has been mapped as Plains Grassland (Figures 3c; 3f; 3i).

Grassy Woodland, Plains Grassland and Plains Grassy Woodland are listed as Endangered within the Victorian Volcanic Plain and Otway Plain bioregions (DSE 2011).

3.5 Fauna

Eighty fauna species were recorded during the field assessment, comprising 64 birds (56 native and eight introduced), seven mammals (three native and four introduced), six frog species (all native), two native reptiles and one introduced fish species (Appendix 3.1). No national, state or regionally significant fauna species were recorded within the study area during the assessment.

3.6 Targeted Survey

Growling Grass Frog (including tadpoles or metamorphs) was not recorded within the study area during targeted surveys. Results from the targeted survey indicated that a number of waterbodies (numbered 1; 4; 7; 9; 15; 16; 19; 24; 25; 26 and 27; Figures 3a-3i) contain suitable habitat for Growling Grass Frog. However, based on the results of targeted surveys, lack of connectivity to known sites and the paucity of records within the local area (within 10 kilometres of the study area), there is a low likelihood of occurrence for this species within the study area for breeding or foraging purposes.

Six common frog species were recorded throughout the study area during targeted surveys, including Spotted Marsh Frog *Limnodynastes tasmaniensis*, Southern Brown Tree Frog *Litoria ewingii*, Southern Banjo Frog *Limnodynastes dumerili*, Striped Marsh Frog *Limnodynastes peronii*, Common Spadefoot Toad *Neobatrachus sudelli* and Common Toadlet *Crinia signifera*. These frogs were recorded within permanent and ephemeral waterbodies (including drainage lines along Reserve Road, Barwarre Road and Horseshoe Bend Road) (Figures 3a-3d).

3.7 Habitat Assessment

Growling Grass Frog (including tadpoles or metamorphs) was not recorded within the study area during targeted surveys. The majority of waterbodies within the study area were highly modified as a result of grazing and the prevalence of exotic vegetation and did not support suitable habitat attributes for Growling Grass Frog. Of the 28 sites assessed, 11 provided suitable habitat for Growling Grass Frog (i.e. good water quality and high levels of aquatic and semi-aquatic vegetation) (Figures 3a-3d; Appendix 5).

The eleven waterbodies containing potentially suitable Growling Grass Frog habitat had similar water chemistry readings for pH, temperature (^{o}C), and turbidity (mV) with only small fluctuations between each waterbody (Appendix 5). Results for turbidity (N.T.U) varied noticeably and may be caused by variety of factors including; soil erosion, runoff, flood events, livestock grazing, algae growth, or bottom-feeding fish (i.e. carp) that stir up bottom sediments (Nolen *et al.* 1985) (Appendix 5).

It is recommended that waterbodies supporting potential suitable habitat for Growling Grass Frog be retained or enhanced (where practicable).

3.8 Significant Fauna

3.8.1 National

No national significant fauna species were recorded within the study area during the assessment. Twenty two nationally listed fauna species have previously been recorded within the local area (within 10 km of the study area) (VBA 2010); or habitat for these species is predicted to occur within the study area (SEWPaC 2010) (Figure 5). The likelihood of

occurrence of nationally significant fauna species within the study area is outlined in Appendix 3.2.

These species include:

- Five terrestrial mammals: Eastern Barred Bandicoot *Perameles gunnii*, Southern Brown Bandicoot *Isoodon obesulus obesulus*, Long-nosed Potoroo *Potorous tridactylus*, Spot-tailed Quoll *Dasyurus maculatus* and New Holland Mouse *Pseudomys novaehollandiae*;
- Two bat species: Grey-headed Flying-fox *Pteropus poliocephalus* and Southern Bent-wing bat *Miniopterus schreibersii bassannii*;
- Three coastal-associated birds: Hooded Plover *Thinornis rubricollis rubricollis*, Orange bellied Parrot *Neophema chrysogaster* and Rufous Bristlebird *Dasyornis Broadbenti caryochrus*
- Two woodland dependent birds: Regent Honeyeater *Xanthomyza phrygia* and Swift Parrot *Lathamus discolor*;
- One grassland dependent bird: Plains Wanderer *Pedionomus torquatus*;
- Two wetland dependent birds: Australasian Bittern *Botaurus poiciloptilus* and Australian Painted Snipe *Rostratula australis*;
- One reptile: Striped Legless Lizard *Delma impar*;
- Five fish: Australian Grayling *Prototroctes maraena*, Dwarf Galaxias *Galaxiella pusilla*, Macquarie perch *Macquaria australasica*, Murray Cod *Maccullochella peelii peelii* and Yarra Pygmy Perch *Nannoperca obscura*; and,
- One frog: Growling Grass Frog *Litoria raniformis*.

Grey-headed Flying-fox was observed within the study area during the field assessment. River Red-gums and other eucalypt species within the study area may provide a potential foraging resource for this species. However, it is unlikely that Grey-headed Flying-fox would reside within the study area for extended periods or on an annual basis.

Potential suitable Growling Grass Frog habitat was identified at 11 sites within the study area (Figures 3a-3d). However, based on the results of targeted surveys, lack of connectivity to known sites and the paucity of records within the local area, there is a low likelihood of occurrence for this species within the study area for breeding or foraging purposes.

There are 46 records of Australasian Bittern within the local area (VBA 2010), although the majority of these occurrences are from Reedy Lake and Lake Connewarre to the east of the study area (Figure 5). However, the majority of waterbodies within the study area do not contain suitable habitat (i.e. reedbeds or vegetation containing cumbungi, rushes and sedges).

As a result, this species is unlikely to reside within the study area for foraging or breeding purposes.

Swift Parrot and Regent Honeyeater may fly over the study area on an occasional basis for feeding or roosting purposes (Appendix 3.2). There is a low likelihood of occurrence for any additional national listed fauna species within the study area (Appendix 3.2).

3.8.2 State

No state significant fauna species were recorded within the study area during the field assessment. The VBA (2010) contains records of 41 state significant fauna previously recorded from within 10 kilometres of the study area (Figure 5) (Appendix 3.2). The likelihood of occurrence of state significant fauna species within the study area is outlined in Appendix 3.2.

These species include:

- Three nocturnal raptors: Barking Owl *Ninox connivens,* Masked Owl *Tyto novaehollandiae* and Powerful Owl *Ninox strenua*;
- Three diurnal raptors: Black Falcon *Falco subniger,* Grey Goshawk *Accipiter novaehollandiae* and White-bellied Sea-Eagle *Haliaeetus leucogaster*;
- Twenty five wetland associated birds: Australian Shoveler *Anas rhynchotis*, Baillon's Crake *Porzana pusilla,* Common Sandpiper *Actitis hypoleucos*, Blue-billed Duck *Oxyura australis*, Brolga *Grus rubicunda,* Caspian Tern *Sterna caspia* Eastern Great Egret *Ardea modesta,* Fairy Tern *Sternula nereis nereis,* Hardhead *Aythya australis,* Intermediate Egret *Egretta intermedia*, Lewin's Rail *Lewinia pectoralis*, Little Bittern *Ixobrychus minutus dubius,* Little Egret *Egretta garzetta nigripes*, Gull-billed Tern *Gelochelidon nilotica macrotarsa*, Whimbrel *Numenius phaeopus*, Black-tailed Godwit *Limosa limosa*, Grey-tailed Tattler *Heteroscelus brevipes*, Great Knot *Calidris tenuirostris*, Freckled Duck *Stictonetta naevosa,* Little Tern *Sternula albifrons sinensis*, Magpie Goose *Anseranas semipalmata,* Musk Duck *Biziura lobata*, Royal Spoonbill *Platalea regia,* Terek Sandpiper *Xenus cinereus* and Wood sandpiper *Tringa glareola*;
- Five woodland associated birds: Brown Treecreeper (south-eastern spp.) *Climacteris picumnus victoriae*, Diamond Firetail *Stagonopleura guttata*, Grey-crowned Babbler *Potmatostomus temporalis temporalis*, Hooded Robin *Melanodryas cucullata* and Speckled Warbler *Chthonicola sagittata*;
- Three heathland/grassland associated birds: King Quail *Coturnix chinensis victoriae*, Red- chested Button-quail *Turnix pyrrhothorax* and Ground Parrot *Pezoporus wallicus wallicus*;
- One frog species: Southern Toadlet *Pseudophyryne semimarmorata;* and,

- One invertebrates: Yellow Sedge-skipper *Hesperilla flavescens flavescens.*

Royal Spoonbill and Eastern Great Egret may occasionally use waterbodies with sufficient vegetation cover (i.e. waterbodies 24-26; Figure 3) for foraging purposes. Potential foraging habitat was identified within the study area for a variety of wetland associated birds such as: Australian Shoveler, Magpie Goose, Cattle Egret, Intermediate Egret, Hardhead and Musk Duck and Little Bittern. Suitable habitat for these birds includes larger permanent or ephemeral wetlands and drainage lines located throughout the study area (Figures 3a-3d).

The study area does not support suitable habitat for any additional state significant fauna species (Appendix 3.2).

3.8.3 Regional and local

No regionally significant fauna species were recorded within the study area during the field assessment. The VBA (2010) contains records of nineteen state significant fauna previously recorded from within 10 kilometres of the study area (Appendix 3.2).

These species include:

- Eight wetland associated birds: Cape Barren Goose *Cereopsis novaehollandiae*, Australian Pratincole *Stiltia Isabella*, Whiskered Tern *Chlidonias hybridus javanicus*, Azure Kingfisher *Alcedo azurea*, Glossy Ibis *Plegadis faclinellus*, Latham's Snipe, Nankeen Night Heron *Nycticorax caledonicus* and Pied Cormorant *Phalacrocorax varius*;

- Three woodland associated birds: Brown Quail *Coturnix ypsilophora*, Spotted Quail-thrush *Cinclosoma punctatum* and Little Button-quail *Turnix velox*;

- Seven coastal associated birds: White-fronted Tern *Sterna striata*, Sooty Oystercatcher *Haematopus fuliginosus*, Eastern Curlew *Numenius madagascariensis*, Red Knot *Calidris canutus*, Sanderling *Calidris alba*, Grey Plover *Pluvialis squatarola* and Pacific Golden Plover *Pluvialis fulva*; and,

- One diurnal raptor: Spotted Harrier *Circus assimilis*.

Latham's Snipe may use ephemeral wetlands (i.e. surrounding adjacent waterbodies 24-26; Figure 3) for breeding or foraging purposes during favourable conditions (i.e. high rainfall). Whiskered Tern, Glossy Ibis and Pied Cormorant may occasionally forage within the study area, and Spotted Harrier may forage over open areas on rare occasions.

All other native fauna (primarily grassland dependent birds) are of local significance, as they are not listed as rare or threatened on a national, state and/or regional level. The likely use of the study area by the above listed species is provided in Appendix 3.2.

3.9 Fauna Habitats

Fauna habitats located within the study area have been assigned a general designation by grouping similar EVCs together. Some habitat types do not relate to any EVC (i.e. introduced pasture, artificial dams), and are based on general habitat characteristics and not vegetation type. The study area supports five broad habitat types: remnant woodland and scattered indigenous trees; introduced pasture grass and crops, ephemeral drainage lines, planted vegetation and artificial waterbodies.

Remnant woodland and scattered indigenous trees (Corresponding EVCs: Plains Grassy Woodland and Grassy Woodland)

Overall habitat value – Remnant woodland and scattered indigenous trees are of **moderate to high** habitat value for fauna. This habitat is likely to facilitate fauna movement between habitats throughout an otherwise cleared landscape.

Description - This habitat type occurs as patches of woodland and individual remnant trees, supporting mature eucalypts to 15 metres. Some of these trees provide large numbers of hollows that vary in size and shape. The understorey is comprised of scattered indigenous grasses and predominantly introduced vegetation (i.e. open pasture).

Terrestrial fauna – Brush-tailed Possum *Trichosurus vulpecular*, Common Ring-tailed Possum *Pseudocheirus peregrines* and Sulphur-crested Cockatoos *Cacatua galarita* are likely to use this habitat for breeding or foraging habitat. Common bat species such as the White-striped Freetail-bat *Tadarida australis* which was heard during targeted surveys are likely to use hollows and loose bark for breeding habitat and refuge.

This habitat was also found to support a wide range of native bird species in which the majority of hollow bearing trees were used by pest species such as Common Starlings *Sturnus vulgaris* and Common Myners *Acridotheres tristis*.

Remnant trees also provide habitat for diurnal raptors (e.g., Nankeen Kestrel, Black-shouldered Kite), which use trees for perching, roosting and foraging activities. When in flower, remnant woodland trees are also likely to provide food resources for a variety of honeyeaters, corellas, rosellas and lorikeets.

Introduced pasture and crops (Corresponding EVC: None)

Overall habitat value - Exotic grasslands are of **low** habitat value for fauna. Ungrazed pasture grasses, which in some places grows up to one metre high, provides habitat for birds adapted to agricultural landscapes, and ground dwelling mammals, reptiles and frogs.

Description - This habitat occurs throughout the majority of the overall precinct area and comprises mostly of improved pasture dominated by pasture grasses, with environmental weeds also present. Some native grasses tolerant to disturbances such as grazing (i.e. Common Wallaby Grass and Common Wheat Grass) were also present within some areas.

Terrestrial fauna - Common open country species (primarily birds) recorded using this habitat included grassland birds such as Australian Magpie *Gymnorhina tibicen*, Little Raven *Corvus*

mellori, and Australasian Pipit *Anthus novaeseelandiae*. Exotic grasslands also provide foraging habitat for diurnal raptors (e.g., Nankeen Kestrel *Falco cenchroides*, Black-shouldered Kite *Elanus axillaris*, Brown Falcon *Falco berigora*, and Swamp Harrier *Circus approximans*).

Ephemeral drainage lines (Corresponding EVC: Not Applicable)

Overall habitat value – Ephemeral drainage lines are considered to provide **moderate** habitat value for fauna species within the study area, especially birds and frogs.

Description – During the field assessment the drainage lines aligning the road reserves contained water. Ephemeral drainage lines are not likely to contain water during warmer months and therefore are not likely to act as potential fauna habitat when dry. Additionally, drainage lines lack an extensive cover of fringing aquatic and semi-aquatic vegetation, and suitable refuge sites such as logs. The surrounding vegetation typically comprises introduced grasses for the majority of the study area.

Terrestrial fauna – Ephemeral drainage lines may provide foraging habitat for several native fauna including waterbirds such as Straw-necked Ibis *Threskiornis spinicollis*, White-necked Heron *Ardea pacifica* and Pacific Black Duck *Anas superciliosa*.

Numerous frog species, Spotted Marsh Frog, Common Froglet and Southern Banjo Frog were heard calling within drainage lines during the assessment. Additionally, any areas containing remnant woodland patches are likely to provide suitable foraging, breeding and dispersal habitat for a range of locally abundant fauna species (i.e. mammals, birds and reptiles).

Artificial waterbodies (farm dams) (Corresponding EVC: None)

Overall habitat value – Artificial waterbodies are considered to be of **low to moderate** habitat value for fauna.

Description – Numerous waterbodies exist within the study area (Figure 5). They currently support varying levels of emergent macrophytes and aquatic vegetation, with few refuge sites such as logs or rocks. The surrounding vegetation typically comprises introduced pasture grass or crops.

Terrestrial fauna – Waterbirds such as Australian Wood Duck *Chenonetta jubata* or Pacific Black Duck *Anas superciliosa*, Chestnut Teal *Anas castanea*, Masked Lapwing *Vanellus miles* and frog species such as Common Froglet and Spotted Marsh Frog are expected to use this habitat for breeding or foraging purposes on a regular basis.

Waterbodies supporting protective cover within, and around their margins offer protection for Little Grassbird *Megalurus gramineus*, Australian Reed Warbler *Acrocephalus australis* and Golden-headed Cisticola *Cisticola exilis*.

Planted vegetation/Windrows (Corresponding EVC: None)

Overall habitat value – Habitat value for planted vegetation ranges from **low** for immature plantings, to **moderate** for mature plantings.

Description – A range of native and introduced trees and shrubs have been planted, throughout the overall precinct area. Many of these trees are mature and reach a height of up to 10-15 metres, some supporting small hollows. The understorey generally consisted of predominantly introduced vegetation. Areas of potential fauna habitat were also identified at the Narana Cultural Centre (Figure 3d), which contains areas of planted native vegetation with a grassy dominated understorey.

Terrestrial fauna – Many of these trees provide foraging resources for species adapted to modified environments such as Magpies, wattlebirds, and honeyeaters. Additionally, low growing shrubs would be used by smaller passerine species such as wrens, thornbills, and fantails for nesting and foraging purposes.

3.10 Ecological Significance

Based on the available information and the results of the site assessment, remnant vegetation within the study area is considered of at least high local conservation significance due to the presence of:

- Remnant vegetation associated with three Ecological Vegetation Classes (Grassy Woodland, Plains Grassland and Plains Grassy Woodland) listed as Endangered in the Victorian Volcanic Plain and Otway Plain bioregions;
- Two nationally listed ecological communities (*Natural Temperate Grassland of the Victorian Volcanic Plain* and *Grassy Eucalypt Woodland of the Victorian Volcanic Plain*);
- One state listed floristic community (*Western (Basalt) Plains Grassland*) listed as Threatened under the FFG Act;
- One state listed flora species (Melbourne Yellow-Gum) listed as Endangered in Victoria;
- One nationally listed fauna species (Grey-headed Flying-fox); and,
- Potential suitable habitat for one national listed fauna species (Growling Grass Frog).

4 IMPLICATIONS OF THE FINDINGS

4.1 Legislative and Policy Implications

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

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Commonwealth);
- *Flora and Fauna Guarantee Act 1988* (FFG Act) (Victoria);
- *Planning and Environment Act 1987* (Victoria);
- *Wildlife Act 1975* and Wildlife Regulations 2002 (Victoria);
- *Catchment and Land Protection Act 1994* (CALP Act) (Victoria);
- Victoria's Biodiversity Strategy 1997;
- Corangamite Native Vegetation Plan; and,
- Victoria's *Native Vegetation Management Framework – A Framework for Action* (Net Gain policy).

4.1.1 Environment Protection and Biodiversity Conservation Act 1999

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

- World Heritage properties
- National heritage places
- Ramsar wetlands of international significance
- Threatened species and ecological communities
- Migratory and marine species
- Commonwealth marine area
- Nuclear actions (including uranium mining)

- Great Barrier Reef Marine Park

Matters of NES

Ramsar wetlands of international significance

One wetland of international significance occurs in the vicinity or in the catchment of the study area: Port Phillip Bay (Western Shoreline) and Melbourne Peninsula (SEWPaC 2010), however, it is not likely to be impacted by any proposed development within the study area.

Listed flora and fauna species, and ecological communities

An action requires approval from the Commonwealth Environment Minister if it will, or if it is likely to, have a significant impact on an endangered or critically endangered species, or on an 'important population' or critical habitat of a listed vulnerable species.

Flora – No EPBC Act listed flora species were recorded within the study area during the field assessment. The FIS (2011) contains records of four nationally listed flora species within the local area (10 km radius of study area); and an additional six species have habitat that either occurs or is predicted to occur in the local area (SEWPaC 2010) (Figure 4). No EPBC Act listed flora species are considered likely to occur within the study area as no suitable habitat is present.

Fauna – One EPBC Act listed fauna species was recorded during the field assessment (Grey-headed Flying-fox). Twenty two nationally listed fauna species have previously been recorded within the local area (within 10 kilometres of the study area) (VBA 2010) or is predicted to occur in the local area (SEWPaC 2010) (Figure 5). Potential suitable Growling Grass Frog habitat was identified within the study area (Figures 3a-3d).

No suitable breeding habitat for any additional EPBC Act listed fauna species is present within the study area (Appendix 3.2.).

Ecological Communities – Two nationally listed ecological communities (NTGVVP and GEWVVP), were recorded within the study area (Figures 3c; 3f; 3i).

Listed migratory and marine species

Several migratory and marine species have been recorded from the local area (VBA 2010). However, there is no important wetland or marine habitats within the study area, and therefore the study area is unlikely to support an ecologically significant population of any migratory and/or marine species.

Commonwealth marine area, marine parks and nuclear actions

The study area is not within a marine area, nor is the proposed works related to nuclear actions.

Implications for the proposed development

There is a low likelihood that Grey-headed Flying-fox would reside within the study area for extended periods or on an annual basis. This species is only considered likely to occur within the study area on an occasional basis for foraging purposes.

Based on the results of targeted surveys, the lack of connectivity to known sites and the paucity of records within the local area, there is a low likelihood of occurrence for Growling Grass Frog within the study area for breeding or foraging purposes.

Two EPBC Act listed ecological communities (NTGVVP and GEWVVP), were recorded in the study area (Figures 3c; 3f; 3i).

Once detailed development plans are available, an assessment about the requirement for an EPBC Act referral to the Commonwealth Environment Minister referral should be made to determine the potential impacts on matters of NES (i.e. NTGVVP and GEWVVP ecological communities) from future development of the Horseshoe Bend Precinct.

4.1.2 Flora and Fauna Guarantee Act 1988

The primary legislation for the protection of flora and fauna in Victoria is the FFG Act. The broad objectives of the FFG Act are to: 1) ensure native flora and fauna survive, flourish and maintain in situ evolutionary potential; 2) manage threatening processes; 3) encourage the conserving of flora and fauna through cooperative community endeavours; and 4) establish a regulatory structure for the conservation of flora and fauna in Victoria.

The FFG Act contains protection procedures such as the listing of threatened species and/or communities of flora and fauna, and the preparation of action statements to protect the long-term viability of these values.

Flora – No FFG listed threatened flora species was recorded within the study area. Six flora species listed as threatened under the FFG Act have been recorded within a 10 kilometre radius of the study area (FIS 2011; Appendix 2.2). An additional five flora species are listed as potentially occurring, or their habitat as potentially occurring within the local area (Appendix 2.2).

Vegetation Communities – One listed threatened vegetation community, *Western (Basalt) Plains Grassland*, was recorded within the study area, and has been mapped as Plains Grassland (PG1-3) (Figure 3).

Fauna – One FFG Act listed fauna species (Grey-headed Flying-fox) was recorded within the study area. An additional 53 fauna species listed as threatened under the FFG Act have previously been recorded from the local area (i.e. within a 10 kilometre of the study area) (Appendix 3.2). The study area supports potential suitable habitat for Growling Grass Frog (Figures 3a-3d); however, there is a low likelihood of occurrence for Growling Grass Frog to occur within the study area for breeding or foraging purposes.

Threatening processes – Threatening process listed under Schedule 3 of the FFG Act that requires consideration include:

- The invasion of native vegetation by environmental weeds;
- Habitat fragmentation as a threatening process for fauna in Victoria and,
- Loss of hollow-bearing trees from Victorian native forests.

Implications for the proposed development

An FFG Act permit is required for the removal of protected species located on areas of public land (i.e. within road reserves), including any of the Asteraceae (Daisies), all orchids, ferns (excluding Bracken) and Acacia species (excluding *Acacia dealbata, Acacia decurrens, Acacia implexa, Acacia melanoxylon* and *Acacia paradoxa*). This also includes the removal of any species associated with listed threatened communities (i.e. *Western (Basalt) Plains Grassland*), on areas of public land. An FFG Act permit is generally not required for removal of protected flora species on private land.

4.1.3 Planning and Environment Act 1987

All planning schemes contain native vegetation provisions at Clause 52.17. A planning permit is required under the *Planning and Environment Act 1987* to remove, destroy or lop native vegetation on a site of more than 0.4 hectares, unless:

- The application is exempt under the schedule to Clause 52.17
- A Native Vegetation Precinct Plan (NVPP) applies.

Planning schemes may contain other provisions in relation to the removal of native vegetation.

Recent changes to the planning provisions (DSE 2007a) have altered the criteria for when DSE is the mandatory referral authority. A permit must be referred to DSE if there is one or more of the following:

Scattered Trees (may include trees from patches of vegetation)

- Greater than 15 trees with a diameter less than 40 centimetres at 1.3 metres above ground.
- Greater than 5 trees with a diameter more than 40 centimetres at 1.3 metres above ground.

Areas of vegetation (may include trees)

- Greater than 0.5 hectares of vegetation in an EVC with Bioregional Conservation Status of Endangered, Vulnerable or Rare.
- Greater than 1 hectare of vegetation in an EVC with Bioregional Conservation Status of Depleted or Least Concern.

Other circumstances

- On Crown land managed by the responsible authority.
- Where a property vegetation plan applies to the site.

Implications for the proposed development

At present, a permit from CoGG is required for the removal of native vegetation under Clause 52.17. However, a NVPP is a planning tool that sets out requirements for the protection and removal of native vegetation for a defined area or precinct. The primary purpose of the NVPP is to allow for the management of native vegetation in a precinct, rather than on a site-by-site, or on an ad hoc basis. It also provides an opportunity to identify significant native vegetation on a broader scale and to inform how it will be managed (DPCD 2008).

Within a precinct the NVPP can:

1. Allow remnant native vegetation issues in each of the precincts to be considered as part of the strategic planning process for new development.

2. Guide the extent and nature of future development in the precincts by identifying remnant native vegetation to be retained and areas proposed to be removed in the context of development constraints and opportunities.

3. Attempt to streamline the approval process particularly with respect to the proposed removal of remnant native vegetation.

4. Form a component of a structure plan together with other development requirements (DPCD 2008).

A NVPP is considered appropriate to inform the planning process and provide a clear direction about the extent of native vegetation removal within the Horseshoe Bend Precinct.

4.1.4 Wildlife Act 1975

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

The *Wildlife Act 1975* has the following objectives:

- To establish procedures for the promotion of protection and conservation of wildlife, the prevention of species extinctions, and the sustainable use and access to wildlife; and,

- To prohibit and regulate the conduct of those involved in wildlife related activities.

4.1.5 Wildlife Regulations 2002

The objectives of the Wildlife Regulations are:

- To make further provision in relation to the licensing system established by section 22 of the *Wildlife Act 1975*;
- To prescribe fees, offences, royalties and various other matters for the purposes of the *Wildlife Act 1975*; and,
- To provide for exemptions from certain provisions of the *Wildlife Act 1975*.

Authorisation for habitat removal may be obtained under the *Wildlife Act 1975*; through a licence granted under the *Forests Act 1958,* or under any other Act such as the *Planning and Environment Act 1987*.

Implications for the proposed development

While a permit will be required for removal of habitat vegetation within the study area, this could be in the form of a permit to remove native vegetation under the *Planning and Environment Act 1987*.

Consequently, a separate permit to remove fauna for this project under either the *Wildlife Act 1975* or the *Wildlife Regulations 2002* is unlikely to be required if a permit under the *Planning and Environment Act* is obtained.

4.1.6 Catchment and Land Protection Act 1994

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

- Avoid causing or contributing to land degradation which causes or may cause damage to land of another land owner;
- Protect water resources;
- Conserve soil;
- Eradicate regionally prohibited weeds;
- Prevent the growth and spread of regionally controlled weeds; and
- Prevent the spread of, and as far as possible eradicate, established pest animals

Essentially the CaLP Act establishes a framework for the integrated management and protection of catchments, and provides a framework for the integrated and coordinated management, which aims to ensure that the quality of the State's land and water resources and their associated plant and animal life are maintained and enhanced.

Implications for the proposed development

A number of weeds listed as noxious under the CaLP Act were recorded during the assessment (Appendix 2.1). Landowners are responsible for the control of any infestation of noxious weeds. To meet CaLP Act requirements listed noxious weeds should be appropriately controlled throughout the study area to minimise their spread and impact on ecological values.

4.1.7 Victoria's Biodiversity Strategy

The Victorian Government endorses this strategy titled 'Victoria's Biodiversity – Directions in Management (NRE 1997) and represents a benchmark for biodiversity conservation and management throughout the state.

The Biodiversity Strategy encourages Victorians to better understand and appreciate flora and fauna and ecosystems throughout the state, and to take an active part in conservation and management to ensure biodiversity is managed in an ecologically sound and sustainable manner.

4.1.8 Corangamite Native Vegetation Plan

The Corangamite Native Vegetation Plan (CCMA 2005) is a guide for local government in assessing planning applications for vegetation removal and determining permit conditions (Net Gain requirements) to ensure that ecological values across the region are not compromised.

The Plan provides information on biodiversity values across the Region and gives guidance to local municipalities on how clearing applications should be assessed. The document also outlines actions to ensure there is more strategic and coordinated approach to address ongoing degradation in quantity and quality of native vegetation throughout south western Victoria.

The recommendations made in the *Native Vegetation Plan*, should be taken into consideration in the planning phase of the proposed works.

Implications for the proposed development

Any development within the study area should consider the biodiversity objectives of the Corangamite Native Vegetation Plan (CCMA 2005).

4.1.9 The Native Vegetation Framework

Since 1989, most proposals to clear native vegetation have required a planning permit from the local Council (Responsible Authority), under the native vegetation provisions of Clause 52.17 of the Victoria Planning Provisions ("VPPs").

In 2002, the Victorian Government released Victoria's Native Vegetation Management – A Framework for Action (NRE 2002) ('the Framework'), which establishes a 'strategic direction for the protection, enhancement and revegetation of native vegetation across the State'.

The State Planning Policy Framework and in the decision guidelines at Clause 52.17 (Native Vegetation) of Particular Provisions, under Clause 12.01 requires Planning and Responsible Authorities to have regard for the Framework.

Implications for the proposed development

The results of the Net Gain analysis are outlined in Section 5.

4.1.10 Local Planning Schemes

Under the CoGG Planning Scheme the study area is zoned Urban Growth (UGZ) and Public Use (PUZ), with a several areas in the western half of the study area subject to Environmental Significance Overlay Schedule 1 (ESO – 1) (DPCD 2010).

Objectives of ESO – 1 relative to potential future development of the study area include:

- To conserve and protect areas of flora and fauna habitat and geological and natural interest.
- To ensure that development does not impact on the environmental significance of the land.
- To ensure that siting and design of any buildings and works maintains the environmental integrity of the land.

Implications of ESO – 1 for potential future development of the study area include:

- Loss of remnant native vegetation through clearing for development.
- Loss of potential habitat for threatened vegetation communities and fauna species (DPCD 2010).

Remnant vegetation within the road reserves of Boundary Rd, Barwarre Rd, Horseshoe Bend Rd and Burvilles Rd are covered by a Vegetation Protection Overlay (VPO – 1) (DPCD 2010).

Objectives of VPO – 1 relative to potential future development of the study area include:

- To protect areas of significant indigenous vegetation.
- To maintain habitat corridors for indigenous flora and fauna.
- To ensure that all development and works minimise the loss of indigenous vegetation.

Implications of VPO – 1 for potential future development of the study area include:

- Loss of remnant native vegetation through clearing for development.
- Loss of potential habitat for threatened vegetation communities and fauna species (DPCD 2010).

Implications for the proposed development

The objectives of the ESO1 and VPO1 should be taken into consideration for any future development of the study area.

5 NET GAIN ASSESSMENT

A Net Gain assessment has been prepared for the study area, and includes the results of the habitat hectare assessment and Net Gain implications. No detailed development plans of the Horseshoe Precinct were available at the time of the assessment. The losses and associated gain targets are based on the potential removal of all remnant vegetation from within the study area.

However, a fundamental premise of Net Gain is to achieve an 'outcome for native vegetation and habitat where overall gains are greater than losses and individual losses are avoided where possible' (NRE 2002). Therefore, in line with the three-step approach as defined within the Framework, the principles of avoid and minimise are essential to initially assess any proposed removal of remnant vegetation. Any proposed removal of remnant native vegetation within the study area should be seen in the context of the on-going vegetation loss in the Victorian Volcanic Plain and Otway Plain bioregions.

5.1 Habitat Hectare Assessment

The study area contains 45.32 hectares of remnant vegetation, comprising 44.35 ha of Grassy Woodland, 0.35 ha of Plains Grassy Woodland and 0.62 ha of Plains Grassland (Figures 3a to 3i).

Seventeen different quality zones of Grassy Woodland and four different quality zones of Plains Grassy Woodland and Plains Grassland were identified within the study area. Each of these quality zones meets the EVC benchmark outlined by DSE (2011); however, they generally differ in regards to understorey condition, species composition and cover. The presence of scattered indigenous trees has been attributed to Grassy Woodland and Plains Grassy Woodland. The habitat hectare assessment results are presented in Tables 2a – 2g.

Note: Planted exotic trees and shrubs located amongst areas of indigenous vegetation do not have any formal Net Gain offset requirements if removed. Planted native trees that were not funded by 'Landcare' or any other government authority such as Catchment Management Authorities, or that are not part of an existing offset do not require Net Gain offsets.

Table 2a. *Habitat scores for vegetation quality zones recorded within the study area*

EVC Name			PG	PG	PG	PG	PG	PG	PG	PG	PG	PG	PG	PGW
Habitat Zone			1a	1b	1c	1d	2	3a	3b	4a	4b	4c	4d	1
EVC Number			132	132	132	132	132	132	132	132	132	132	132	55
Bioregion			VVP	VVP	VVP	VVP	VVP	VVP	VVP	OP	OP	OP	OP	VVP
Bioregional Conservation Status			EN	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN
		Possible Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Old Trees	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
	Canopy Cover	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5
	Understorey	25	5	5	5	5	10	5	5	5	5	5	5	0
	Lack of Weeds	15	6	6	6	6	6	2	2	6	6	6	6	2
	Recruitment	10	3	3	3	3	10	3	3	3	3	3	3	0
	Organic Litter	5	5	5	5	5	5	5	5	5	5	5	5	4
	Logs	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3
Standardiser (PG = SC x 1.36)			25.84	25.84	25.84	25.84	42.16	20.4	20.4	25.84	25.84	25.84	25.84	NA
Landscape Context Score		25	2	2	2	2	2	2	2	2	2	2	2	2
Habitat points out of 100		100	28	28	28	28	44	22	22	28	28	28	28	16
Habitat Score (habitat points/100)			0.28	0.28	0.28	0.28	0.44	0.22	0.22	0.28	0.28	0.28	0.28	0.16
Area of Habitat Zone (ha)			0.04	0.02	0.10	0.15	0.02	0.02	0.04	0.13	0.12	0.01	0.01	0.04
Total Habitat Hectares*			0.01	0.01	0.03	0.04	0.01	0.00	0.01	0.04	0.03	0.00	0.00	0.01
Conservation Significance	**Conservation status x Habitat Score**		High	High	High	High	Very High	High	High	High	High	High	High	High
	Threatened Species		na	na	na	na	na	na	na	na	na	na	na	na
	Other Site Attributes		na	na	na	na	na	na	na	na	na	na	na	na
	Overall Conservation Significance (highest rating)		**High**	**High**	**High**	**High**	**Very High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**
Number of LOTs within habitat zone.			0	0	0	0	0	0	0	0	0	0	0	0

Notes: GW = Grassy Woodland, PG = Plains Grassland, PGW = Plains Grassy Woodland, OP = Otway Plain, VVP = Victorian Volcanic Plain, EN = Endangered, NA= Not Applicable, * Rounded to 2 decimal places.

Table 2b. *Habitat scores for vegetation quality zones recorded within the study area*

EVC Name			PGW	PGW	PGW	PGW	PGW	GW	GW	GW	GW	GW	GW	GW
Habitat Zone			2a	2b	3	4a	4b	1	2	3a	3b	3c	3d	3e
EVC Number			55	55	55	55	55	175	175	175	175	175	175	175
Bioregion			VVP	VVP	VVP	VVP	VVP	OP	OP	OP	OP	OP	OP	OP
Bioregional Conservation Status			EN	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN
		Possible Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Old Trees	10	0	0	7	0	0	0	8	6	6	6	6	6
	Canopy Cover	5	0	0	3	0	0	5	5	3	3	3	3	3
	Understorey	25	5	5	5	5	5	0	0	5	5	5	5	5
	Lack of Weeds	15	2	2	2	2	2	2	2	2	2	2	2	2
	Recruitment	10	5	5	5	0	0	0	0	0	0	0	0	0
	Organic Litter	5	4	4	5	4	4	4	4	4	4	4	4	4
	Logs	5	0	0	0	0	0	2	3	0	0	0	0	0
Standardiser (PG = SC x 1.36)			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Landscape Context Score		25	2	2	2	2	2	2	2	2	2	2	2	2
Habitat points out of 100		100	18	18	29	13	13	15	24	22	22	22	22	22
Habitat Score (habitat points/100)			0.18	0.18	0.29	0.13	0.13	0.15	0.24	0.22	0.22	0.22	0.22	0.22
Area of Habitat Zone (ha)			0.02	0.15	0.05	0.04	0.06	0.04	0.03	0.32	0.08	0.16	0.10	0.02
Total Habitat Hectares*			0.00	0.03	0.01	0.01	0.01	0.01	0.01	0.08	0.02	0.04	0.02	0.00
Conservation Significance	**Conservation status x Habitat Score**		High	High	High	High	High	High	High	High	High	High	High	High
	Threatened Species		na	na	na	na	na	High	Very High	Very High	Very High	Very High	Very High	Very High
	Other Site Attributes		na	na	na	na	na	na	na	na	na	na	na	na
	Overall Conservation Significance (highest rating)		**High**	**High**	**High**	**High**	**High**	**High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**
Number of LOTs within habitat zone.			0	0	1	0	0	0	2	2	2	2	2	1

Notes: GW = Grassy Woodland, PG = Plains Grassland, PGW = Plains Grassy Woodland, OP = Otway Plain, VVP = Victorian Volcanic Plain, EN = Endangered, NA= Not Applicable, * Rounded to 2 decimal places.

Table 2c. *Habitat scores for vegetation quality zones recorded within the study area*

EVC Name			GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
Habitat Zone			4a	4b	4c	5a	5b	5c	5d	5e	5f	5g	5h	5i
EVC Number			175	175	175	175	175	175	175	175	175	175	175	175
Bioregion			OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP
Bioregional Conservation Status			EN	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN
		Possible Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Old Trees	10	0	0	0	0	0	0	0	0	0	0	0	0
	Canopy Cover	5	5	5	5	0	0	0	0	0	0	0	0	0
	Understorey	25	5	5	5	5	5	5	5	5	5	5	5	5
	Lack of Weeds	15	2	2	2	2	2	2	2	2	2	2	2	2
	Recruitment	10	5	5	5	5	5	5	5	5	5	5	5	5
	Organic Litter	5	5	5	5	4	4	4	4	4	4	4	4	4
	Logs	5	2	2	2	0	0	0	0	0	0	0	0	0
Standardiser (PG = SC x 1.36)			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Landscape Context Score		25	2	2	2	2	2	2	2	2	2	2	2	2
Habitat points out of 100		100	26	26	26	18	18	18	18	18	18	18	18	18
Habitat Score (habitat points/100)			0.26	0.26	0.26	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
Area of Habitat Zone (ha)			0.13	0.03	0.01	0.08	0.03	0.01	0.03	0.05	0.22	0.11	0.10	0.01
Total Habitat Hectares*			0.03	0.01	0.00	0.01	0.01	0.00	0.01	0.01	0.04	0.02	0.02	0.00
Conservation Significance	**Conservation status x Habitat Score**		High	High	High	High	High	High	High	High	High	High	High	High
	Threatened Species		High	High	High	na	na	na	na	na	na	na	na	na
	Other Site Attributes		na	na	na	na	na	na	na	na	na	na	na	na
	Overall Conservation Significance (highest rating)		**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**
Number of LOTs within habitat zone.			0	0	0	0	0	0	0	0	0	0	0	0

Notes: GW = Grassy Woodland, PG = Plains Grassland, PGW = Plains Grassy Woodland, OP = Otway Plain, VVP = Victorian Volcanic Plain, EN = Endangered, NA= Not Applicable, * Rounded to 2 decimal places.

Table 2d. *Habitat scores for vegetation quality zones recorded within the study area*

EVC Name			GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
Habitat Zone			5j	5k	5l	5m	5n	5o	5p	5q	5r	5s	5t	6a
EVC Number			175	175	175	175	175	175	175	175	175	175	175	175
Bioregion			OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP
Bioregional Conservation Status			EN	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN
		Possible Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Old Trees	10	0	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	3
	Understorey	25	5	5	5	5	5	5	5	5	5	5	5	5
	Lack of Weeds	15	2	2	2	2	2	2	2	2	2	2	2	2
	Recruitment	10	5	5	5	5	5	5	5	5	5	5	5	5
	Organic Litter	5	4	4	4	4	4	4	4	4	4	4	4	5
	Logs	5	0	0	0	0	0	0	0	0	0	0	0	0
Standardiser (PG = SC x 1.36)			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Landscape Context Score		25	2	2	2	2	2	2	2	2	2	2	2	2
Habitat points out of 100		100	18	18	18	18	18	18	18	18	18	18	18	22
Habitat Score (habitat points/100)			0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.22
Area of Habitat Zone (ha)			0.02	0.01	0.11	0.08	0.17	0.03	0.02	0.12	0.01	0.02	0.04	0.08
Total Habitat Hectares*			0.00	0.00	0.02	0.01	0.03	0.01	0.00	0.02	0.00	0.00	0.01	0.02
Conservation Significance	**Conservation status x Habitat Score**		High	High	High	High	High	High	High	High	High	High	High	High
	Threatened Species		na	na	na	na	na	na	na	na	na	na	na	High
	Other Site Attributes		na	na	na	na	na	na	na	na	na	na	na	na
	Overall Conservation Significance (highest rating)		**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**
Number of LOTs within habitat zone.			0	0	0	0	0	0	0	0	0	0	0	0

Notes: GW = Grassy Woodland, PG = Plains Grassland, PGW = Plains Grassy Woodland, OP = Otway Plain, VVP = Victorian Volcanic Plain, EN = Endangered, NA= Not Applicable, * Rounded to 2 decimal places.

Table 2e. *Habitat scores for vegetation quality zones recorded within the study area*

EVC Name			GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
Habitat Zone			6b	6c	6d	6e	6f	6g	6h	6i	6j	7a	7b	7c
EVC Number			175	175	175	175	175	175	175	175	175	175	175	175
Bioregion			OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP
Bioregional Conservation Status			EN	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN
		Possible Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Old Trees	10	0	0	0	0	0	0	0	0	0	7	7	7
	Canopy Cover	5	3	3	3	3	3	3	3	3	3	3	3	3
	Understorey	25	5	5	5	5	5	5	5	5	5	5	5	5
	Lack of Weeds	15	2	2	2	2	2	2	2	2	2	2	2	2
	Recruitment	10	5	5	5	5	5	5	5	5	5	3	3	3
	Organic Litter	5	5	5	5	5	5	5	5	5	5	5	5	5
	Logs	5	0	0	0	0	0	0	0	0	0	0	0	0
Standardiser (PG = SC x 1.36)			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Landscape Context Score		25	2	2	2	2	2	2	2	2	2	2	2	2
Habitat points out of 100		100	22	22	22	22	22	22	22	22	22	27	27	27
Habitat Score (habitat points/100)			0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.27	0.27	0.27
Area of Habitat Zone (ha)			0.11	0.07	0.75	0.04	0.24	0.03	0.03	0.12	0.02	0.07	0.05	0.27
Total Habitat Hectares*			0.02	0.02	0.17	0.01	0.05	0.01	0.01	0.03	0.00	0.05	0.01	0.07
Conservation Significance	**Conservation status x Habitat Score**		High	High	High	High	High	High	High	High	High	High	High	High
	Threatened Species		High	High	High	High	High	High	High	High	High	Very High	Very High	Very High
	Other Site Attributes		na	na	na	na	na	na	na	na	na	na	na	na
	Overall Conservation Significance (highest rating)		**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**Very High**	**Very High**	**Very High**
Number of LOTs within habitat zone.			0	0	0	0	0	0	0	0	0	1	1	5

Notes: GW = Grassy Woodland, PG = Plains Grassland, PGW = Plains Grassy Woodland, OP = Otway Plain, VVP = Victorian Volcanic Plain, EN = Endangered, NA= Not Applicable, * Rounded to 2 decimal places.

Table 2f. *Habitat scores for vegetation quality zones recorded within the study area*

EVC Name			GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
Habitat Zone			7d	7e	7f	7g	7h	7i	7j	8a	9a	9b	9c	9d
EVC Number			175	175	175	175	175	175	175	175	175	175	175	175
Bioregion			OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP
Bioregional Conservation Status			EN	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN
		Possible Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Old Trees	10	7	7	7	7	7	7	7	9	0	0	0	0
	Canopy Cover	5	3	3	3	3	3	3	3	0	0	0	0	0
	Understorey	25	5	5	5	5	5	5	5	5	5	5	5	5
	Lack of Weeds	15	2	2	2	2	2	2	2	2	4	4	4	4
	Recruitment	10	3	3	3	3	3	3	3	6	0	0	0	0
	Organic Litter	5	5	5	5	5	5	5	5	5	4	4	4	4
	Logs	5	0	0	0	0	0	0	0	0	0	0	0	0
Standardiser (PG = SC x 1.36)			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Landscape Context Score		25	2	2	2	2	2	2	2	2	2	2	2	2
Habitat points out of 100		100	27	27	27	27	27	27	27	29	15	15	15	15
Habitat Score (habitat points/100)			0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.29	0.15	0.15	0.15	0.15
Area of Habitat Zone (ha)			0.19	0.33	0.17	0.21	0.23	0.10	0.09	0.22	0.14	0.11	0.11	0.13
Total Habitat Hectares*			0.05	0.09	0.05	0.06	0.06	0.03	0.02	0.06	0.02	0.02	0.02	0.02
Conservation Significance	**Conservation status x Habitat Score**		High	High	High	High	High	High	High	High	High	High	High	High
	Threatened Species		Very High	Very High	Very High	Very High	Very High	Very High	Very High	High	na	na	na	na
	Other Site Attributes		na	na	na	na	na	na	na	na	na	na	na	na
	Overall Conservation Significance (highest rating)		**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**High**	**High**	**High**	**High**	**High**
Number of LOTs within habitat zone.			8	1	1	10	2	8	1	4	0	0	0	0

Notes: GW = Grassy Woodland, PG = Plains Grassland, PGW = Plains Grassy Woodland, OP = Otway Plain, VVP = Victorian Volcanic Plain, EN = Endangered, NA= Not Applicable, * Rounded to 2 decimal places.

Table 2g. *Habitat scores for vegetation quality zones recorded within the study area*

EVC Name			GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
Habitat Zone			9e	9f	9g	9h	10	11	12	13	14	15	16	17
EVC Number			175	175	175	175	175	175	175	175	175	175	175	175
Bioregion			OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP
Bioregional Conservation Status			EN	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN	EN
		Possible Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score
Site Condition	Large Old Trees	10	0	0	0	0	9	8	4	6	0	0	6	4
	Canopy Cover	5	0	0	0	0	3	5	0	5	3	0	3	5
	Understorey	25	5	5	5	5	5	10	5	5	5	5	5	15
	Lack of Weeds	15	4	4	4	4	2	2	9	2	2	6	2	4
	Recruitment	10	0	0	0	0	5	10	5	5	0	5	0	6
	Organic Litter	5	4	4	4	4	5	5	5	5	4	5	4	5
	Logs	5	0	0	0	0	0	2	0	5	0	0	2	2
Standardiser (PG = SC x 1.36)			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Landscape Context Score		25	2	2	2	2	2	2	2	2	2	2	2	4
Habitat points out of 100		100	15	15	15	15	31	44	30	35	16	23	24	45
Habitat Score (habitat points/100)			0.15	0.15	0.15	0.15	0.31	0.44	0.30	0.35	0.16	0.23	0.24	0.45
Area of Habitat Zone (ha)			0.05	0.02	0.03	0.04	0.29	0.43	0.31	0.31	0.33	3.25	0.30	2.71
Total Habitat Hectares*			0.01	0.00	0.00	0.01	0.09	0.19	0.09	0.11	0.05	0.75	0.07	1.22
Conservation Significance	**Conservation status x Habitat Score**		High	High	High	High	High	Very High	High	High	High	High	High	Very High
	Threatened Species		na	na	na	na	Very High	Very High	High	Very High	High	na	Very High	Very High
	Other Site Attributes		na	na	na	na	na	na	na	na	na	na	na	na
	Overall Conservation Significance (highest rating)		**High**	**High**	**High**	**High**	**Very High**	**Very High**	**High**	**Very High**	**High**	**High**	**Very High**	**Very High**
Number of LOTs within habitat zone.			0	0	0	0	7	6	2	2	0	0	2	12

Notes: GW = Grassy Woodland, PG = Plains Grassland, PGW = Plains Grassy Woodland, OP = Otway Plain, VVP = Victorian Volcanic Plain, EN = Endangered, NA= Not Applicable, * Rounded to 2 decimal places.

5.2 Tree Assessment

5.2.1 Trees in habitat zones

Eighty five Large Old Trees (LOTS) were present in habitat zones within the study area (Tables 2a – 2g).

5.2.2 Scattered trees

Two hundred and fourteen scattered indigenous trees were recorded within the study area. Scattered indigenous trees were classified as Very Large Old Trees (VLOTs), Large Old Trees (LOTs), Medium Old Trees (MOTs) and Small Trees (STs) according to the Grassy Woodland and Plains Grassy Woodland EVC Benchmarks (DSE 2011). A summary of scattered indigenous trees recorded within the study area is outlined in Table 3. The size and species of scattered trees recorded is shown in Appendix 5.

Table 3. Quantification of Scattered Trees

Bioregion	Conservation Significance	Tree size	Total Number of Trees
VVP	High	VLOT	4
		LOT	19
		MOT	15
		ST	22
OP	High	VLOT	5
		LOT	71
		MOT	39
		ST	39

Notes: Tree Size: VLOT = Very Large Old Tree, LOT Large Old Tree, MOT = Medium Old Tree, ST = Small Tree, VVP = Victorian Volcanic Plain, OP = Otway Plain.

5.3 Summary of Net Gain Habitat Hectare and Tree Assessments

In summary, the study area consists of **4.25 habitat hectares** and **85 Large Old Trees** within remnant patches and 214 scattered trees, comprising:

Victorian Volcanic Plain bioregion

- **0.01 habitat hectares** of Very High conservation significance Plains Grassland;
- **0.10 habitat hectares** of High conservation significance Plains Grassland;
- **0.06 habitat hectares** of High conservation significance Plains Grassy Woodland
- **1 Large Old Tree** in a habitat zone; and,
- **60** scattered indigenous trees comprising 4 VLOTs, 19 LOTs, 15 MOTs and 22 STs.

Otway Plain bioregion

- **2.34 habitat hectares** of Very High conservation significance Grassy Woodland;
- **1.66 habitat hectares** of High conservation significance Grassy Woodland;
- **0.08 habitat hectares** of High conservation significance Plains Grassland; and,
- **84 Large Old Trees** in habitat zones; and,
- **154** scattered indigenous trees comprising 5 VLOTs, 71 LOTs, 39 MOTs and 39 STs.

The location of 'very high' and 'high' conservation significance vegetation within the study area is shown in Figure 6.

5.4 Modified Treeless Vegetation

Areas comprising greater than 25% cover of native grass species that were unlikely to have originally dominated the site have been mapped as 'Modified Treeless Vegetation'. Areas comprising less than 25% cover of scattered indigenous grasses were treated as 'Minor Treeless Vegetation' (DSE 2010b) (Figures 3a to 3i).

5.5 Assessment of Best or Remaining 50% Habitat for Threatened Species

Several significant flora and fauna species have been recorded within the vicinity of the study area (Figures 4 and 5), and remnant patches within the study area have the possibility of containing habitat for threatened flora and fauna. The habitat assessment in accordance with the *Native Vegetation Guide for assessment of referred planning permit applications* (DSE 2007a) is summarised in Table 4.

Table 4. *Habitat assessment for threatened species*

Step	Description	Outcome
A	Is the species, or has the species been recorded as resident on site> OR if the species is not 'resident' has it been recorded regularly (e.g. annually) on-site?	Yes – go to B No – go to D
B	Is it possible to discriminate between the importance of different populations of the species? For example, can numbers be reasonably estimated and is there available knowledge on what are typical population sizes?	Yes – go to C No – go to E
C	Does the site contain a population that is above average size or importance for the bioregion?	Yes – Best 50% of habitat No – remaining 50% of habitat
D	Does the habitat on site clearly meet one or more of the habitat requirements of the species? Is it reasonable to expect that the species is present or would make significant use of the site in the medium term (i.e. within the next 10 years)?	Yes to both – go to F No to either – no further consideration required for that species
E	Has some form of habitat modelling been undertaken for the species in the bioregion?	Yes – use this information to determine Best 50% of habitat or Remaining 50% of habitat No – go to F
F	Does the site represent above-average condition and landscape context for the relevant EVC or habitat type in the bioregion?	Yes – best 50% of habitat No – Remaining 50% of habitat

5.5.1 *Best or remaining 50% for rare and threatened flora species*

The determination of the best or remaining habitat for threatened flora species within the study area is provided in Table 5.

Table 5: *Habitat assessment for threatened flora*

Species	Conservation status	Habitat Zone	Steps (1)	Determination of Best 50% / Remaining 50% (2)	Conservation significance (3)	Notes
Melbourne Yellow-gum	Endangered	GW 2, 3, 7, 10, 11, 13, 16 & 17	A – yes, B – yes, C – yes	Best 50%	Very High	Species recorded within the habitat zones, above-average quality.
Melbourne Yellow-gum	Endangered	GW1, 4, 6, 8, 12 & 14	A – no, D – yes, F – no	Remaining 50%	High	Species recorded within the adjacent habitat zones, below-average quality.

(1) From Table 2 in the Guide for Assessment of Referred Planning Permit Applications (DSE 2007a) specify steps taken in habitat assessment to determine best 50% or remaining 50% of habitat.
(2) Specify 'best' or 'remaining'.
(3) Conservation significance of the habitat zone based on consideration of threatened species.
*Assessment based on DSE (2010c).

5.5.2 *Best or remaining 50% for rare and threatened fauna species*

The determination of the best or remaining habitat for threatened fauna species within the study area is provided in Table 6.

Table 6. *Habitat assessment for threatened fauna species*

Species	Conservation status	Habitat Zone	Steps (1)	Determination of Best 50% / Remaining 50% (2)	Conservation significance (3)	Notes
Growling Grass Frog	Endangered	n/a	A – no, D – no	No further consideration	n/a	Not recorded within the study area
Grey-headed Flying-fox	Vulnerable	PGW1, GW1	A – no, D – no	No further consideration	n/a	Recorded flying through study area

(1) From Table 2 in the Guide for Assessment of Referred Planning Permit Applications (DSE 2007a) specify steps taken in habitat assessment to determine best 50% or remaining 50% of habitat.
(2) Specify 'best' or 'remaining'.
(3) Conservation significance of the habitat zone based on consideration of threatened species.

5.5.3 *Summary of threatened species assessment*

Remnant vegetation within study area provides moderate to good quality habitat for one threatened flora species (Melbourne Yellow-gum). Habitat zones GW 2, 3, 7, 10, 11, 13, 16 & 17 are considered to be in the Best 50% and habitat zones GW1, 4, 6, 8, 12 & 14 are considered to be in the remaining 50% habitat for Melbourne Yellow-gum.

Potential habitat for two additional threatened fauna species (Growling Grass Frog and Grey-headed Flying-fox) was present within the study area. However, habitat for Growling Grass Frog was limited to farm dams and Grey-headed Flying-fox was only observed flying across

the study area. Based on the survey results it was considered that these species would not make significant use of the study area.

6 NET GAIN IMPLICATIONS

6.1 Overview

Net Gain is an overall outcome where native vegetation and habitat gains are greater than vegetation and habitat losses. Victoria's *Native Vegetation Management – A Framework for Action* (NRE 2002) (the Framework) has defined a three-step approach for applying Net Gain to protection and clearance decisions. Emphasis is placed on the first two steps, and only after these two steps have been taken should offsets (actions undertaken to achieve commensurate gains) be considered (NRE 2002). The three-step approach is:

1. To avoid adverse impacts, particularly through vegetation clearance.
2. If impacts cannot be avoided, to minimise impacts through appropriate consideration in planning processes and expert input to project design or management.
3. Identify appropriate offset options.

6.1.1 Avoidance (Step one)

Avoidance may generally be interpreted as avoiding adverse vegetation impacts, such as the clearance of habitat zones and trees, and the vegetation being retained post construction (NRE 2002).

No detailed development plans of the Horseshoe Bend Precinct were available at the time of the assessment. Therefore, the losses and associated gain targets are based on the potential removal of all remnant vegetation from within the study area.

In previous development proposals from adjacent modified areas, DSE has identified that 90% of remnant vegetation can be avoided through initial planning and design. Any future development of the study area should aim to avoid the loss of remnant native vegetation, through the strategic placement of the development footprint. Trees can only be considered retained if they are fenced off to at least the drip line, and do not become a public risk (i.e. under the tree it is landscaped to prevent human access).

6.1.2 Minimisation (Step two)

Minimisation may generally be interpreted as minimising impacts on scattered trees or habitat patches through appropriate consideration in planning processes and expert input to project design or management (NRE 2002). If the modification of development plans does not enable the proponent to avoid all adverse impacts to native vegetation, there are several activities that can assist to minimise impacts on native vegetation on site and in adjoining areas, thus satisfying the first two stages of avoid and minimise under the Framework (NRE 2002).

To minimise the loss of vegetation within the study area the following should be considered:

- Appropriate consideration in planning processes and expert input into project design and management.

- Temporary fencing should be installed around retained areas of remnant vegetation to minimise disturbance (i.e. designated 'no-go' areas) prior to construction.

- Tree Retention Zones (TRZs) should be implemented to prevent indirect losses of native vegetation during construction activities (DSE 2010b), and at a minimum standard of a TRZ should include:

    - A TRZ of trees should be no less than 2 metres or greater than 15 metres;

    - Construction, 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;

    - Subject to qualified arborist confirming that it is appropriate for the specific works, directional drilling may be used for works within the TRZ without being considered encroachment. The directional bore should be at least 600 mm deep. An arborist should also confirm that the radius of the bore will not significantly damage the tree causing it to be lost in the future.

Where the minimum standard for a TRZ has not been met an offset may be required (DSE 2010b).

6.1.3 Offset Calculations (Step three)

Once steps 1 and 2 have been considered, then offsets or Net Gain targets can be calculated for any permitted vegetation clearance. The Framework (NRE 2002) sets out responses, including like for like criteria and Net Gain ratios, to proposals to clear and offset native vegetation, based on the conservation significance of the vegetation, (NRE 2002), which is determined by the habitat score and bioregional conservation status from Appendix 3, Table 5 of the Framework (NRE 2002).

To meet the objectives of the Net Gain policy, offset criteria must be met, and at least:

- 2 times the habitat hectare loss for Very High conservation significance; and,

- 1.5 times the habitat hectare loss for High conservation significance sites.

The quality and extent of native vegetation within the study area has been summarised in section 3.3. Net Gain targets based on these proposed losses are summarised in Table 7.

Table 7. Net Gain habitat hectare targets

Habitat Hectares Target							Large Old Tree Target				
Bioregion	Target No.	Conservation Significance	Target EVC	Total Losses in Habitat Ha	Net Gain Multiplier*	Net Gain Target (Habitat Ha)	Total Losses	Multiplier*	Total to be Protected	Multiplier*	Total to be Recruited
VVP	1	**Very High**	PG	0.01	2	0.02	0	8	0	40	0
VVP	2	**High**	PG	0.10	1.5	0.15	0	4	0	20	0
VVP	1	**High**	PGW	0.06	1.5	0.09	1	4	4	20	20
OP	1	**Very High**	GW	2.34	2	4.68	78	8	624	40	3120
OP	2	**High**	GW	1.66	1.5	2.49	6	4	24	20	120
OP	2	**High**	PG	0.08	1.5	0.12	0	4	0	20	0
			TOTAL	**4.25**	**TOTAL**	**7.55**	**85**		**652**		**3260**

Notes: *These multipliers relate to Table 6 of the Framework; #Net Gain losses are based on assumed loss of all vegetation within the study area; GW = Grassy Woodland, PGW = Plains Grassy Woodland, OP = Otway Plain, VVP = Victorian Volcanic Plain, n/a = not applicable.

6.1.4 Scattered Tree Offsets

The scattered trees are assigned the lowest conservation status rating from the EVC in which they would have originated. As these trees represent Grassy Woodland and Plains Grassy Woodland, both with a conservation status of Endangered within the Otway Plain and Victorian Volcanic Plain bioregions, they are assigned a conservation significance rating of 'high' (NRE 2002). The offset requirements for the loss of scattered trees within the study area are outlined in Tables 8 and 9. Net Gain targets based on scattered tree losses are based on the Framework (NRE 2002) and the Corangamite Native Vegetation Plan (CCMA 2005).

Table 8. Protect and recruit offset requirements for scattered trees

Bioregion	Conservation significance	Size	No. trees to be removed#	Protect		Recruit	
				Multiplier	Offset total	Multiplier	Offset total
VVP	High	VLOT	4	4	16	20	80
VVP	High	LOT	19	2	38	10	190
VVP	High	MOT	15	1	15	5	75
VVP	High	ST	22	0	0	50	1100
OP	High	VLOT	5	4	20	20	100
OP	High	LOT	71	2	142	10	710
OP	High	MOT	39	1	39	5	195
OP	High	ST	39	0	0	50	1950
Total			**214**		**331**	**Total**	**4400**

Notes: Multipliers relate to Table 6 of the Framework (NRE 2002); VLOT = Very Large Old Tree LOT = Large Old Tree, MOT = Medium Old Tree, ST = Small Tree, OP = Otway Plain, VVP = Victorian Volcanic Plain.

Table 9. Recruit only offset requirements for scattered trees#

Bioregion	Size class	No. proposed to be removed	Offset requirement per tree	Total plants required for offset
VVP	VLOT	4	Recruit 200 new plants	Recruit 800 new plants
VVP	LOT	19	Recruit 100 new plants	Recruit 1900 new plants
VVP	MOT	15	Recruit 50 new plants	Recruit 750 new plants
VVP	ST	22	Recruit 50 new plants	Recruit 1100 new plants
OP	VLOT	5	Recruit 200 new plants	Recruit 1000 new plants
OP	LOT	71	Recruit 100 new plants	Recruit 7100 new plants
OP	MOT	39	Recruit 50 new plants	Recruit 1950 new plants
OP	ST	39	Recruit 50 new plants	Recruit 1950 new plants
Total				**16550**

Notes: Multipliers relate to Table 6 of the Framework (NRE 2002); VLOT = Very Large Old Tree LOT = Large Old Tree, MOT = Medium Old Tree, OP = Otway Plain, VVP = Victorian Volcanic Plain.

6.2 Summary of Net Gain Targets

The Net Gain targets for removal of native vegetation and large old trees in remnant patches within the study area consists of a total of **7.55 habitat hectares**, comprising:

Victorian Volcanic Plain bioregion

- **0.02 habitat hectares** of Very High conservation significance Plains Grassland;
- **0.15 habitat hectares** of High conservation significance Plains Grassland;
- **0.09 habitat hectares** of High conservation significance Plains Grassy Woodland; and,
- Protect **4 large old trees** and recruit **20 new trees**.

To offset for the loss of 60 scattered trees using the 'protect and recruit' option there is a requirement to protect to 16 VLOTs, 38 LOTs, 15 MOTs and recruit 1445 new trees. Alternatively, the 'recruitment only' option would require a total of 4550 new trees or plants to be recruited.

Otway Plain bioregion

- **4.68 habitat hectares** of Very High conservation significance Grassy Woodland;
- **2.49 habitat hectares** of High conservation significance Grassy Woodland;
- **0.12 habitat hectares** of High conservation significance Plains Grassland; and,
- Protect **648 large old trees** and recruit **3240 new trees**.

To offset for the loss of 154 scattered trees using the 'protect and recruit' option there is a requirement to protect to 20 VLOTs, 142 LOTs, 39 MOTs and recruit 2955 new trees.

Alternatively, the 'recruitment only' option would require a total of 12,000 new trees or plants to be recruited.

All gains are required to be generated from the Victorian Volcanic Plain and Otway Plain bioregions in order meet the objectives of the Net Gain policy.

In determining the appropriate offset responses for permitted vegetation clearance, the Framework sets out several 'like for like' criteria in Table 6, Appendix 4, which must generally be considered for any offset site (NRE 2002). In order to locate an offset site for vegetation of very high conservation significance, there is a requirement that the offset be:

- The same vegetation/habitat type;
- Similar or more effective ecological function AND land protection function as impacted by the loss; and,
- The existing vegetation proposed as an offset must be at least 90% of the quality of the area being lost.

In order to locate an offset site for vegetation of high conservation significance, there is a requirement that the offset be:

- The same vegetation/habitat type OR a Very High significance vegetation/habitat in the same bioregion;
- Similar or more effective ecological function OR land protection function as impacted by the loss.
- At least 75% of the quality of the vegetation being lost.

7 POTENTIAL IMPACTS AND MITIGATION MEASURES

Any loss of ecological values should be viewed in the overall context of on-going loss, fragmentation, and deterioration in the quality of remnant vegetation throughout the greater Otway Plain and Victorian Volcanic Plain bioregions. The proposed development is likely to have a localised impact on indigenous flora and fauna species habitats, within an otherwise modified landscape.

No nationally significant flora species are likely to be directly affected as a result of any development of the study area. Future development has the potential to impact a population of the state significant Melbourne Yellow Gum and areas comprising two nationally listed ecological communities (NTGVVP and GEWVVP), and remnant vegetation associated with Grassy Woodland, Plains Grassland and Plains Grassy Woodland.

Based on the results of targeted surveys, lack of connectivity to known sites and the paucity of records within the local area, there is a low likelihood of occurrence for Growling Grass Frog to occur within the study area for breeding or foraging purposes.

Measures to mitigate/ameliorate potential impacts on the ecological values in the study area include:

- Any future development should address the first two principles of three-step approach of the Framework to ‘avoid’ and ‘minimise’ impacts to remnant native vegetation, which reduces the requirement for vegetation removal, and can reduce the Net Gain targets;
- A Construction Environment Management Plan should be developed prior to any works commencing on the project. This plan should include:
    - A Weed Management Plan to control listed noxious and environmental weeds during each construction phase;
    - Best practice sedimentation and pollution control measures to the satisfaction of Environmental Protection Authority to minimise/avoid sedimentation and deterioration in water quality;
    - Where construction is identified adjacent to areas of ecological value, these sites should be fenced and identified as ‘no go’ areas to avoid disturbance during the construction phase of the project;
    - Where possible, construction stockpiles, machinery, roads, and other infrastructure should be placed away from areas supporting native vegetation, large old trees and/or wetlands; and,
- Where revegetation works may be required, use indigenous plants associated with the relevant EVC as part of any landscaping works to increased habitat for native fauna.

8 CONCLUSION

Ecological Significance

Based on the available information and the results of the site assessment, remnant vegetation within the study area is considered of at least high local conservation significance due to the presence of:

- Remnant vegetation associated with three Ecological Vegetation Classes (Grassy Woodland, Plains Grassland and Plains Grassy Woodland) listed as Endangered in the Victorian Volcanic Plain and Otway Plain bioregions;
- Two nationally listed ecological communities (*Natural Temperate Grassland of the Victorian Volcanic Plain* and *Grassy Eucalypt Woodland of the Victorian Volcanic Plain*);
- One state listed floristic community (*Western (Basalt) Plains Grassland*) listed as Threatened under the FFG Act;
- One state listed flora species (Melbourne Yellow-Gum) listed as Endangered in Victoria;
- One nationally listed fauna species (Grey-headed Flying-fox); and,
- Potential suitable habitat for one national listed fauna species (Growling Grass Frog).

Significant Species and Communities

Flora

One hundred and forty two flora species (67 indigenous and 75 exotic) were recorded in the study area during the assessment. No nationally listed significant flora species was recorded within the study area. One state listed flora species (Melbourne Yellow Gum) was recorded during the assessment.

Fauna

Eighty fauna species were recorded during the field survey, comprising 64 birds (56 native and eight introduced), seven mammals (three native and four introduced), six frog species (all native), two native reptiles and one introduced fish species. One nationally significant species (Grey-headed Flying-fox) was recorded during the assessment.

Significant communities

Two nationally listed ecological communities (NTGVVP and GEWVVP) were recorded during the field assessment in the north eastern section of the study area and have been mapped as Plains Grassland (NTGVVP), and Plains Grassy Woodland (GEWVVP).

One state listed floristic community (*Western (Basalt) Plains Grassland*) listed as Threatened under the FFG Act, was also recorded within the Victorian Volcanic Plain section of the study area and has been mapped as Plains Grassland (Figures 3c; 3f; 3i).

Targeted surveys and Habitat Assessment

Growling Grass Frog (including tadpoles or metamorphs) was not recorded within the study area during targeted surveys. The majority of waterbodies within the study area were highly modified as a result of grazing and the prevalence of exotic vegetation and did not support suitable habitat characteristics for Growling Grass Frog. Of the 28 sites assessed, 11 provided suitable habitat for Growling Grass Frog (i.e. good water quality and high levels of aquatic and semi-aquatic vegetation).

Based on the results of targeted surveys, the lack of connectivity to known sites and the paucity of records within the local area, there is a low likelihood of occurrence for Growling Grass Frog within the study area for breeding or foraging purposes.

Net Gain Assessment

In summary, the study area consists of **4.25 habitat hectares** and **85 Large Old Trees** within remnant patches and 214 scattered trees, comprising:

Victorian Volcanic Plain bioregion

- **0.01 habitat hectares** of Very High conservation significance Plains Grassland;
- **0.10 habitat hectares** of High conservation significance Plains Grassland;
- **0.06 habitat hectares** of High conservation significance Plains Grassy Woodland
- **1 Large Old Tree** in a habitat zone; and,
- **60** scattered indigenous trees comprising 4 VLOTs, 19 LOTs, 15 MOTs and 22 STs.

Otway Plain bioregion

- **2.34 habitat hectares** of Very High conservation significance Grassy Woodland;
- **1.66 habitat hectares** of High conservation significance Grassy Woodland;
- **0.08 habitat hectares** of High conservation significance Plains Grassland; and,
- **84 Large Old Trees** in habitat zones; and,

- **154** scattered indigenous trees comprising 5 VLOTs, 71 LOTs, 39 MOTs and 39 STs.

Vegetation Losses

No detailed development plans of the Horseshoe Bend Precinct were available at the time of the assessment. Therefore, the losses and associated gain targets are based on the potential removal of all remnant vegetation from within the study area

Avoidance and Minimisation

In previous development proposals from adjacent modified areas, DSE has identified that 90% of remnant vegetation can be avoided through initial planning and design. Any future development of the study area should aim to avoid the loss of remnant native vegetation, through the strategic placement of the development footprint. Trees can only be considered retained if they are fenced off to at least the drip line, and do not become a public risk (i.e. under the tree it is landscaped to prevent human access).

To minimise the loss of vegetation within the study area the following should be considered:

- Appropriate consideration in planning processes and expert input into project design and management.
- Temporary fencing should be installed around remnant vegetation to minimise disturbance (i.e. designated 'no-go' areas) prior to construction.
- Tree Retention Zones should be implemented to prevent indirect losses of native vegetation during construction activities.

Net Gain Targets

The Net Gain targets for removal of native vegetation and large old trees in remnant patches within the study area consists of a total of **7.55 habitat hectares**, comprising:

Victorian Volcanic Plain bioregion

- **0.02 habitat hectares** of Very High conservation significance Plains Grassland;
- **0.15 habitat hectares** of High conservation significance Plains Grassland;
- **0.09 habitat hectares** of High conservation significance Plains Grassy Woodland; and,
- Protect **4 large old trees** and recruit **20 new trees**.

To offset for the loss of 60 scattered trees using the 'protect and recruit' option there is a requirement to protect to 16 VLOTs, 38 LOTs, 15 MOTs and 22 STs and recruit 1455 new trees. Alternatively, the 'recruitment only' option would require a total of 4550 new trees or plants to be recruited.

Otway Plain bioregion

- **4.68 habitat hectares** of Very High conservation significance Grassy Woodland;
- **2.49 habitat hectares** of High conservation significance Grassy Woodland;
- **0.12 habitat hectares** of High conservation significance Plains Grassland; and,
- Protect **648 large old trees** and recruit **3240 new trees**.

To offset for the loss of 154 scattered trees using the 'protect and recruit' option there is a requirement to protect to 20 VLOTs, 142 LOTs, 39 MOTs and 39 STs and recruit 2955 new trees. Alternatively, the 'recruitment only' option would require a total of 12,000 new trees or plants to be recruited.

All gains are required to be generated from the Victorian Volcanic Plain and Otway Plain bioregions (where applicable) in order meet the objectives of the Net Gain policy.

Potential impacts and mitigation measures

No nationally significant flora species are likely to be directly affected as a result of any development of the study area. Future development has the potential to impact a population of the state significant Melbourne Yellow Gum and areas comprising two nationally listed ecological communities (NTGVVP and GEWVVP), and remnant vegetation associated with Grassy Woodland, Plains Grassland and Plains Grassy Woodland.

Measures to mitigate/ameliorate potential impacts on the ecological values in the study area include:

- Any future development should address the first two principles of three-step approach of the Framework to 'avoid' and 'minimise' impacts to remnant native vegetation, which reduces the requirement for vegetation removal, and can reduce the Net Gain targets;
- A Construction Environment Management Plan should be developed prior to any works commencing on the project. This plan should include:
    - A Weed Management Plan to control listed noxious and environmental weeds during each construction phase;
    - Best practice sedimentation and pollution control measures to the satisfaction of Environmental Protection Authority to minimise/avoid sedimentation and deterioration in water quality;
    - Where construction is identified adjacent to areas of ecological value, these sites should be fenced and identified as 'no go' areas to avoid disturbance during the construction phase of the project;

- Where possible, construction stockpiles, machinery, roads, and other infrastructure should be placed away from areas supporting native vegetation, large old trees and/or wetlands; and,

- Where revegetation works may be required, use indigenous plants associated with the relevant EVC as part of any landscaping works to increased habitat for native fauna.

Additional Requirements

A Native Vegetation Precinct Plan is considered appropriate to inform the planning process and provide a clear direction about the extent of native vegetation removal within the Horseshoe Bend Precinct.

Once detailed development plans are available, an assessment about the requirement for an EPBC Act referral to the Commonwealth Environment Minister referral should be made to determine the potential impacts on matters of NES (i.e. NTGVVP and GEWVVP ecological communities) from future development of the Horseshoe Bend Precinct.

FIGURES

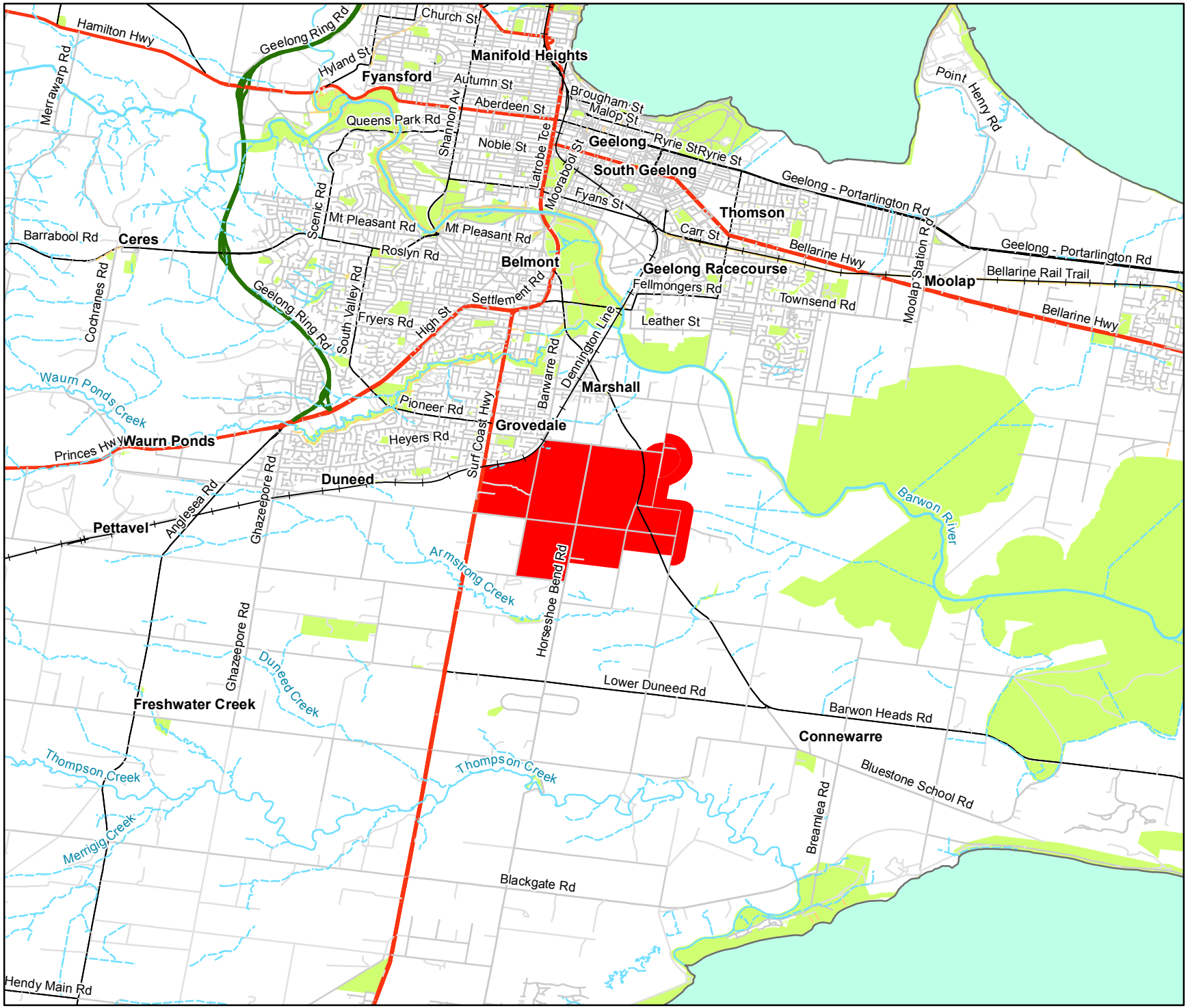
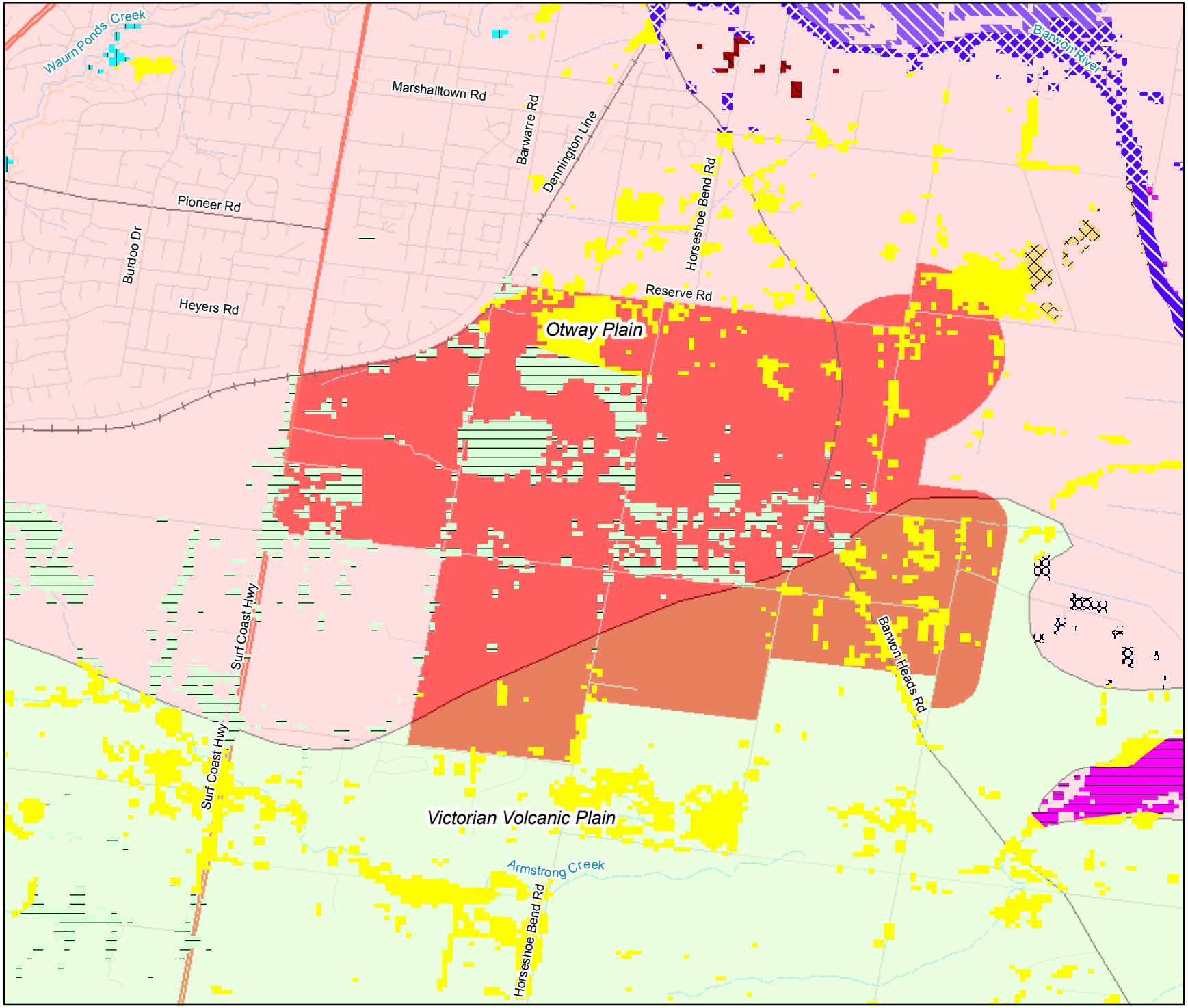


Figure 1
Location of the Study Area
Horseshoe Bend Precint

ecologypartners

2300_Fig1_Study_area_13Jan11.mxd
13/1/2011 RG



Current EVC extent

- Cane Grass-Lignum Halophytic Herbland
- Coastal Alkaline Scrub
- Coastal Saltmarsh/Mangrove Shrubland Mosaic
- Floodplain Riparian Woodland
- Grassy Woodland
- Lignum Swamp
- Plains Grassland
- Plains Sedgy Wetland
- Swampy Riparian Woodland
- Water Body - Fresh

Bioregions

- Otway Plain
- Victorian Volcanic Plain
- Study Area

Figure 2
Current EVC extent and Bioregion boundary
Horseshoe Bend Precint

N

0 0.5 1
Kilometres

ecologypartners

2300_Fig02_EVC_current_13Jan11.mxd
13/1/2011 RG

Legend

Ecological Features

- Plains Grassland
- Plains Grassy Woodland
- Grassy Woodland
- Modified Treeless Vegetation
- Minor Treeless Vegetation
- Potential Wildlife Habitat

Scattered trees

- Very Large Old Tree
- Large Old Tree
- Medium Old Tree
- Small Tree
- Large Old Trees in patches
- Waterbodies
- Horseshoe Bend Precinct
- Additional 200m Buffer

Armstrong Creek East Precinct

- Habitat Zones NVPP
- LOTs in HZ NVPP

Major Activity Centre Precinct

- Habitat Zones in NVPP
- Degraded treeless vegetation
- Trees in NVPP

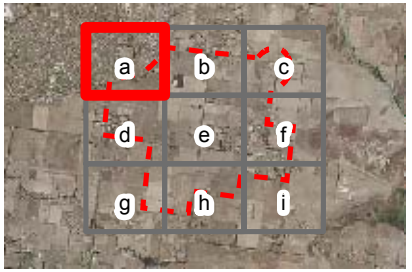


Figure 3a
Ecological features within the study area
Horsehoe Bend Precinct

N

0 100 200
Metres

ecologypartners

Legend

Ecological Features

- Plains Grassland
- Plains Grassy Woodland
- Grassy Woodland
- Modified Treeless Vegetation
- Minor Treeless Vegetation
- Potential Wildlife Habitat

Scattered trees

- Very Large Old Tree
- Large Old Tree
- Medium Old Tree
- Small Tree
- Large Old Trees in patches
- Waterbodies
- Horseshoe Bend Precinct
- Additional 200m Buffer

Armstrong Creek East Precinct

- Habitat Zones NVPP
- LOTs in HZ NVPP

Major Activity Centre Precinct

- Habitat Zones in NVPP
- Degraded treeless vegetation
- Trees in NVPP

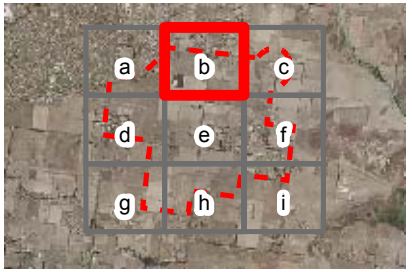


Figure 3b

Ecological features within the study area

Horsehoe Bend Precinct

N

0 100 200

Metres

ecologypartners

2300_Fig03_Eco_features_27OCT11.mxd 27/10/11 RLG

Legend

Ecological Features

- Plains Grassland
- Plains Grassy Woodland
- Grassy Woodland
- Modified Treeless Vegetation
- Minor Treeless Vegetation
- Potential Wildlife Habitat

Scattered trees

- Very Large Old Tree
- Large Old Tree
- Medium Old Tree
- Small Tree
- Large Old Trees in patches
- Waterbodies
- Horseshoe Bend Precinct
- Additional 200m Buffer

Armstrong Creek East Precinct

- Habitat Zones NVPP
- LOTs in HZ NVPP

Major Activity Centre Precinct

- Habitat Zones in NVPP
- Degraded treeless vegetation
- Trees in NVPP

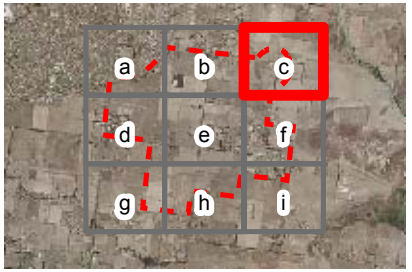


Figure 3c

Ecological features within the study area

Horsehoe Bend Precinct

N

0 100 200

Metres

ecologypartners

2300_Fig03_Eco_features_27OCT11.mxd 27/10/11 RLG

Legend

Ecological Features

- Plains Grassland
- Plains Grassy Woodland
- Grassy Woodland
- Modified Treeless Vegetation
- Minor Treeless Vegetation
- Potential Wildlife Habitat

Scattered trees

- Very Large Old Tree
- Large Old Tree
- Medium Old Tree
- Small Tree
- Large Old Trees in patches
- Waterbodies
- Horseshoe Bend Precinct
- Additional 200m Buffer

Armstrong Creek East Precinct

- Habitat Zones NVPP
- LOTs in HZ NVPP

Major Activity Centre Precinct

- Habitat Zones in NVPP
- Degraded treeless vegetation
- Trees in NVPP

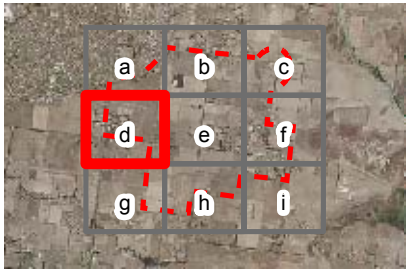


Figure 3d

Ecological features within the study area

Horsehoe Bend Precinct

0 100 200

Metres

N

ecologypartners

Legend

Ecological Features

- Plains Grassland
- Plains Grassy Woodland
- Grassy Woodland
- Modified Treeless Vegetation
- Minor Treeless Vegetation
- Potential Wildlife Habitat

Scattered trees

- Very Large Old Tree
- Large Old Tree
- Medium Old Tree
- Small Tree
- Large Old Trees in patches
- Waterbodies
- Horseshoe Bend Precinct
- Additional 200m Buffer

Armstrong Creek East Precinct

- Habitat Zones NVPP
- LOTs in HZ NVPP

Major Activity Centre Precinct

- Habitat Zones in NVPP
- Degraded treeless vegetation
- Trees in NVPP

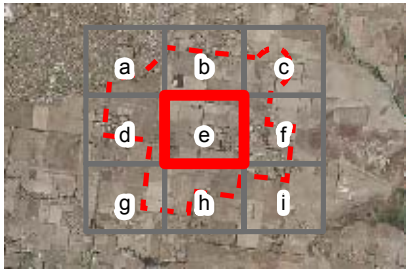


Figure 3e
Ecological features within the study area
Horsehoe Bend Precinct

N

0 100 200
Metres

ecologypartners

Legend

Ecological Features

- Plains Grassland
- Plains Grassy Woodland
- Grassy Woodland
- Modified Treeless Vegetation
- Minor Treeless Vegetation
- Potential Wildlife Habitat

Scattered trees

- Very Large Old Tree
- Large Old Tree
- Medium Old Tree
- Small Tree
- Large Old Trees in patches
- Waterbodies
- Horseshoe Bend Precinct
- Additional 200m Buffer

Armstrong Creek East Precinct

- Habitat Zones NVPP
- LOTs in HZ NVPP

Major Activity Centre Precinct

- Habitat Zones in NVPP
- Degraded treeless vegetation
- Trees in NVPP

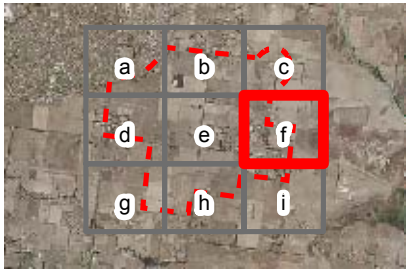


Figure 3f

Ecological features within the study area

Horsehoe Bend Precinct

N

0 100 200

Metres

ecologypartners

2300_Fig03_Eco_features_27OCT11.mxd 27/10/11 RLG

Legend

Ecological Features

- Plains Grassland
- Plains Grassy Woodland
- Grassy Woodland
- Modified Treeless Vegetation
- Minor Treeless Vegetation
- Potential Wildlife Habitat

Scattered trees

- Very Large Old Tree
- Large Old Tree
- Medium Old Tree
- Small Tree
- Large Old Trees in patches
- Waterbodies
- Horseshoe Bend Precinct
- Additional 200m Buffer

Armstrong Creek East Precinct

- Habitat Zones NVPP
- LOTs in HZ NVPP

Major Activity Centre Precinct

- Habitat Zones in NVPP
- Degraded treeless vegetation
- Trees in NVPP

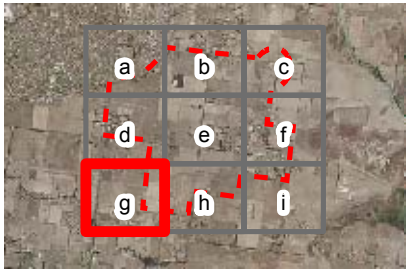


Figure 3g
Ecological features within the study area
Horsehoe Bend Precinct

N

0 100 200
Metres

ecologypartners

2300_Fig03_Eco_features_27OCT11.mxd 27/10/11 RLG

Legend

Ecological Features

- Plains Grassland
- Plains Grassy Woodland
- Grassy Woodland
- Modified Treeless Vegetation
- Minor Treeless Vegetation
- Potential Wildlife Habitat

Scattered trees

- Very Large Old Tree
- Large Old Tree
- Medium Old Tree
- Small Tree
- Large Old Trees in patches
- Waterbodies
- Horseshoe Bend Precinct
- Additional 200m Buffer

Armstrong Creek East Precinct

- Habitat Zones NVPP
- LOTs in HZ NVPP

Major Activity Centre Precinct

- Habitat Zones in NVPP
- Degraded treeless vegetation
- Trees in NVPP

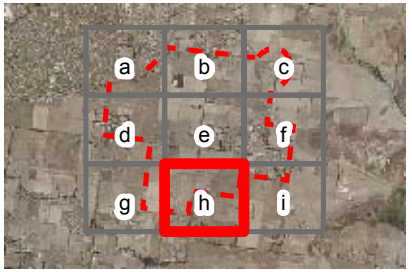


Figure 3h

Ecological features within the study area

Horsehoe Bend Precinct

N

0 100 200

Metres

ecologypartners

2300_Fig03_Eco_features_27OCT11.mxd 27/10/11 RLG

Legend

Ecological Features

- Plains Grassland
- Plains Grassy Woodland
- Grassy Woodland
- Modified Treeless Vegetation
- Minor Treeless Vegetation
- Potential Wildlife Habitat

Scattered trees

- Very Large Old Tree
- Large Old Tree
- Medium Old Tree
- Small Tree
- Large Old Trees in patches
- Waterbodies
- Horseshoe Bend Precinct
- Additional 200m Buffer

Armstrong Creek East Precinct

- Habitat Zones NVPP
- LOTs in HZ NVPP

Major Activity Centre Precinct

- Habitat Zones in NVPP
- Degraded treeless vegetation
- Trees in NVPP

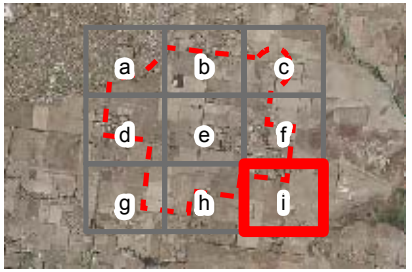


Figure 3i

Ecological features within the study area

Horsehoe Bend Precinct

N

0 100 200

Metres

ecologypartners

2300_Fig03_Eco_features_27OCT11.mxd 27/10/11 RLG

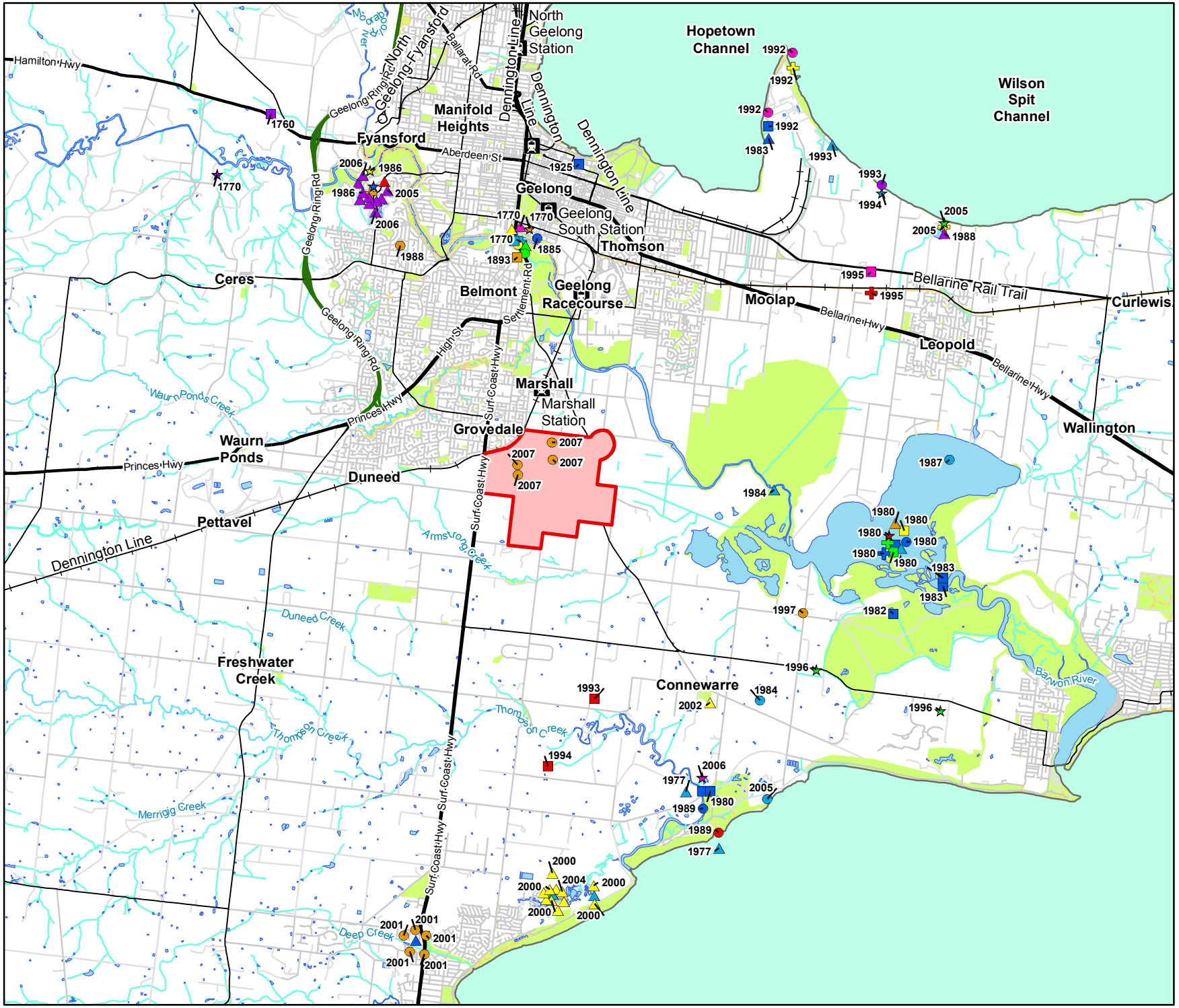


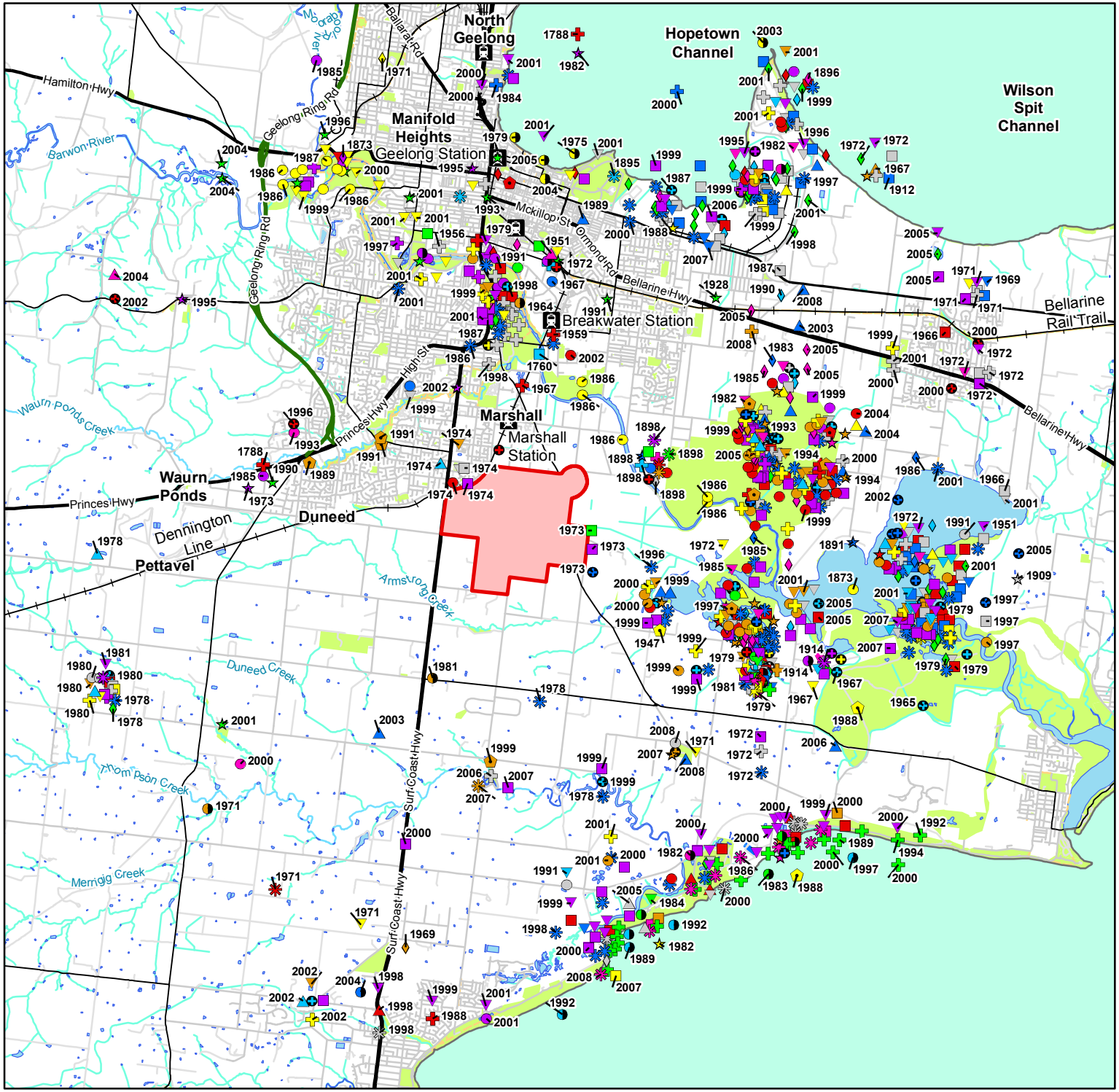
Figure 4

Significant Flora Records within 10km radius of the Study Area

Horseshoe Bend Precinct

ecologypartners

2300_Fig04_SigFlora_21Dec10.mxd 21/12/2010 ALF



- Australasian Bittern
- Australasian Shoveler
- Australian Grayling
- Australian Painted Snipe
- Australian Pratincole
- Azure Kingfisher
- Baillon's Crake
- Barking Owl
- Black Falcon
- Black-browed Albatross
- Black-faced Cormorant
- Black-tailed Godwit
- Blue Petrel
- Blue-billed Duck
- Brolga
- Brown Quail
- Brown Treecreeper (south-eastern ssp.)
- Cape Barren Goose
- Caspian Tern
- Common Diving-Petrel
- Common Sandpiper
- Diamond Firetail
- Eastern Barred Bandicoot
- Eastern Curlew
- Eastern Great Egret
- Fairy Prion
- Fairy Tern
- Freckled Duck
- Glossy Ibis
- Great Knot
- Grey Goshawk
- Grey Plover
- Grey-crowned Babbler
- Grey-headed Flying-fox
- Grey-tailed Tattler
- Ground Parrot
- Growling Grass Frog
- Gull-billed Tern
- Hardhead
- Hooded Plover
- Hooded Robin
- Humpback Whale
- Intermediate Egret
- King Quail
- Latham's Snipe
- Lewin's Rail
- Little Bittern
- Little Button-quail
- Little Egret
- Little Tern
- Long-toed Stint
- Macquarie Perch
- Magpie Goose
- Masked Owl
- Murray Cod
- Musk Duck
- Nankeen Night Heron
- Northern Giant-Petrel
- Orange-bellied Parrot
- Pacific Golden Plover
- Pacific Gull
- Pectoral Sandpiper
- Pied Cormorant
- Plains-wanderer
- Powerful Owl
- Red Knot
- Red-chested Button-quail
- Regent Honeyeater
- Royal Spoonbill
- Rufous Bristlebird (Otways subsp.)
- Sanderling
- Shy Albatross
- Sooty Oystercatcher
- Southern Brown Bandicoot
- Southern Elephant Seal
- Southern Giant-Petrel
- Southern Right Whale
- Southern Toadlet
- Speckled Warbler
- Spotted Harrier
- Spotted Quail-thrush
- Swift Parrot
- Terek Sandpiper
- Wandering Albatross
- Whimbrel
- Whiskered Tern
- White-bellied Sea-Eagle
- White-faced Storm-Petrel
- White-fronted Tern
- White-winged Black Tern
- Wood Sandpiper
- Yarra Pigmy Perch
- Yellow Sedge-skipper
- Yellow-nosed Albatross
- Study Area

Figure 5

Significant Fauna Records within 10km radius of the Study Area

Horseshoe Bend Precinct

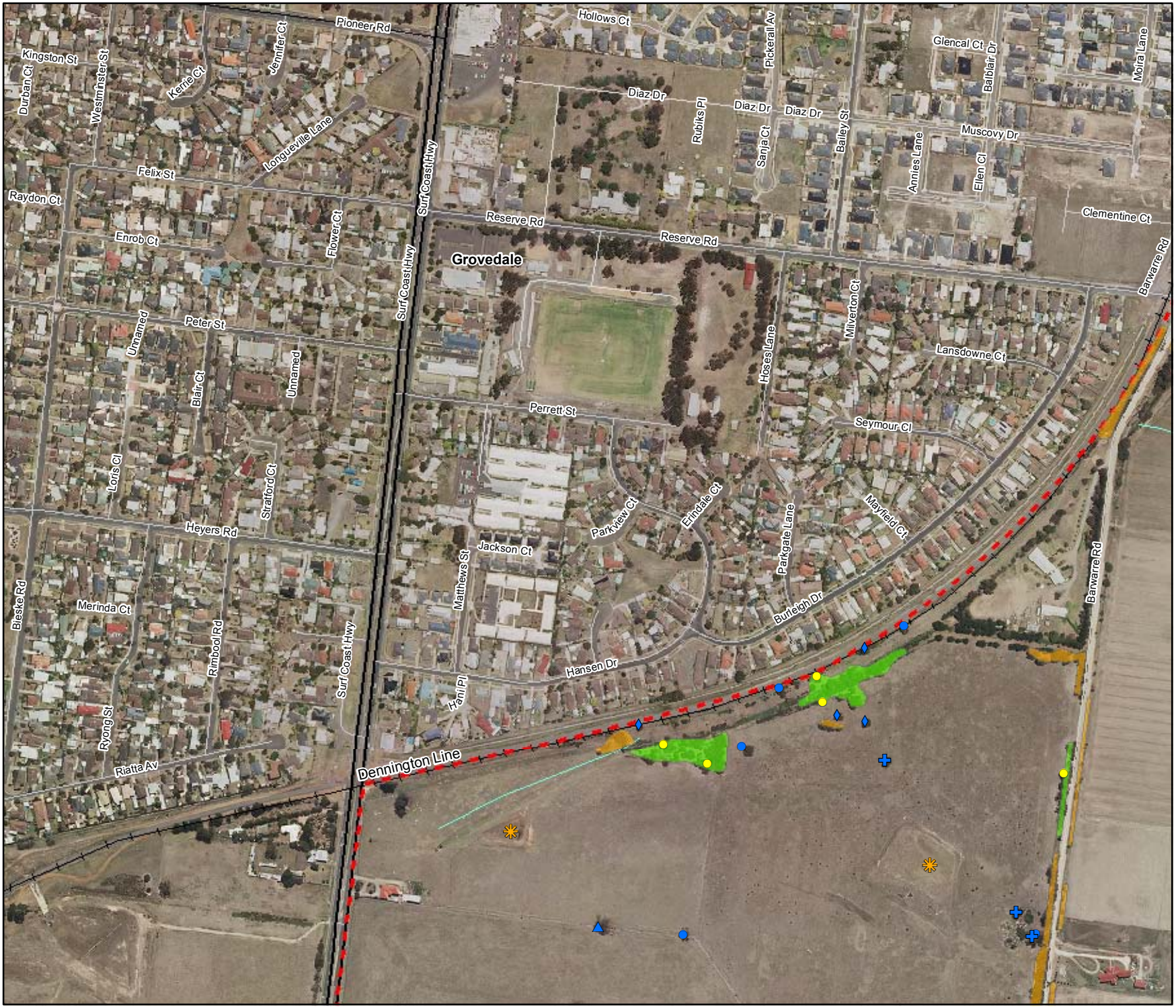
N

0 2 4

Kilometers

ecologypartners

2300_Fig05_SigFauna_21Dec10.mxd 21/12/2010 ALF



Conservation Significance

- High
- Very High

Trees

- Very Large Old Tree
- Large Old Tree
- Medium Old Tree
- Small Tree
- Large Old Trees in patches
- Waterbodies
- Horseshoe Bend Precinct
- Additional 200m Buffer

Figure 6a
Conservation Significance of patches within the study area and adjacent precincts
Horseshoe Bend Precinct

N

0 75 150
Metres

ecology & heritage partners

2300__Fig06_Cons_sig.mxd 2/2/12 RLG

Conservation Significance
- High
- Very High

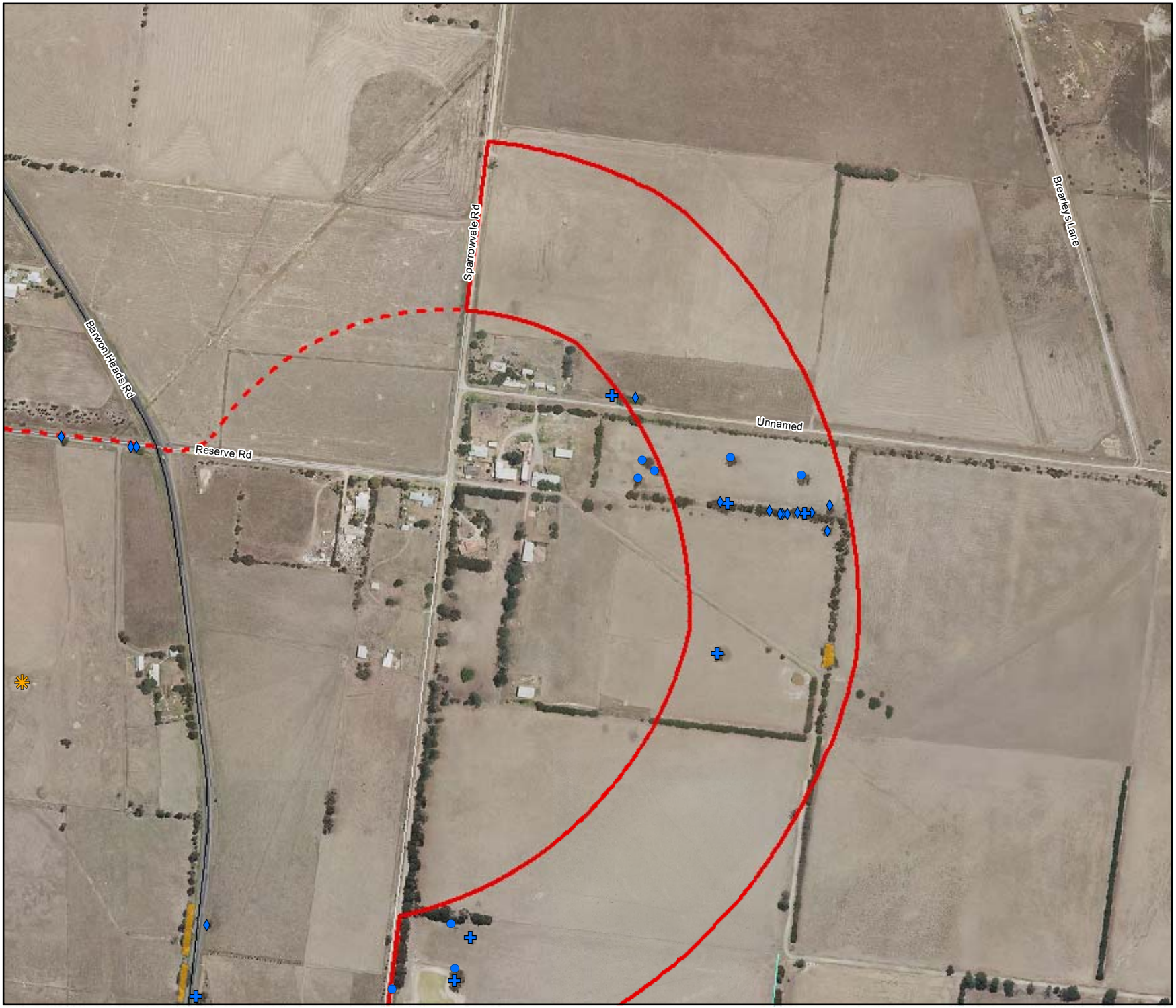
Trees
- Very Large Old Tree
- Large Old Tree
- Medium Old Tree
- Small Tree
- Large Old Trees in patches
- Waterbodies
- Horseshoe Bend Precinct
- Additional 200m Buffer

Figure 6b
Conservation Significance of patches within the study area and adjacent precincts
Horsehoe Bend Precinct

N
0 75 150
Metres

ecology & heritage partners

2300__Fig06_Cons_sig.mxd 2/2/12 RLG



Conservation Significance
- High
- Very High

Trees
- Very Large Old Tree
- Large Old Tree
- Medium Old Tree
- Small Tree
- Large Old Trees in patches
- Waterbodies
- Horseshoe Bend Precinct
- Additional 200m Buffer

Figure 6c
Conservation Significance of patches within the study area and adjacent precincts
Horsehoe Bend Precinct

N
0 75 150
Metres

ecology & heritage partners

2300__Fig06_Cons_sig.mxd 2/2/12 RLG

Conservation Significance
- High
- Very High

Trees
- Very Large Old Tree
- Large Old Tree
- Medium Old Tree
- Small Tree
- Large Old Trees in patches
- Waterbodies
- Horseshoe Bend Precinct
- Additional 200m Buffer

Figure 6d
Conservation Significance of patches within the study area and adjacent precincts
Horsehoe Bend Precinct

N
0 75 150
Metres

ecology & heritage partners

2300__Fig06_Cons_sig.mxd 2/2/12 RLG

Conservation Significance
- High
- Very High

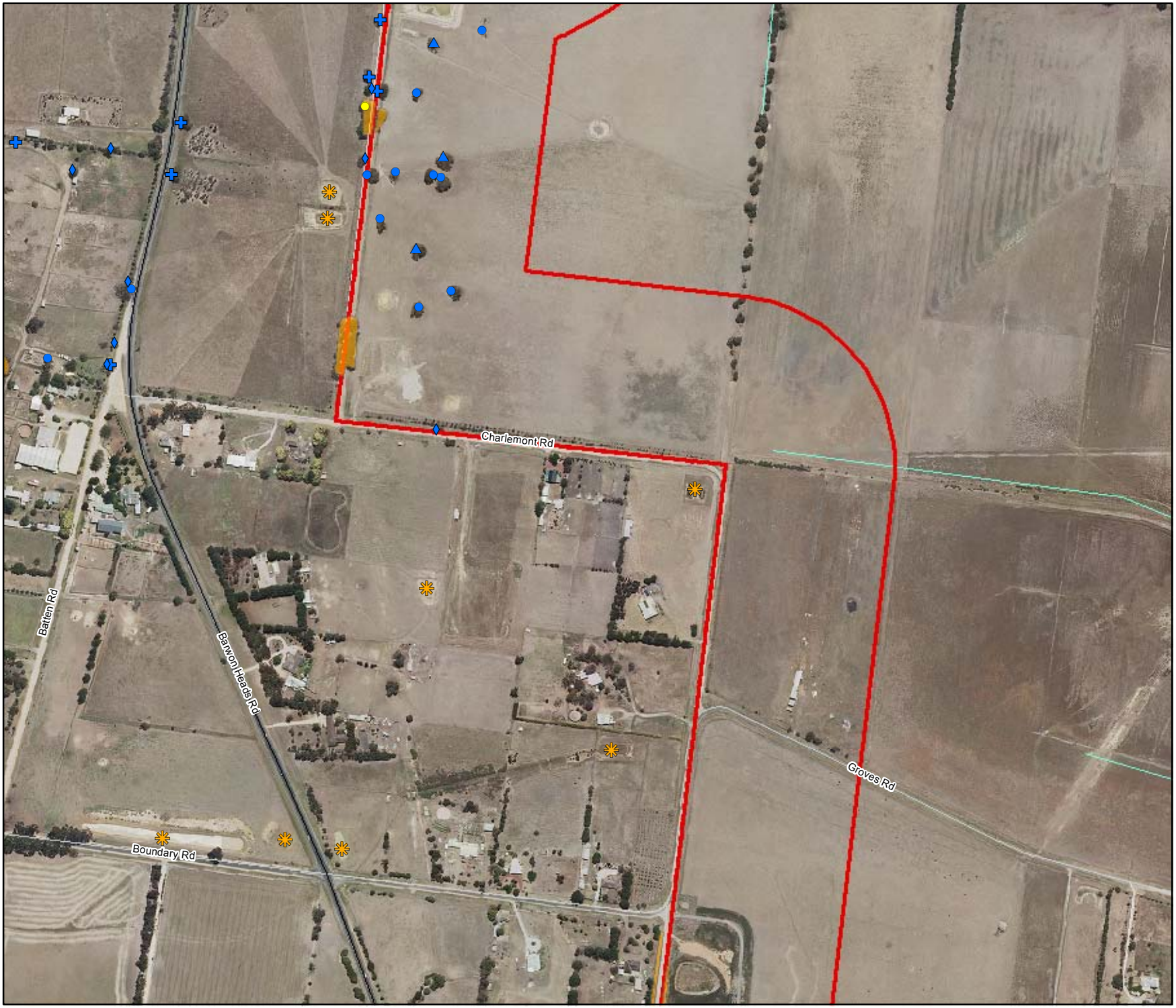
Trees
- Very Large Old Tree
- Large Old Tree
- Medium Old Tree
- Small Tree
- Large Old Trees in patches
- Waterbodies
- Horseshoe Bend Precinct
- Additional 200m Buffer

Figure 6e
Conservation Significance of patches within the study area and adjacent precincts
Horsehoe Bend Precinct

N
0 75 150
Metres

ecology & heritage partners

2300__Fig06_Cons_sig.mxd 2/2/12 RLG



Conservation Significance
- High
- Very High

Trees
- Very Large Old Tree
- Large Old Tree
- Medium Old Tree
- Small Tree
- Large Old Trees in patches
- Waterbodies
- Horseshoe Bend Precinct
- Additional 200m Buffer

Figure 6f
Conservation Significance of patches within the study area and adjacent precincts
Horsehoe Bend Precinct

N
0 75 150
Metres

ecology & heritage partners

2300__Fig06_Cons_sig.mxd 2/2/12 RLG

Conservation Significance
- High
- Very High

Trees
- Very Large Old Tree
- Large Old Tree
- Medium Old Tree
- Small Tree
- Large Old Trees in patches
- Waterbodies
- Horseshoe Bend Precinct
- Additional 200m Buffer

Figure 6g
Conservation Significance of patches within the study area and adjacent precincts
Horsehoe Bend Precinct

N
0 75 150
Metres

ecology & heritage partners

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Conservation Significance
- High
- Very High

Trees
- Very Large Old Tree
- Large Old Tree
- Medium Old Tree
- Small Tree
- Large Old Trees in patches
- Waterbodies
- Horseshoe Bend Precinct
- Additional 200m Buffer

Figure 6h
Conservation Significance of patches within the study area and adjacent precincts
Horsehoe Bend Precinct

N

0 75 150
Metres

ecology & heritage partners

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Conservation Significance
- High
- Very High

Trees
- Very Large Old Tree
- Large Old Tree
- Medium Old Tree
- Small Tree
- Large Old Trees in patches
- Waterbodies
- Horseshoe Bend Precinct
- Additional 200m Buffer

Figure 6i
Conservation Significance of patches within the study area and adjacent precincts
Horsehoe Bend Precinct

N
0 75 150
Metres

ecology & heritage partners

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APPENDICES

Appendix 1 – Significance Assessment

Criteria used by Ecology and Heritage Partners Pty Ltd to define conservation significance, vegetation condition and habitat quality is provided below.

A1.1. 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, Briggs and Leigh 1996)
EX - Extinct: Extinct is when there is no reasonable doubt that the last individual of the species has died.
CR - Critically Endangered: A species is critically endangered when it is facing an extremely high risk of extinction in the wild in the immediate future.
EN - Endangered: A species is endangered when it is not critically endangered but is facing a very high risk of extinction in the wild in the near future.
VU - Vulnerable: A species is vulnerable when it is not critically endangered or endangered but is facing a high risk of extinction in the wild in the medium-term future.
R* - Rare: A species is rare but overall is not currently considered critically endangered, endangered or vulnerable.
K* - Poorly Known: A species is suspected, but not definitely known, to belong to any of the categories extinct, critically endangered, endangered, vulnerable or rare.
CONSERVATION STATUS IN VICTORIA (Based on DSE 2005, DSE 2007b, DSE 2009)
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.

A1.2. Defining Ecological Significance

Table A1.2. *Defining Ecological Significance.*

Criteria for defining Ecological Significance	
NATIONAL SIGNIFICANCE	
Flora	National conservation status is based on the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) list of taxa considered threatened in Australia (i.e. extinct, critically endangered, endangered, vulnerable).
	Flora listed as rare in Australia in *Rare or Threatened Australian Plants* (Briggs and Leigh 1996).
Fauna	National conservation status is based on the *Environment Protection and Biodiversity Conservation Act 1999* (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 the Department of Environment and Heritage: threatened marsupials and monotremes (Maxwell *et al.* 1996), bats (Duncan et al. 1999), birds (Garnett and Crowley 2000), reptiles (Cogger *et. al.* 1993), amphibians (Tyler 1997) and Butterflies (Sands and New 2002).
Communities	Vegetation communities considered critically endangered, endangered or vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* and considering vegetation condition.
STATE SIGNIFICANCE	
Flora	Threatened taxa listed under the provisions of the *Flora and Fauna Guarantee Act 1988*.
	Flora listed as extinct, endangered, vulnerable or rare in Victoria in the DSE Flora Information System (most recent Version).
	Flora listed in the State Government's *Advisory List of Rare or Threatened Plants in Victoria*, 2005 (DSE 2005).
	Flora listed as poorly known in Australia in *Rare or Threatened Australian Plants* (Briggs and Leigh 1996).
Fauna	Threatened taxon listed under Schedule 2 of the *Flora and Fauna Guarantee Act 1988*.
	Fauna listed as extinct, critically endangered, endangered and vulnerable on the State Government's *Advisory List of Threatened Vertebrate Fauna in Victoria - 2003* (DSE 2007).
	Listed as Lower Risk (near threatened, conservation dependent or least concern), data deficient, insufficiently known under National Action Plans for terrestrial species prepared for the Department of Environment and Heritage: threatened marsupials and monotremes (Maxwell *et al.* 1996), bats (Duncan *et al.* 1999), birds (Garnett and Crowley 2000), reptiles (Cogger *et. al.* 1993), amphibians (Tyler 1997) and butterflies (Sands and New 2002).

Criteria for defining Ecological Significance	
Communities	Ecological communities listed as threatened under the *Flora and Fauna Guarantee Act 1988*.
	Ecological vegetation class listed as threatened (i.e. endangered, vulnerable) or rare in a Native Vegetation Plan for a particular bioregion (DSE Website) and considering vegetation condition.
REGIONAL SIGNIFICANCE	
Flora	Flora considered rare in any regional native vegetation plan for a particular bioregion.
	Flora considered rare by the author for a particular bioregion.
Fauna	Fauna with a disjunct distribution, or a small number of documented recorded or naturally rare in the bioregion.
	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* - 2007 (DSE 2007).
Communities	Ecological vegetation class listed as depleted or least concern in a Native Vegetation Plan for a particular bioregion (DSE Website) and considering vegetation condition.
	Ecological vegetation class 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.	

A1.3 Defining Site Significance

The following geographical areas apply to the overall level of significance with respect to the current survey.

National: Australia

State: Victoria

Regional: Victorian Volcanic Plain and Otway Plain bioregions

Local: Within 10 kilometres surrounding the study area

Table A1.3. *Defining Site Significance.*

Criteria for defining Site Significance
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 DSEWPC. - It regularly supports, or has a high probability of supporting, an 'important population' as defined under the EPBC Act of one or more nationally 'vulnerable' flora and fauna taxon. - It is known to support, or has a high probability of supporting taxon listed as 'Vulnerable' under National Action Plans. - It is known to regularly support a large proportion (i.e. greater than 1%) of a population of a taxon listed as 'Conservation Dependent' under the EPBC Act and/or listed as Rare or Lower Risk (near threatened, conservation dependent or least concern) under National Action Plans. - It contains an area, or part thereof designated as 'critical habitat' under the EPBC Act, or if the site is listed under the Register of National Estate compiled by the Australian Heritage Commission. - It is a site which forms part of, or is connected to a larger area(s) of remnant native vegetation or habitat of national conservation significance such as most National Park, and/or a Ramsar Wetland(s).
STATE SIGNIFICANCE
A site is of State significance if: - It occasionally (i.e. every 1 to 5 years) supports, or has suitable habitat to support taxon listed as 'Critically Endangered' or 'Endangered' under the EPBC Act and/or under National Action Plans. - It regularly supports, or has a high probability of regularly supporting (i.e. high habitat quality) taxon listed as 'Vulnerable', 'Near threatened', 'Data Deficient' or 'Insufficiently Known' in Victoria (DSE 2005, 2007b), 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.

Criteria for defining Site Significance
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.

A1.4. Defining Vegetation Condition

Table A1.4. *Defining Vegetation Condition.*

Criteria for defining Vegetation Condition
Good condition - 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 condition - 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.
Poor condition - Vegetation dominated by introduced species, but supports low levels of indigenous species present, in the canopy, shrub layer or ground cover.

A1.5. Defining Habitat Quality

Several factors are taken into account when determining the value of habitat. Habitat quality varies on both spatial and temporal scales, with the habitat value varying depending upon a particular fauna species.

Table A1.5. *Defining Habitat Quality.*

Criteria for defining Habitat Quality
HIGH QUALITY
High degree of intactness (i.e. floristically and structurally diverse), containing several important habitat features such as ground debris (logs, rocks, vegetation), mature hollow-bearing trees, and a dense understorey component.
High species richness and diversity (i.e. represented by a large number of species from a range of fauna groups).
High level of foraging and breeding activity, with the site regularly used by native fauna for refuge and cover.
Habitat that has experienced, or is experiencing low levels of disturbance and/or threatening processes (i.e. weed invasion, introduced animals, soil erosion, salinity).
High contribution to a wildlife corridor, and/or connected to a larger area(s) of high quality habitat.
Provides known, or likely habitat for one or more rare or threatened species listed under the EPBC Act, FFG Act, or species considered rare or threatened according to DSE 2007.
MODERATE QUALITY
Moderate degree of intactness, containing one or more important habitat features such as ground debris (logs, rocks, vegetation), mature hollow-bearing trees, and a dense understorey component.
Moderate species richness and diversity - represented by a moderate number of species from a range of fauna groups.
Moderate levels of foraging and breeding activity, with the site used by native fauna for refuge and cover.
Habitat that has experienced, or is experiencing moderate levels of disturbance and/or threatening processes.
Moderate contribution to a wildlife corridor, or is connected to area(s) of moderate quality habitat.
Provides potential habitat for a small number of threatened species listed under the EPBC Act, FFG Act, or species considered rare or threatened according to DSE 2007b.
LOW QUALITY
Low degree of intactness, containing few important habitat features such as ground debris (logs, rocks, vegetation), mature hollow-bearing trees, and a dense understorey component.
Low species richness and diversity (i.e. represented by a small number of species from a range of fauna groups).
Low levels of foraging and breeding activity, with the site used by native fauna for refuge and cover.
Habitat that has experienced, or is experiencing high levels of disturbance and/or threatening processes.
Unlikely to form part of a wildlife corridor, and is not connected to another area(s) of habitat.
Unlikely to provide habitat for rare or threatened species listed under the EPBC Act, FFG Act, or considered rare or threatened according to DSE 2007b.

Appendix 2.1 – Flora results

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

Scientific Name	Common Name
INDIGENOUS SPECIES	
Acaena echinata	Sheep's Burr
Acacia implexa	Lightwood
Acacia mearnsii	Black Wattle
Acacia paradoxa	Hedge Wattle
Acacia pycnantha	Golden Wattle
Allocasuarina verticillata	Drooping Sheoak
Amphibromus nervosus	Common Swamp Wallaby-grass
Arthropodium strictum	Chocolate Lily
Austrodanthonia caespitosa	Common Wallaby-grass
Austrodanthonia geniculata	Kneed Wallaby-grass
Austrodanthonia laevis	Smooth Wallaby-grass
Austrodanthonia fulva	Copper-awned Wallaby-grass
Austrodanthonia racemosa var. *racemosa*	Slender Wallaby-grass
Austrodanthonia setacea	Bristly Wallaby-grass
Austrostipa bigeniculata	Kneed Spear-grass
Austrostipa elegantissima	Feather Spear-grass
Austrostipa nodosa	Knotty Spear-grass
Austrostipa mollis	Supple Spear-grass
Austrostipa rudis	Veined Spear-grass
Austrostipa scabra subsp. *falcata*	Rough Spear-grass
Azolla pinnata	Ferny Azolla
Bursaria spinosa	Sweet Bursaria
Calystegia sepium	Large Bindweed
Carex appressa	Tall Sedge
Cassinia arcuata	Drooping Cassinia
Centrolepis aristata	Pointed Centrolepis
Convolvulus erubescens spp. agg.	Pink Bindweed
Cotula australis	Common Cotula
Dianella admixta	Black-anther Flax-lily
Dichondra repens	Kidney Weed
Dichelachne micrantha	Common Plume-grass
Dillwynia spp.	Parrot-pea
Einadia nutans subsp. *nutans*	Nodding Saltbush
Eleocharis acuta	Common Spike-sedge
Elymus scabra	Common Wheat-grass
Eucalyptus camaldulensis	River Red-gum
Eucalyptus leucoxylon subsp. *connata*	Melbourne Yellow Gum
Eucalyptus ovata	Swamp Gum
Exocarpos cupressiformis	Cherry Ballart
Ficinia nodosa	Knobby Club-rush
Gahnia filum	Chaffy Saw-sedge
Isolepis spp.	Club Sedge
Joycea pallida	Silvertop Wallaby-grass
Juncus bufonius	Toad Rush
Juncus spp.	Rush
Lachnagrostis filiformis	Common Blown-grass
Lepidosperma curtisiae	Little Sword-sedge
Lepidosperma congestum	Clustered Sword-sedge
Leptospermum laevigatum	Coast Tea-tree
Linum marginale	Native Flax
Lomandra filiformis	Wattle Mat-rush
Lomandra nana	Dwarf Mat-rush
Microlaena stipoides	Weeping Grass
Pelargonium australe	Austral Stork's-bill
Pimelea curviflora	Curved Rice-flower

Scientific Name	Common Name
Poa labillardierei	Common Tussock-grass
Poa sieberiana	Grey Tussock-grass
Ranunculus spp.	Buttercup
Rhagodia candolleana ssp. *candolleana*	Seaberry Saltbush
Rumex brownii	Slender Dock
Schoenus apogon	Common Bog-sedge
Senecio glomeratus	Annual Fireweed
Senecio quadridentatus	Cotton Fireweed
Themeda triandra	Kangaroo Grass
Tricoryne elatior	Yellow Rush-lily
Triglochin procerum	Water-ribbons
Typha orientalis	Cumbungi
INTRODUCED SPECIES	
Acetosella vulgaris	Sheep Sorrel
Agapanthus praecox subsp. *orientalis*	Agapanthus
Aira caryophyllea	Silvery Hair-grass
Aira elegantissima	Delicate Hair-grass
Aloe arborescens	Tree Aloe
Anagallis arvensis	Scarlet Pimpernel
Arctotheca calendula	Cape Weed
Asparagus asparagoides	Bridal Creeper
Avena barbata	Bearded Oat
Brassica fruticulosa	Twiggy Turnip
Briza maxima	Large Quaking-grass
Bromus catharticus	Prairie Grass
Bromus hordeaceus subsp. *hordeaceus*	Soft Brome
Centella cordifolia	Centella
Cirsium vulgare	Spear Thistle
Coprosma repens	Mirror Bush
Cotoneaster spp.	Cotoneaster
Critesion murinum	Sea Barely-grass
Cupressus macrocarpa	Monterey Cypress
Cynodon dactylon var. *dactylon*	Couch
Cyperus eragrostis	Drain Flat-sedge
Dactylis glomerata	Cocksfoot
Echium plantagineum	Paterson's Curse
Ehrharta erecta var. *erecta*	Panic Veldt-grass
Ehrharta longiflora	Annual Veldt-grass
Erodium cicutarium	Common Heron's-bill
Eucalyptus cladocalyx	Sugar Gum
Festuca arundinacea	Tall Fescue
Fraxinus angustifolia	Desert Ash
Fumaria muralis subsp. *muralis*	Wall Fumitory
Galenia pubescens var. *pubescens*	Galenia
Galium aparine	Cleavers
Genista monspessulana	Montpellier Broom
Genista linifolia	Genista
Helminthotheca echioides	Ox-tongue
Holcus lanatus	Yorkshire Fog
Hordeum murinum s.l.	Barley-grass
Hypochoeris glabra	Smooth Cat's-ear
Hypochoeris radicata	Flatweed
Juncus acutus	Spiny Rush
Leontodon taraxacoides	Hairy Hawkbit
Lolium perenne	Perennial Rye-grass
Lolium rigidum	Wimmera Rye-grass
Lycium ferocissimum	African Box-thorn
Malva parviflora	Small-flower Mallow
Marrubium vulgare	Horehound
Medicago polymorpha	Burr Medic
Nassella neesiana	Chilean Needle-grass

Scientific Name	Common Name
Nassella trichotoma	Serrated Tussock
Oxalis pes-caprae	Soursob
Paspalum dilatatum	Paspalum
Pennisetum clandestinum	Kikuyu
Phalaris aquatica	Toowoomba Canary-grass
Phoenix dactylifera	Date Palm
Piptatherum miliaceum	Rice Millet
Pinus radiata	Radiata Pine
Plantago coronopus	Buck's-horn Plantain
Plantago lanceolata	Ribwort
Romulea rosea	Onion Grass
Rosa rubiginosa	Sweet Briar
Rubus fruticosus spp. agg.	Blackberry
Salix babylonica	Weeping Willow
Salvia verbenaca	Wild Sage
Schinus molle	Pepper Tree
Solanum nigrum s.s.	Black Nightshade
Sonchus oleraceus	Common Sow-thistle
Trifolium arvense	Hare's-foot Clover
Trifolium repens var. *repens*	White Clover
Trifolium spp.	Clover
Trifolium subterraneum	Subterranean Clover
Ulex europaeus	Gorse
Urtica dioica	Common Nettle
Vicia sativa	Common Vetch
Vulpia bromoides	Squirrel-tail Fescue
Vulpia myuros	Rat's-tail Fescue

Appendix 2.2 – Significant flora species

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

Sources used to determine species status:

EPBC	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
DSE	Advisory List of Threatened Flora in Victoria (DSE 2005)
FFG	*Flora and Fauna Guarantee Act 1988* (Victoria)

National status of species is designated by:

X	Extinct
CR	Critically endangered
EN	Endangered
VU	Vulnerable
K	Poorly Known (Briggs and Leigh 1996)
#	Records identified from EPBC Act Protected Matters Search Tool.
*	Native non-indigenous species

State status of species is designated by:

X	Extinct
e	Endangered
v	Vulnerable
r	Rare
k	Poorly Known
L	FFG Act Listed

Likelihood of occurrence:

1	known occurrence
2	habitat present
3	habitat present, but low likelihood
4	unlikely
5	no suitable habitat

Scientific Name	Common Name	Last Documented Record (FIS)	Total number of documented records (FIS)	EPBC	VROTS	FFG	Likely occurrence within the study area
NATIONAL SIGNIFICANCE							
# *Caladenia pumila*	Dwarf Spider-orchid	-	-	X	x	L	5
# *Carex tasmanica*	Curly Sedge	-	-	VU	v	L	4
# *Glycine latrobeana*	Clover Glycine	1881	1	VU	v	L	4
Lepidium aschersonii	Spiny Peppercress	2006	1	VU	e	L	3
# *Pimelea spinescens subsp. spinescens*	Spiny Rice-flower	-	-	CR	e		4
# *Prasophyllum frenchii*	Maroon Leek-orchid	-	-	EN	e	L	5
# *Senecio macrocarpus*	Large-headed Fireweed	1853	1	VU	e	L	4
# *Thelymitra epipactoides*	Metallic Sun-orchid	-	-	EN	e	L	5
# *Thelymitra matthewsii*	Spiral Sun-orchid	-	-	VU	v	L	5
# *Xerochrysum palustre*	Swamp Everlasting	1995	1	VU	v	L	4
STATE SIGNIFICANCE							
Acacia cupularis	Cup Wattle	2000	2	-	r	-	5
Acacia uncifolia	Coast Wirilda	2004	16	-	r	-	5
Adriana quadripartita	Coast Bitter-bush	2005	5	-	v	-	5
Atriplex paludosa subsp. paludosa	Marsh Saltbush	1985	8	-	r	-	5
Austrofestuca littoralis	Coast Fescue	1989	3	-	r	-	5
Avicennia marina subsp. australasica	Grey Mangrove	1980	1	-	r	-	5
Callitriche palustris var. palustris	Swamp Water-starwort	1986	1	-	k	-	5
Callitriche umbonata	Winged Water-starwort	1770	1	-	r	-	5
Cardamine tenuifolia	Slender Bitter-cress	1986	1	-	k	-	5
Eucalyptus leucoxylon subsp. bellarinensis	Melbourne Yellow-gum	2007	11	-	e	L	1
Euphrasia scabra	Rough Eyebright	1770	1	-	e	L	4
Galium compactum	Compact Bedstraw	1885	1	-	r	-	4
Helichrysum aff. rutidolepis (Lowland Swamps)	Pale Swamp Everlasting	1995	1	-	v	-	5
Heterozostera tasmanica	Tasman Grass-wrack	2005	2	-	r	-	4
Juncus revolutus	Creeping Rush	2000	7	-	r	-	4
Lachnagrostis robusta	Salt Blown-grass	2005	3	-	r	-	4
Lawrencia spicata	Salt Lawrencia	1994	2	-	r	-	4

Scientific Name	Common Name	Last Documented Record (FIS)	Total number of documented records (FIS)	EPBC	VROTS	FFG	Likely occurrence within the study area
Lemna trisulca	Ivy-leaf Duckweed	1980	1	-	k	-	5
Limonium australe	Yellow Sea-lavender	1980	1	-	k	-	5
Lotus australis var. australis	Austral Trefoil	1989	1	-	k	-	5
Malva preissiana s.s. (white-flowered coastal form)	Coast Hollyhock	1993	1	-	v	-	5
Nicotiana maritima	Coast Tobacco	1986	1	-	e	-	5
Pleurosorus subglandulosus	Glandular Blanket-fern	1770	1	-	k	-	5
Pomaderris halmaturina subsp. continentis	Glenelg Pomaderris	1994	2	-	r	-	4
Prasophyllum lindleyanum	Green Leek-orchid	1893	1	-	v	-	4
Rhagodia parabolica	Fragrant Saltbush	2006	12	-	r	-	4
Salsola tragus subsp. pontica	Coast Saltwort	1992	2	-	r	-	5
Senecio cunninghamii var. cunninghamii	Branching Groundsel	1770	1	-	r	-	4
Thelymitra circumsepta	Naked Sun-orchid	1760	1	-	v	-	4
Triglochin minutissima	Tiny Arrowgrass	1980	1	-	r	-	5
Triglochin mucronata	Prickly Arrowgrass	1980	1	-	r	-	5
Triodia bunicola	Southern Porcupine Grass	1770	1	-	k	-	4
Tripogon loliiformis	Rye Beetle-grass	1986	1	-	r	-	4
Zygophyllum billardierei	Coast Twin-leaf	1980	1	-	r	-	5

Source: Flora Information System (2011); Protected Matters Search Tool (SEWPaC 2011)

Appendix 3.1 – Fauna results

Table A3.1. Fauna recorded during the field survey, and previously recorded within 10 kilometres of the study area.

H	Heard	Mi	Migratory
S	Seen	Ma	Marine
I	Incidental (feathers, bones, scats etc)	*	Introduced species
T	Trapped / handheld		

Common name	Scientific name	Total # of documented records	Last documented record	Hollow use	Mi/Ma	Present survey
		MAMMALS				
Platypus	*Ornithorhynchus anatinus*	4	2002	-	-	-
Short-beaked Echidna	*Tachyglossus aculeatus*	4	2004	-	-	-
Eastern Barred Bandicoot	*Perameles gunnii*	1	1760	-	-	-
Southern Brown Bandicoot	*Isoodon obesulus obesulus*	3	1981	-	-	-
Common Brushtail Possum	*Trichosurus vulpecula*	10	2006	Total	-	I
Common Ringtail Possum	*Pseudocheirus peregrinus*	11	2006	Partial	-	-
Koala	*Phascolarctos cinereus*	10	1987	-	-	-
Common Wombat	*Vombatus ursinus*	1	1760	-	-	-
Black Wallaby	*Wallabia bicolor*	2	1998	-	-	-
Eastern Grey Kangaroo	*Macropus giganteus*	3	2004	-	-	-
Grey-headed Flying-fox	*Pteropus poliocephalus*	8	2002	-	-	S
White-striped Freetail Bat	*Tadarida australis*	4	2006	Total	-	H
Lesser Long-eared Bat	*Nyctophilus geoffroyi*	3	1981	Total	-	-
Gould's Wattled Bat	*Chalinolobus gouldii*	6	2006	Total	-	-
Southern Forest Bat	*Vespadelus regulus*	1	1760	Total	-	-
Little Forest Bat	*Vespadelus vulturnus*	8	2006	Total	-	-
Swamp Rat	*Rattus lutreolus*	3	2002	-	-	-
Black Rat*	*Rattus rattus*	11	2006	-	-	-
Brown Rat*	*Rattus norvegicus*	2	1760	-	-	-
House Mouse*	*Mus musculus*	9	2007	-	-	S
Water Rat	*Hydromys chrysogaster*	9	2007	-	-	-

Common name	Scientific name	Total # of documented records	Last documented record	Hollow use	Mi/Ma	Present survey
European Rabbit*	*Oryctolagus cuniculus*	10	2007	-	-	S
European Hare*	*Lepus europeaus*	4	2005	-	-	S
Sheep (feral)*	*Ovis aries*	1	2006	-	-	-
Red Fox*	*Vulpes vulpes*	15	2007	-	-	S
Cat*	*Felis catus*	2	1983	-	-	-
Dog*	*Canis lupus*	2	2006	-	-	-
	BIRDS					
Australian Pelican	*Pelecanus conspicillatus*	285	2008	-	Ma	-
Whiskered Tern	*Chlidonias hybridus javanicus*	84	2007	-	Ma	-
Gull-billed Tern	*Gelochelidon nilotica macrotarsa*	16	2008	-	Ma	-
Caspian Tern	*Hydroprogne caspia*	104	2006	-	Mi/Ma	-
Crested Tern	*Thalaseus bergii*	81	2007	-	-	-
Little Tern	*Sternula albifrons sinensis*	21	1997	-	Mi/Ma	-
Fairy Tern	*Sternula nereis nereis*	54	2000	-	Ma	-
Silver Gull	*Chroicocephalus novaehollandiae*	576	2008	-	Ma	S
Ruddy Turnstone	*Arenaria interpres*	20	2000	-	Mi/Ma	-
Pied Oystercatcher	*Haematopus longirostris*	36	2008	-	-	-
Sooty Oystercatcher	*Haematopus fuliginosus*	2	1988	-	Ma	-
Red-kneed Dotterel	*Erythrogonys cinctus*	41	2005	-	-	-
Masked Lapwing	*Vanellus miles*	538	2008	-	-	S
Banded Lapwing	*Vanellus tricolor*	44	1999	-	-	-
Grey Plover	*Pluvialis squatarola*	1	1980	-	Mi/Ma	-
Pacific Golden Plover	*Pluvialis fulva*	20	2007	-	Mi/Ma	-
Hooded Plover	*Thinornis rubricollis rubricollis*	53	2008	-	Ma	-
Double-banded Plover	*Charadrius bicinctus*	43	2008	-	Mi/Ma	-
Red-capped Plover	*Charadrius ruficapillus*	138	2008	-	Ma	-
Black-fronted Dotterel	*Elseyornis melanops*	102	2008	-	-	-
Black-winged Stilt	*Himantopus himantopus*	135	2007	-	Ma	-
Banded Stilt	*Cladorhynchus leucocephalus*	33	2008	-	-	-

Common name	Scientific name	Total # of documented records	Last documented record	Hollow use	Mi/Ma	Present survey
Red-necked Avocet	*Recurvirostra novaehollandiae*	35	2006	-	Ma	-
Eastern Curlew	*Numenius madagascariensis*	49	2008	-	Mi/Ma	-
Whimbrel	*Numenius phaeopus*	2	1980	-	Mi/Ma	-
Black-tailed Godwit	*Limosa limosa*	15	2004	-	Mi/Ma	-
Bar-tailed Godwit	*Limosa lapponica*	10	2006	-	Mi/Ma	-
Wood Sandpiper	*Tringa glareola*	4	2008	-	Mi/Ma	-
Grey-tailed Tattler	*Heteroscelus brevipes*	3	1988	-	Mi/Ma	-
Common Sandpiper	*Actitis hypoleucos*	12	2007	-	Mi/Ma	-
Common Greenshank	*Tringa nebularia*	128	2008	-	Mi/Ma	-
Marsh Sandpiper	*Tringa stagnatilis*	44	2001	-	Mi/Ma	-
Terek Sandpiper	*Xenus cinereus*	3	2008	-	Mi/Ma	-
Curlew Sandpiper	*Calidris ferruginea*	92	2006	-	Mi/Ma	-
Red-necked Stint	*Calidris ruficollis*	142	2006	-	Mi/Ma	-
Sharp-tailed Sandpiper	*Calidris acuminata*	95	2006	-	Mi/Ma	-
Red Knot	*Calidris canutus*	11	2001	-	Mi/Ma	-
Great Knot	*Calidris tenuirostris*	5	2001	-	Mi/Ma	-
Sanderling	*Calidris alba*	12	2008	-	Mi/Ma	-
Small wader	*Fam. Scolopacidae (Small wader)*	1	2008	-	-	-
Lesser Yellowlegs	*Tringa flavipes*	3	1986	-	-	-
Little Ringed Plover	*Charadrius dubius*	1	1987	-	Mi/Ma	-
Baird's Sandpiper	*Calidris bairdii*	2	1986	-	Mi/Ma	-
Ruff	*Philomachus pugnax*	3	1995	-	Mi/Ma	-
Long-toed Stint	*Calidris subminuta*	7	1986	-	Mi/Ma	-
Pectoral Sandpiper	*Calidris melanotos*	14	2001	-	Mi/Ma	-
Kelp Gull	*Larus dominicanus*	7	1999	-	Ma	-
Pacific Gull	*Larus pacificus pacificus*	124	2007	-	Ma	-
Emu	*Dromaius novaehollandiae*	1	2001	-	-	-
Stubble Quail	*Coturnix pectoralis*	30	2004	-	Ma	H
Brown Quail	*Coturnix ypsilophora australis*	5	1995	-	-	-

Common name	Scientific name	Total # of documented records	Last documented record	Hollow use	Mi/Ma	Present survey
King Quail	*Coturnix chinensis victoriae*	1	1898	-	-	-
Painted Button-quail	*Turnix varia*	3	1980	-	-	-
Little Button-quail	*Turnix velox*	1	1971	-	-	-
Red-chested Button-quail	*Turnix pyrrhothorax*	1	1898	-	-	-
Plains-wanderer	*Pedionomus torquatus*	2	1971	-	-	-
Peaceful Dove	*Geopelia striata*	1	1981	-	-	-
Common Bronzewing	*Phaps chalcoptera*	26	2001	-	-	-
Brush Bronzewing	*Phaps elegans*	2	1981	-	-	-
Crested Pigeon	*Ocyphaps lophotes*	3	2007	-	-	S
Lewin's Rail	*Lewinia pectoralis pectoralis*	8	2006	-	Mi	-
Buff-banded Rail	*Gallirallus philippensis*	10	2004	-	-	-
Australian Spotted Crake	*Porzana fluminea*	29	2001	-	-	-
Baillon's Crake	*Porzana pusilla palustris*	28	2001	-	Ma	-
Spotless Crake	*Porzana tabuensis*	17	2006	-	Ma	-
Black-tailed Native-hen	*Gallinula ventralis*	9	2005	-	-	-
Dusky Moorhen	*Gallinula tenebrosa*	299	2008	-	-	S
Purple Swamphen	*Porphyrio porphyrio*	305	2007	-	-	H
Eurasian Coot	*Fulica atra*	310	2008	-	-	-
Great Crested Grebe	*Podiceps cristatus*	47	2006	-	-	-
Australasian Grebe	*Tachybaptus novaehollandiae*	151	2008	-	-	S
Hoary-headed Grebe	*Poliocephalus poliocephalus*	190	2006	-	-	-
Great Cormorant	*Phalacrocorax carbo*	215	2006	-	-	-
Little Black Cormorant	*Phalacrocorax sulcirostris*	222	2008	-	-	-
Black-faced Cormorant	*Phalacrocorax fuscescens*	4	1979	-	Ma	-
Pied Cormorant	*Phalacrocorax varius*	86	2008	-	-	-
Little Pied Cormorant	*Microcarbo melanoleucos*	288	2008	-	-	S
Darter	*Anhinga novaehollandiae*	14	2007	-	-	-
Broad-billed Sandpiper	*Limicola falcinellus*	2	1992	-	Mi/Ma	-
Latham's Snipe	*Gallinago hardwickii*	101	2006	-	Mi/Ma	-

Common name	Scientific name	Total # of documented records	Last documented record	Hollow use	Mi/Ma	Present survey
Australian Painted Snipe	*Rostratula benghalensis australis*	5	1985	-	Mi/Ma	-
Australian Pratincole	*Stiltia isabella*	1	1985	-	Ma	-
Brolga	*Grus rubicunda*	17	2008	-	-	-
Glossy Ibis	*Plegadis falcinellus*	29	2007	-	Mi/Ma	-
Australian White Ibis	*Threskiornis molucca*	381	2007	-	Ma	S
Straw-necked Ibis	*Threskiornis spinicollis*	293	2007	-	Ma	S
Royal Spoonbill	*Platalea regia*	152	2007	-	-	-
Yellow-billed Spoonbill	*Platalea flavipes*	135	2006	-	-	-
Little Egret	*Egretta garzetta nigripes*	57	2006	-	Ma	-
Intermediate Egret	*Ardea intermedia*	18	2001	-	Ma	S
Eastern Great Egret	*Ardea modesta*	213	2007	-	Mi/Ma	-
White-faced Heron	*Egretta novaehollandiae*	410	2008	-	-	S
White-necked Heron	*Ardea pacifica*	107	2007	-	-	-
Nankeen Night Heron	*Nycticorax caledonicus hillii*	59	2001	-	Ma	-
Little Bittern	*Ixobrychus minutus dubius*	2	2001	-	-	-
Australasian Bittern	*Botaurus poiciloptilus*	46	2008	-	-	-
Cape Barren Goose	*Cereopsis novaehollandiae*	4	2007	-	Ma	-
Magpie Goose	*Anseranas semipalmata*	39	2006	-	Ma	-
Australian Wood Duck	*Chenonetta jubata*	59	2007	Total	-	S
Black Swan	*Cygnus atratus*	431	2008	-	-	-
Australian Shelduck	*Tadorna tadornoides*	232	2006	Total	-	-
Pacific Black Duck	*Anas superciliosa*	423	2008	-	-	S
Garganey	*Anas querquedula*	1	1889	-	-	-
Chestnut Teal	*Anas castanea*	187	2008	Total	-	S
Grey Teal	*Anas gracilis*	264	2008	Total	-	-
Australasian Shoveler	*Anas rhynchotis*	78	2006	-	-	-
Pink-eared Duck	*Malacorhynchus membranaceus*	17	1996	Partial	-	-
Freckled Duck	*Stictonetta naevosa*	6	2005	-	-	-
Hardhead	*Aythya australis*	106	2005	-	-	-

Common name	Scientific name	Total # of documented records	Last documented record	Hollow use	Mi/Ma	Present survey
Blue-billed Duck	*Oxyura australis*	14	2002	-	-	-
Musk Duck	*Biziura lobata*	49	2006	-	Ma	-
Spotted Harrier	*Circus assimilis*	3	1997	-	-	-
Swamp Harrier	*Circus approximans*	182	2007	-	Ma	-
Grey Goshawk	*Accipiter novaehollandiae novaehollandiae*	21	2007	-	-	-
Brown Goshawk	*Accipiter fasciatus*	87	2007	-	Ma	-
Collared Sparrowhawk	*Accipiter cirrhocephalus*	8	2001	-	-	-
Wedge-tailed Eagle	*Aquila audax*	20	2007	-	-	S
Little Eagle	*Hieraaetus morphnoides*	33	2007	-	-	S
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	12	2005	-	Mi/Ma	-
Whistling Kite	*Haliastur sphenurus*	162	2007	-	Ma	S
Black Kite	*Milvus migrans*	4	2007	-	-	-
Black-shouldered Kite	*Elanus axillaris*	168	2007	-	-	S
Letter-winged Kite	*Elanus scriptus*	1	1977	-	-	-
Australian Hobby	*Falco longipennis*	89	2001	-	-	-
Peregrine Falcon	*Falco peregrinus*	23	2001	Partial	-	-
Black Falcon	*Falco subniger*	20	2008	-	-	-
Brown Falcon	*Falco berigora*	169	2007	-	-	-
Nankeen Kestrel	*Falco cenchroides*	128	2006	Partial	Ma	S
Osprey	*Pandion cristatus*	2	2007	-	-	-
Southern Boobook	*Ninox novaeseelandiae*	13	2006	Total	Ma	-
Barking Owl	*Ninox connivens connivens*	2	2000	Total	-	-
Powerful Owl	*Ninox strenua*	2	2007	Total	-	-
Pacific Barn Owl	*Tyto javanica*	10	2003	-	-	-
Masked Owl	*Tyto novaehollandiae novaehollandiae*	2	1983	Total	-	-
Rainbow Lorikeet	*Trichoglossus haematodus*	192	2007	Total	-	S
Scaly-breasted Lorikeet	*Trichoglossus chlorolepidotus*	14	2007	Total	-	-
Musk Lorikeet	*Glossopsitta concinna*	88	2007	Total	-	-

Common name	Scientific name	Total # of documented records	Last documented record	Hollow use	Mi/Ma	Present survey
Purple-crowned Lorikeet	*Glossopsitta porphyrocephala*	141	2003	Total	-	-
Little Lorikeet	*Glossopsitta pusilla*	55	2001	Total	-	-
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	81	2007	Total	-	S
Sulphur-crested Cockatoo	*Cacatua galerita*	186	2007	Total	-	S
Little Corella	*Cacatua sanguinea*	2	2007	Total	-	-
Long-billed Corella	*Cacatua tenuirostris*	8	2003	Total	-	S
Galah	*Eolophus roseicapilla*	275	2007	Total	-	S
Cockatiel	*Nymphicus hollandicus*	4	1998	Total	-	-
Australian King-Parrot	*Alisterus scapularis*	9	1999	Total	-	-
Crimson Rosella	*Platycercus elegans*	199	2007	Total	-	S
Eastern Rosella	*Platycercus eximius*	211	2007	Total	-	S
Red-rumped Parrot	*Psephotus haematonotus*	174	2007	-	-	S
Mulga Parrot	*Psephotus varius*	1	1874	-	-	-
Orange-bellied Parrot	*Neophema chrysogaster*	73	2007	-	Mi/Ma	-
Blue-winged Parrot	*Neophema chrysostoma*	61	2008	Partial	-	H
Swift Parrot	*Lathamus discolor*	28	2006	Total	Ma	-
Budgerigar	*Melopsittacus undulatus*	1	1951	Partial	-	-
Ground Parrot	*Pezoporus wallicus wallicus*	1	1909	-	-	-
Tawny Frogmouth	*Podargus strigoides*	10	2007	-	-	-
Azure Kingfisher	*Alcedo azurea*	3	1999	-	-	-
Laughing Kookaburra	*Dacelo novaeguineae*	103	2007	Total	-	-
Sacred Kingfisher	*Todiramphus sanctus*	18	2000	Partial	Ma	-
Rainbow Bee-eater	*Merops ornatus*	26	2001	-	Mi/Ma	-
White-throated Nightjar	*Eurostopodus mystacalis*	1	1898	-	-	-
White-throated Needletail	*Hirundapus caudacutus*	20	2000	-	Mi/Ma	-
Fork-tailed Swift	*Apus pacificus*	11	2000	-	Mi/Ma	-
Pallid Cuckoo	*Cuculus pallidus*	37	2000	-	Ma	-
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	55	2007	-	-	-
Brush Cuckoo	*Cacomantis variolosus*	1	1977	-	-	-

Common name	Scientific name	Total # of documented records	Last documented record	Hollow use	Mi/Ma	Present survey
Horsfield's Bronze-Cuckoo	*Chrysococcyx basalis*	75	2006	-	Ma	-
Shining Bronze-Cuckoo	*Chrysococcyx lucidus*	42	2008	-	Ma	-
Domestic Goose*	*Anser anser*	1	1997	-	-	-
Red-necked Phalarope	*Phalaropus lobatus*	5	2002	-	Mi/Ma	-
Northern Mallard*	*Anas platyrhynchos*	70	2001	-	-	-
Rock Dove*	*Columba livia*	134	2005	-	-	S
Cattle Egret	*Ardea ibis*	113	2008	-	Mi/Ma	-
Spotted Turtle-Dove*	*Streptopelia chinensis*	387	2008	-	-	S
Welcome Swallow	*Hirundo neoxena*	587	2007	Partial	-	S
Tree Martin	*Hirundo nigricans*	40	2005	Total	Ma	S
Fairy Martin	*Hirundo ariel*	48	2007	Partial	-	S
Grey Fantail	*Rhipidura albiscarpa*	159	2006	-	-	S
Rufous Fantail	*Rhipidura rufifrons*	6	2001	-	Mi/Ma	-
Willie Wagtail	*Rhipidura leucophrys*	464	2007	-	-	S
Leaden Flycatcher	*Myiagra rubecula*	2	1967	-	-	-
Satin Flycatcher	*Myiagra cyanoleuca*	6	1979	-	Mi/Ma	-
Restless Flycatcher	*Myiagra inquieta*	33	2008	-	-	-
Jacky Winter	*Microeca fascinans*	16	2003	-	-	-
Scarlet Robin	*Petroica boodang*	51	2001	-	-	-
Flame Robin	*Petroica phoenicea*	53	2004	-	-	-
Pink Robin	*Petroica rodinogaster*	20	2001	-	-	-
Rose Robin	*Petroica rosea*	8	2008	-	-	-
Hooded Robin	*Melanodryas cucullata cucullata*	3	1978	-	-	-
Eastern Yellow Robin	*Eopsaltria australis*	27	2000	-	-	-
Golden Whistler	*Pachycephala pectoralis*	82	2007	-	-	-
Rufous Whistler	*Pachycephala rufiventris*	42	2006	-	-	-
Olive Whistler	*Pachycephala olivacea*	3	1981	-	-	-
Grey Shrike-thrush	*Colluricincla harmonica*	102	2007	Partial	-	H
Magpie-lark	*Grallina cyanoleuca*	570	2008	-	-	S

Common name	Scientific name	Total # of documented records	Last documented record	Hollow use	Mi/Ma	Present survey
Crested Shrike-tit	*Falcunculus frontatus*	28	2001	-	-	-
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	155	2007	-	Ma	S
White-bellied Cuckoo-shrike	*Coracina papuensis*	1	1999	-	Ma	-
White-winged Triller	*Lalage sueurii*	6	2000	-	-	-
Spotted Quail-thrush	*Cinclosoma punctatum*	2	1979	-	-	-
Grey-crowned Babbler	*Pomatostomus temporalis temporalis*	2	1898	-	-	-
White-fronted Chat	*Epthianura albifrons*	283	2007	-	-	S
Western Gerygone	*Gerygone fusca*	1	1998	-	-	-
Weebill	*Smicrornis brevirostris*	4	1998	-	-	-
Striated Thornbill	*Acanthiza lineata*	48	2004	-	-	-
Yellow Thornbill	*Acanthiza nana*	40	2001	-	-	S
Brown Thornbill	*Acanthiza pusilla*	131	2007	-	-	S
Buff-rumped Thornbill	*Acanthiza reguloides*	19	1999	-	-	-
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	243	2007	-	-	S
White-browed Scrubwren	*Sericornis frontalis*	103	2007	-	-	-
Speckled Warbler	*Chthonicola sagittata*	3	1960	-	-	-
Brown Songlark	*Cincloramphus cruralis*	14	2008	-	-	-
Rufous Songlark	*Cincloramphus mathewsi*	10	1981	-	-	-
Little Grassbird	*Megalurus gramineus*	195	2007	-	-	H
Clamorous Reed Warbler	*Acrocephalus stentoreus*	153	2008	-	Mi/Ma	H
Golden-headed Cisticola	*Cisticola exilis*	175	2007	-	-	H
Southern Emu-wren	*Stipiturus malachurus*	7	2006	-	-	-
Superb Fairy-wren	*Malurus cyaneus*	374	2007	-	-	S
Masked Woodswallow	*Artamus personatus*	4	2008	-	-	-
White-browed Woodswallow	*Artamus superciliosus*	14	2008	-	-	-
Dusky Woodswallow	*Artamus cyanopterus*	59	2007	Partial	-	-
Varied Sittella	*Daphoenositta chrysoptera*	5	1979	-	-	-
White-throated Treecreeper	*Cormobates leucophaeus*	46	1981	Total	-	-
Mistletoebird	*Dicaeum hirundinaceum*	14	2001	-	-	-

Common name	Scientific name	Total # of documented records	Last documented record	Hollow use	Mi/Ma	Present survey
Spotted Pardalote	*Pardalotus punctatus*	157	2007	-	-	S
Silvereye	*Zosterops lateralis*	286	2006	-	Ma	S
White-naped Honeyeater	*Melithreptus lunatus*	67	2003	-	-	-
Brown-headed Honeyeater	*Melithreptus brevirostris*	29	1998	-	-	-
Eastern Spinebill	*Acanthorhynchus tenuirostris*	102	2001	-	-	-
Tawny-crowned Honeyeater	*Phylidonyris melanops*	5	1981	-	-	-
Regent Honeyeater	*Anthochaera phrygia*	2	1993	-	Mi	-
Singing Honeyeater	*Lichenostomus virescens*	45	2007	-	-	-
Yellow-faced Honeyeater	*Lichenostomus chrysops*	88	2007	-	-	-
White-eared Honeyeater	*Lichenostomus leucotis*	34	2004	-	-	-
Yellow-plumed Honeyeater	*Lichenostomus ornatus*	1	1898	-	-	-
White-plumed Honeyeater	*Lichenostomus penicillatus*	327	2007	-	-	S
Crescent Honeyeater	*Phylidonyris pyrrhoptera*	24	2000	-	-	-
New Holland Honeyeater	*Phylidonyris novaehollandiae*	414	2007	-	-	S
Noisy Miner	*Manorina melanocephala*	148	2007	-	-	H
Little Wattlebird	*Anthochaera chrysoptera*	17	2001	-	-	-
Red Wattlebird	*Anthochaera carunculata*	498	2007	-	-	H
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*	71	2006	-	-	-
Australasian Pipit	*Anthus novaeseelandiae*	112	2006	-	Ma	S
Horsfield's Bushlark	*Mirafra javanica*	16	2000	-	-	-
Diamond Firetail	*Stagonopleura guttata*	4	1973	-	-	-
Zebra Finch	*Taeniopygia guttata*	2	2000	-	-	-
Red-browed Finch	*Neochmia temporalis*	92	2007	-	-	-
Olive-backed Oriole	*Oriolus sagittatus*	1	1980	-	-	-
White-winged Chough	*Corcorax melanorhamphos*	15	2003	-	-	-
Pied Currawong	*Strepera graculina*	151	2007	-	-	H
Grey Currawong	*Strepera versicolor*	76	2004	-	-	-
Grey Butcherbird	*Cracticus torquatus*	177	2007	-	-	-
Australian Magpie	*Gymnorhina tibicen*	642	2007	-	-	S

Common name	Scientific name	Total # of documented records	Last documented record	Hollow use	Mi/Ma	Present survey
Bassian Thrush	*Zoothera lunulata*	3	1977	-	-	-
Forest Raven	*Corvus tasmanicus*	1	2001	-	Ma	-
Australian Raven	*Corvus coronoides*	75	2007	-	-	H
Little Raven	*Corvus mellori*	416	2006	-	Ma	H
Striated Pardalote	*Pardalotus striatus*	74	2007	Partial	-	-
Common Blackbird*	*Turdus merula*	461	2007	-	-	S
Song Thrush*	*Turdus philomelos*	97	2001	-	-	-
European Skylark*	*Alauda arvensis*	243	2007	-	-	S
Eurasian Tree Sparrow*	*Passer montanus*	35	2001	-	-	-
House Sparrow*	*Passer domesticus*	492	2007	-	-	S
European Goldfinch*	*Carduelis carduelis*	446	2007	-	-	S
European Greenfinch*	*Carduelis chloris*	242	2007	-	-	-
Common Myna*	*Acridotheres tristis*	308	2008	-	-	S
Common Starling*	*Sturnus vulgaris*	558	2008	-	-	S
Rufous Bristlebird (Otways subsp.)	*Dasyornis broadbenti caryochrus*	3	1978	-	-	-
Brown Treecreeper (south-eastern ssp.)	*Climacteris picumnus victoriae*	4	2004	Total	-	-
	REPTILES					
Murray Short-necked Turtle	*Emydura macquarii*	1	1989	-	-	-
Marbled Gecko	*Christinus marmoratus*	4	2008	Partial	-	-
Tree Dragon	*Amphibolurus muricatus*	1	1961	Partial	-	-
Large Striped Skink	*Ctenotus robustus*	1	1995	-	-	-
Cunningham's Skink	*Egernia cunninghami*	1	1961	-	-	-
Garden Skink	*Lampropholis guichenoti*	3	2006	-	-	S
Weasel Skink	*Saproscincus mustelinus*	1	2004	-	-	-
Metallic Skink	*Niveoscincus metallicus*	1	1987	-	-	-
Blotched Blue-tongued Lizard	*Tiliqua nigrolutea*	1	1959	-	-	-
Common Blue-tongued Lizard	*Tiliqua scincoides*	5	2007	-	-	S
Tiger Snake	*Notechis scutatus*	5	2007	-	-	-

Common name	Scientific name	Total # of documented records	Last documented record	Hollow use	Mi/Ma	Present survey
Eastern Three-lined Skink	*Bassiana duperreyi*	6	2007	-	-	-
Lowland Copperhead	*Austrelaps superbus*	5	2006	-	-	-
Tussock Skink	*Pseudemoia pagenstecheri*	1	1987	-	-	-
Southern Grass Skink	*Pseudemoia entrecasteauxii*	1	2004	-	-	-
Southern Water Skink	*Eulamprus tympanum tympanum*	2	1999	-	-	-
	AMPHIBIANS					
Southern Banjo Frog	*Limnodynastes dumerilii*	2	2004	-	-	H
Striped Marsh Frog	*Limnodynastes peronii*	3	1996	-	-	H
Common Spadefoot Toad	*Neobatrachus sudelli*	2	2011	-	-	S
Spotted Marsh Frog	*Limnodynastes tasmaniensis*	8	2004	-	-	S
Southern Toadlet	*Pseudophryne semimarmorata*	1	2004	-	-	-
Common Froglet	*Crinia signifera*	23	2005	-	-	H
Southern Brown Tree Frog	*Litoria ewingii*	9	2004	-	-	S
Growling Grass Frog	*Litoria raniformis*	12	1997	-	-	-
	FISH					
Short-finned Eel	*Anguilla australis*	23	1999	-	-	-
Sandy Sprat	*Hyperlophus vittatus*	1	1995	-	-	-
Brown Trout*	*Salmo trutta*	7	1999	-	-	-
Australian Smelt	*Retropinna semoni*	19	1999	-	-	-
Australian Grayling	*Prototroctes maraena*	34	1987	-	-	-
Spotted Galaxias	*Galaxias truttaceus*	19	1999	-	-	-
Broad-finned Galaxias	*Galaxias brevipinnis*	7	1995	-	-	-
Common Galaxias	*Galaxias maculatus*	30	1999	-	-	-
Goldfish*	*Carassius auratus*	4	1999	-	-	-
Carp*	*Cyprinus carpio*	3	1999	-	-	-
Tench*	*Tinca tinca*	3	1996	-	-	-
Gambusia*	*Gambusia holbrooki*	8	2005	-	-	S
Smallmouthed Hardyhead	*Atherinosoma microstoma*	4	2002	-	-	-
Murray Cod	*Maccullochella peelii peelii*	1	1873	-	-	-

Common name	Scientific name	Total # of documented records	Last documented record	Hollow use	Mi/Ma	Present survey
Macquarie Perch	*Macquaria australasica*	1	1873	-	-	-
Yarra Pygmy Perch	*Nannoperca obscura*	9	2002	-	-	-
Southern Pygmy Perch	*Nannoperca australis*	6	2002	-	-	-
Redfin*	*Perca fluviatilis*	3	1986	-	-	-
Tommy Rough	*Arripis georgianus*	1	1975	-	-	-
Black Bream	*Acanthopagrus butcheri*	1	1975	-	-	-
Yellow-eye Mullet	*Aldrichetta forsteri*	3	1995	-	-	-
Tupong	*Pseudaphritis urvillii*	9	1999	-	-	-
Bridled Goby	*Arenigobius bifrenatus*	1	1987	-	-	-
Lagoon Goby	*Tasmanogobius lasti*	1	1987	-	-	-
Flat-headed Gudgeon	*Philypnodon grandiceps*	11	1999	-	-	-
Longsnouted Flounder	*Ammotretis rostratus*	1	1975	-	-	-
Greenback Flounder	*Rhombosolea tapirina*	1	1975	-	-	-
MUSSELS & CRUSTACEANS						
Common Freshwater Shrimp	*Paratya australiensis*	4	1999	-	-	-
Southern Victorian Spiny Crayfish	*Euastacus yarraensis*	1	1942	-	-	-
Granular Burrowing Crayfish	*Engaeus cunicularius*	1	1982	-	-	-
INVERTEBRATES						
Yellow Sedge-skipper	*Hesperilla flavescens flavescens*	5	1988	-	-	-

Source: Victorian Biodiversity Atlas (2010); SEWPaC (2011).

Appendix 3.2 – Significant fauna species

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

Habitat characteristics of significant flora and 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 (VBA 2011); 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 2007); 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	Total # of documented records	EPBC	FFG	DSE	NAP	Likely use of study area
NATIONAL SIGNIFICANCE								
#Spot-tailed Quoll	*Dasyurus maculatus maculatus*	-	-	EN	L	EN	VU	7
#Long-nosed Potoroo	*Potorous tridactylus tridactylus*	-	-	VU	L	EN	EN	7
Eastern Barred Bandicoot	*Perameles gunnii*	1760	1	EN	L	CR	CR	7
#Southern Brown Bandicoot	*Isoodon obesulus obesulus*	1981	3	EN	L	NT	NT	7
#New Holland Mouse	*Pseudomys novaehollandiae*	-	-	VU	L	VU	-	7
#Grey-headed Flying-fox	*Pteropus poliocephalus*	2002	8	VU	L	VU	VU	3
#Common Bent-wing Bat (S ssp.)	*Miniopterus schreibersii bassani*	-	-	CR	L	EN	CD	7
Plains-wanderer	*Pedionomus torquatus*	1971	2	VU	L	CR	EN	7
Hooded Plover	*Thinornis rubricollis rubricollis*	2008	53	-	L	VU	VU	7
Australasian Bittern	*Botaurus poiciloptilus*	2008	46	-	L	EN	-	5
# Australian Painted Snipe	*Rostratula benghalensis australis*	1985	5	VU	L	CR	VU	7
#Orange-bellied Parrot	*Neophema chrysogaster*	2007	73	CR	L	CR	CR	7
#Swift Parrot	*Lathamus discolor*	2006	28	EN	L	EN	EN	4 (fly over)
#Regent Honeyeater	*Anthochaera phrygia*	1993	2	EN	L	CR	EN	5 (fly over)
Rufous Bristlebird (Otways subsp.)	*Dasyornis broadbenti caryochrus*	1978	3	-	L	NT	VU	7
#Striped Legless Lizard	*Delma impar*	-	-	VU	L	EN	VU	7
#Growling Grass Frog	*Litoria raniformis*	1997	12	VU	L	EN	VU	5
#Australian Grayling	*Prototroctes maraena*	1987	34	VU	L	VU	VU	7
Murray Cod	*Maccullochella peelii peelii*	1873	1	VU	L	EN	-	7
Macquarie Perch	*Macquaria australasica*	1873	1	EN	L	EN	DD	7
#Yarra Pygmy Perch	*Nannoperca obscura*	2002	9	VU	L	NT	VU	7
#Dwarf Galaxias	*Galaxiella pusilla*	-	-	VU	L	VU	VU	7
STATE SIGNIFICANCE								
Gull-billed Tern	*Gelochelidon nilotica macrotarsa*	2008	16	-	L	EN	-	7
Caspian Tern	*Hydroprogne caspia*	2006	104	-	L	NT	-	7
Little Tern	*Sternula albifrons sinensis*	1997	21	-	L	VU	-	7

Common name	Scientific name	Last documented record	Total # of documented records	EPBC	FFG	DSE	NAP	Likely use of study area
Fairy Tern	*Sternula nereis nereis*	2000	54	-	L	EN	-	7
Whimbrel	*Numenius phaeopus*	1980	2	-	L	VU	-	7
Black-tailed Godwit	*Limosa limosa*	2004	15	-		VU	-	7
Wood Sandpiper	*Tringa glareola*	2008	4	-		VU	-	7
Grey-tailed Tattler	*Heteroscelus brevipes*	1988	3	-	L	CR	-	7
Common Sandpiper	*Actitis hypoleucos*	2007	12	-		VU	-	7
Terek Sandpiper	*Xenus cinereus*	2008	3	-	L	EN	-	7
Great Knot	*Calidris tenuirostris*	2001	5	-	L	EN	-	7
Brolga	*Grus rubicunda*	2008	17	-	L	VU	-	4
Royal Spoonbill	*Platalea regia*	2007	152	-		VU	-	4
Little Egret	*Egretta garzetta nigripes*	2006	57	-	L	EN	-	4
Intermediate Egret	*Ardea intermedia*	2001	18	-	L	CR	-	4
Eastern Great Egret	*Ardea modesta*	2007	213	-	L	VU	-	4
Little Bittern	*Ixobrychus minutus dubius*	2001	2	-	L	EN	-	4
Magpie Goose	*Anseranas semipalmata*	2006	39	-	L	NT	-	4
Australasian Shoveler	*Anas rhynchotis*	2006	78	-	-	VU	-	4
Freckled Duck	*Stictonetta naevosa*	2005	6	-	L	EN	-	4
Hardhead	*Aythya australis*	2005	106	-	-	VU	-	4
Blue-billed Duck	*Oxyura australis*	2002	14	-	L	EN	-	4
Musk Duck	*Biziura lobata*	2006	49	-	-	VU	-	4
King Quail	*Coturnix chinensis victoriae*	1898	1	-	L	EN	-	5
Red-chested Button-quail	*Turnix pyrrhothorax*	1898	1	-	L	VU	-	7
Lewin's Rail	*Lewinia pectoralis pectoralis*	2006	8	-	L	VU	NT	4
Baillon's Crake	*Porzana pusilla palustris*	2001	28	-	L	VU	-	4
Grey Goshawk	*Accipiter novaehollandiae novaehollandiae*	2007	21	-	L	VU	-	4
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	2005	12	-	L	VU	-	4
Black Falcon	*Falco subniger*	2008	20	-	-	VU	-	4
Barking Owl	*Ninox connivens connivens*	2000	2	-	L	EN	NT	7

Common name	Scientific name	Last documented record	Total # of documented records	EPBC	FFG	DSE	NAP	Likely use of study area
Powerful Owl	*Ninox strenua*	2007	2	-	L	VU	-	7
Masked Owl	*Tyto novaehollandiae novaehollandiae*	1983	2	-	L	EN	NT	7
Ground Parrot	*Pezoporus wallicus wallicus*	1909	1	-	L	EN	VU	7
Hooded Robin	*Melanodryas cucullata cucullata*	1978	3	-	L	NT	NT	4
Grey-crowned Babbler	*Pomatostomus temporalis temporalis*	1898	2	-	L	EN	NT	7
Speckled Warbler	*Chthonicola sagittata*	1960	3	-	L	VU	NT	7
Diamond Firetail	*Stagonopleura guttata*	1973	4	-	L	VU	NT	7
Brown Treecreeper (south-eastern ssp.)	*Climacteris picumnus victoriae*	2004	4	-	-	NT	NT	5
Southern Toadlet	*Pseudophryne semimarmorata*	2004	1	-	-	VU	-	7
Yellow Sedge-skipper	*Hesperilla flavescens flavescens*	1988	5	-	L	VU	LC	7
REGIONAL SIGNIFICANCE								
Pied Cormorant	*Phalacrocorax varius*	2008	86	-	-	NT	-	4
Whiskered Tern	*Chlidonias hybridus javanicus*	2007	84	-	-	NT	-	4
White-fronted Tern	*Sterna striata*	1978	1	-	-	NT	-	7
Sooty Oystercatcher	*Haematopus fuliginosus*	1988	2	-	-	NT	-	7
Grey Plover	*Pluvialis squatarola*	1980	1	-	-	NT	-	7
Pacific Golden Plover	*Pluvialis fulva*	2007	20	-	-	NT	-	6
Eastern Curlew	*Numenius madagascariensis*	2008	49	-	-	NT	-	7
Red Knot	*Calidris canutus*	2001	11	-	-	NT	-	7
Sanderling	*Calidris alba*	2008	12	-	-	NT	-	7
Latham's Snipe	*Gallinago hardwickii*	2006	101	-	-	NT	-	2
Australian Pratincole	*Stiltia isabella*	1985	1	-	-	NT	-	7
Glossy Ibis	*Plegadis falcinellus*	2007	29	-	-	NT	-	4
Nankeen Night Heron	*Nycticorax caledonicus hillii*	2001	59	-	-	NT	-	7
Cape Barren Goose	*Cereopsis novaehollandiae*	2007	4	-	-	NT	-	5
Brown Quail	*Coturnix ypsilophora australis*	1995	5	-	-	NT	-	4
Little Button-quail	*Turnix velox*	1971	1	-	-	NT	-	5

Common name	Scientific name	Last documented record	Total # of documented records	EPBC	FFG	DSE	NAP	Likely use of study area
Spotted Harrier	*Circus assimilis*	1997	3	-	-	NT	-	5
Azure Kingfisher	*Alcedo azurea*	1999	3	-	-	NT	-	5
Spotted Quail-thrush	*Cinclosoma punctatum*	1979	2	-	-	NT	-	7
Long-toed Stint	*Calidris subminuta*	1986	7	-	-	NT	-	7
Pectoral Sandpiper	*Calidris melanotos*	2001	14	-	-	NT	-	7
Pacific Gull	*Larus pacificus pacificus*	2007	124	-	-	NT	-	6

Source: Victorian Biodiversity Atlas (2010); SEWPaC (2011).

Appendix 4 – Habitat Assessment Results

Table A4.1. Growling Grass Frog Habitat Assessment results

Survey sites	Survey date/s	Waterbody type and size (approx. metres)	Dominant flora	Surrounding habitat (within 30 metres)	Refuge sites	Water quality	Fish present	%CAN	%OP	%FR	%EM	%SUB	%FL	Max. abundance of GGF
1	13/1/11 24/1/11	Dam (20 x 15)	Pasture	Pasture/crops	Dense vegetation lining the banks	Moderate to Good	N/A	0	60	100	35	<1	<5	0
2	13/1/11 24/1/11	Dam (30x30)	Pasture grasses	Heavily grazed pasture	Fringing pasture grass	Poor	N/A	0	60	100	<1	40	40	0
3	*	Dam (60x60)	Pasture	crops/ remnant woodland	Open clay banks – little refuge sites	Poor	N/A	0	100	<5	0	0	0	N/A
4	13/1/11 24/1/11	Dam (30 x 15) Front yard of house	Pasture	Mowed pasture	Island in dam with tall exotic grasses.	Poor	N/A	0	80	100	15	<5	<1	0
5	*	Dry grazed Pasture – No waterbody	Phalaris	Phalaris/ mowed exotic grass	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6	*	Dry grazed Pasture – No waterbody	Pasture	Pasture/Crops	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7	13/1/11 24/1/11	Irrigation dam on tomato farm (30x 15)	Azolla	Exotic grasses/ Pasture/ Tomato crop	Dense fringing vegetation on east bank	Poor/ moderate	Unknown	0	0	70	<5	0	95	0
8	13/1/11 24/1/11	Dam (30 x 18)	Pasture grasses/ some Danthonia around edge	Pasture Grasses	Fringing pasture grasses	Poor	N/A	0	100	70	<1	0	0	0

Survey sites	Survey date/s	Waterbody type and size (approx. metres)	Dominant flora	Surrounding habitat (within 30 metres)	Refuge sites	Water quality	Fish present	%CAN	%OP	%FR	%EM	%SUB	%FL	Max. abundance of GGF
9	13/1/11 24/1/11	Large open dam (90 x 90)	Acacia/Gorse/ Eucalypt/ Pasture grass	Pasture grass/ roads/ railway line	Dense fringing vegetation/ Shrubs/ rocks	Moderate	Gambusia Holbrooki	20	85	100	15	10	<1	0
10	13/1/11 24/1/11	Triangular dam (80 x 80 x 100)	Grazed pasture (cattle)	Grazed pasture	Corrigated iron sheets/ rocks/ old timber posts Emergent rushes	Poor	N/A	0	80	100	20	0	0	0
11	*	Dam (30 x 25)	Grazed Pasture (cattle)	Grazed pasture	Emergent rushes	Poor	N/A	0	90	100	10	0	0	0
12	13/1/11 24/1/11	Pond 'Narana' (80 x 40)	Eucalypt reveg	Reveg/ Walking paths Leaf/bark litter	Shrubs and rushes on central island	Moderate	N/A	70	85	10	15	0	0	0
13	*	Dam (20 x 20)	Grazed pasture(cattle) / Danthonia	Grazed pasture/ Danthonia	Emergent rushes	Poor	N/A	0	90	100	10	0	0	0
14	*	Dam (25 x 25)	Grazed pasture (cattle)/ Danthonia	Grazed pasture/ Danthonia	Emergent rushes	Poor	N/A	0	90	100	10	0	0	0
15	13/1/11 24/1/11	Vet Dam (100 x 15)	Grazed pasture (horse)	Grazed pasture/ roadside drainage line	Emergent rushes/ dense shrubs	Poor	N/A	1	>95	90	<5	0	0	0
16	13/1/11 24/1/11	Vet Dam (25 x 30)	Grazed pasture (horse)	Grazed pasture/ roadside drainage line	Emergent rushes	Poor	N/A	0	90	100	10	0	0	0
17	13/1/11 24/1/11	Dam (20 x 30)	Grazed Pasture (sheep)	Grazed pasture/ roadside drainage line	Emergent rushes/ dense shrubs	Poor	N/A	0	85	100	15	0	0	0
18	13/1/11 24/1/11	Dam (25 x 25)	Typha	Pasture	Dense Typha on southern	Poor/ moderate	N/A	0	70	100	30	0	0	0

Survey sites	Survey date/s	Waterbody type and size (approx. metres)	Dominant flora	Surrounding habitat (within 30 metres)	Refuge sites	Water quality	Fish present	%CAN	%OP	%FR	%EM	%SUB	%FL	Max. abundance of GGF
					edges									
19	13/1/11 24/1/11	Fenced off dam (35 x 45)	Exotic grasses	Exotic grass/pasture/ drainage line on roadside/ saltmarsh	Fallen tree branches/ emergent rushes/ drainage line	Good	N/A	0	65	100	15	10	0	0
20	No access/ assessed from roadside	Dam (15 x 20)	Exotic pasture	Pasture/ crops/ road	Tall grass	Poor (turbid)	N/A	0	100	80	0	0	0	0
21	No access/ assessed from roadside	Dam (25 x 20)	Grazed pasture (sheep)	Pasture/ hobby farm/ road/ driveway	N/A	Poor (turbid)	N/A	0	100	90	0	0	0	0
22	No access/ assessed from roadside	Dam (20 x 30)	Grazed pasture (cattle)	Pasture/ roads	Sheet metal/ tree branches/ emergent rushes	Poor (turbid)	N/A	0	85	100	15	0	0	0
23	No access/ assessed from roadside	Dam (25 x 30)	Grazed pasture (cattle)	Pasture/ roads	Sheet metal/ tree branches/ emergent rushes	Poor (turbid)	N/A	0	85	100	15	0	0	0
24	13/1/11 24/1/11	Dam (20 x 30)	Exotic grasses/ Pasture	Crops/ pasture/ low-lying marsh	Sheet metal/ metal guttering/ fallen hollow branches/ emergent rushes	Good	N/A	0	75	100	20	5	5	0
25	13/1/11 24/1/11	Dam (10 x 8)	Exotic grasses/ Pasture	Crops/ pasture/ low-lying marsh	Fallen tree branches/ emergent	Good	N/A	60	75	100	20	0	5	0

Survey sites	Survey date/s	Waterbody type and size (approx. metres)	Dominant flora	Surrounding habitat (within 30 metres)	Refuge sites	Water quality	Fish present	%CAN	%OP	%FR	%EM	%SUB	%FL	Max. abundance of GGF
					rushes									
26	13/1/11 24/1/11	Dam (20 x 15)	Exotic grasses/ Pasture	Crops/ pasture/ low-lying marsh	Emergent rushes/ fallen hollow tree branches	Moderate/ good	N/A	0	75	100	15	0	10	0
27	13/1/11 24/1/11	Dam (30 x 30)	Typha/ Azolla Pasture	Pasture	Sheets of corrugated iron/ Typha	Moderate	N/A	0	0	100	25	0	75	0
28	13/1/11 24/1/11	Dam (20 x 8)	Grazed pasture (horse)	Grazed pasture/ roads/crops	Emergent rushes	Poor	N/A	0	90	90	10	0	0	0

Notes: *Waterbodies considered unsuitable for Targeted Growling Grass Frog Surveys due to low levels of aquatic and semi-aquatic vegetation and low water quality. Summary of Habitat Descriptions Used in Appendix A5: %CAN: Percentage of Canopy over dam; %OP: Percentage of Open Water; %FR: Percentage of Fringing Vegetation; %EM: Percentage of Emergent Vegetation; %SUB: Percentage of Submergent Vegetation; %FL: Percentage of Floating Vegetation.

Table A4.2. Water Quality/Horiba results for targeted waterbodies within the study area

Site	Turbidity (N.T.U)	Temperature (°C)	pH (units)	EC (mS/cm)	DO mg/L
1	78	25.1	6.8	0.178	4.09
4	76	25.14	7.47	0.214	11.36
7	86	20.85	7.02	1.51	1.7
9	126	24.9	7.08	0.242	7.34
15	95	23.33	7.47	0.231	9.8
16	90	21.87	7.49	0.29	8.3
19	64	25.8	7.35	0.257	7.8
24	136	22.67	6.89	0.115	4.59
25	160	19.5	6.34	0.14	3.35
26	140	22.72	6.83	0.111	4.76
27	210	24.13	6.99	0.348	13.25

Notes: EC = Electrical Conductivity, DO = Dissolved Oxygen

Appendix 5 – Scattered Tree Results

Table A3. *Scattered indigenous trees recorded within the study area*

Survey Number	Bioregion	Species	Size	Latitude	Longitude
0	OP	Melbourne Yellow Gum	ST	-38.21750	144.36471
0	OP	Melbourne Yellow Gum	ST	-38.21555	144.36755
137	VVP	River Red-gum	MOT	-38.20887	144.37611
211	OP	Drooping Sheoak	LOT	-38.22672	144.35546
240	OP	Drooping Sheoak	VLOT	-38.22542	144.35098
241	OP	Melbourne Yellow Gum	LOT	-38.22799	144.35030
242	OP	Melbourne Yellow Gum	LOT	-38.22958	144.34818
243	OP	Melbourne Yellow Gum	LOT	-38.22687	144.35119
244	OP	Melbourne Yellow Gum	MOT	-38.22933	144.35135
245	OP	Melbourne Yellow Gum	LOT	-38.22936	144.35122
255	OP	Melbourne Yellow Gum	MOT	-38.22848	144.35049
256	OP	Melbourne Yellow Gum	LOT	-38.22878	144.35052
257	OP	Melbourne Yellow Gum	ST	-38.22866	144.35057
258	OP	Melbourne Yellow Gum	MOT	-38.22837	144.35092
259	OP	Melbourne Yellow Gum	MOT	-38.22810	144.35067
260	OP	Melbourne Yellow Gum	LOT	-38.22825	144.35148
261	OP	Melbourne Yellow Gum	LOT	-38.22836	144.35140
262	OP	Melbourne Yellow Gum	LOT	-38.22823	144.35155
263	OP	Melbourne Yellow Gum	MOT	-38.22821	144.35160
267	OP	Melbourne Yellow Gum	ST	-38.22890	144.35169
268	OP	Melbourne Yellow Gum	MOT	-38.22886	144.35199
269	OP	Melbourne Yellow Gum	ST	-38.22911	144.35185
272	OP	River Red-gum	VLOT	-38.22328	144.34994
273	OP	River Red-gum	LOT	-38.22297	144.35032
274	OP	River Red-gum	LOT	-38.22235	144.35035
275	OP	Melbourne Yellow Gum	MOT	-38.22309	144.35095
276	OP	Melbourne Yellow Gum	LOT	-38.22317	144.35094
277	OP	Melbourne Yellow Gum	LOT	-38.22327	144.35077
278	OP	Melbourne Yellow Gum	MOT	-38.22318	144.35079
279	OP	Melbourne Yellow Gum	ST	-38.22356	144.35053
329	OP	Melbourne Yellow Gum	MOT	-38.22173	144.35711
427	OP	Melbourne Yellow Gum	MOT	-38.21666	144.34624
428	OP	Melbourne Yellow Gum	MOT	-38.21654	144.34643
429	OP	Melbourne Yellow Gum	LOT	-38.21616	144.34700
430	OP	Melbourne Yellow Gum	LOT	-38.21597	144.34701
431	OP	Melbourne Yellow Gum	MOT	-38.21285	144.34855
432	OP	Melbourne Yellow Gum	LOT	-38.21283	144.34860

Survey Number	Bioregion	Species	Size	Latitude	Longitude
433	OP	Melbourne Yellow Gum	MOT	-38.21260	144.34834
441	OP	Melbourne Yellow Gum	MOT	-38.21094	144.34663
442	OP	Melbourne Yellow Gum	ST	-38.21051	144.34638
449	OP	Melbourne Yellow Gum	ST	-38.21044	144.34601
454	OP	Melbourne Yellow Gum	LOT	-38.21074	144.34471
455	OP	Melbourne Yellow Gum	LOT	-38.21273	144.34385
456	OP	Melbourne Yellow Gum	VLOT	-38.21261	144.34271
457	OP	Melbourne Yellow Gum	VLOT	-38.21350	144.34241
458	OP	Melbourne Yellow Gum	LOT	-38.21462	144.34440
459	OP	Melbourne Yellow Gum	MOT	-38.21522	144.34475
460	OP	Melbourne Yellow Gum	LOT	-38.21712	144.35059
461	OP	Drooping Sheoak	MOT	-38.21718	144.35040
462	OP	Drooping Sheoak	LOT	-38.21729	144.35143
465	OP	Melbourne Yellow Gum	LOT	-38.21683	144.35257
476	OP	Melbourne Yellow Gum	LOT	-38.21526	144.35288
477	OP	Melbourne Yellow Gum	LOT	-38.21322	144.35328
478	OP	Melbourne Yellow Gum	LOT	-38.21077	144.35610
479	OP	River Red-gum	LOT	-38.21191	144.35590
480	OP	River Red-gum	LOT	-38.21199	144.35590
481	OP	Melbourne Yellow Gum	MOT	-38.21450	144.35533
488	OP	Melbourne Yellow Gum	LOT	-38.21071	144.35701
494	OP	Melbourne Yellow Gum	ST	-38.21127	144.35795
500	OP	Melbourne Yellow Gum	ST	-38.21761	144.35709
522	OP	Melbourne Yellow Gum	ST	-38.21165	144.35826
523	OP	Melbourne Yellow Gum	ST	-38.21149	144.35832
524	OP	River Red-gum	ST	-38.21027	144.35855
530	OP	River Red-gum	MOT	-38.21218	144.35832
576	VVP	River Red-gum	ST	-38.20809	144.36816
577	VVP	River Red-gum	ST	-38.20809	144.36809
578	VVP	River Red-gum	ST	-38.20796	144.36716
580	OP	River Red-gum	LOT	-38.20755	144.36322
581	OP	River Red-gum	LOT	-38.20752	144.36310
590	VVP	River Red-gum	ST	-38.21319	144.36892
591	VVP	River Red-gum	MOT	-38.21395	144.36876
592	VVP	River Red-gum	MOT	-38.21530	144.36850
593	VVP	River Red-gum	MOT	-38.21584	144.36835
604	VVP	River Red-gum	ST	-38.21864	144.37183
608	VVP	River Red-gum	LOT	-38.21733	144.37164
609	VVP	River Red-gum	LOT	-38.21717	144.37208
610	VVP	River Red-gum	VLOT	-38.21670	144.37163
611	VVP	River Red-gum	LOT	-38.21638	144.37115

Survey Number	Bioregion	Species	Size	Latitude	Longitude
612	VVP	River Red-gum	LOT	-38.21588	144.37138
613	VVP	River Red-gum	LOT	-38.21593	144.37189
614	VVP	River Red-gum	LOT	-38.21595	144.37198
615	VVP	River Red-gum	VLOT	-38.21573	144.37202
616	VVP	River Red-gum	LOT	-38.21505	144.37169
617	VVP	River Red-gum	VLOT	-38.21452	144.37194
618	VVP	River Red-gum	MOT	-38.21386	144.37225
619	VVP	River Red-gum	LOT	-38.21373	144.37225
620	OP	Melbourne Yellow Gum	LOT	-38.20889	144.36047
621	OP	River Red-gum	LOT	-38.21060	144.36331
622	OP	River Red-gum	LOT	-38.21023	144.36338
623	OP	Melbourne Yellow Gum	ST	-38.21100	144.36323
624	OP	Melbourne Yellow Gum	ST	-38.21118	144.36317
625	OP	River Red-gum	ST	-38.21124	144.36318
626	OP	Melbourne Yellow Gum	LOT	-38.21136	144.36304
627	OP	Melbourne Yellow Gum	LOT	-38.21135	144.36288
628	OP	Melbourne Yellow Gum	MOT	-38.21134	144.36277
629	OP	Melbourne Yellow Gum	MOT	-38.21114	144.36093
630	OP	River Red-gum	LOT	-38.21094	144.35901
631	OP	Melbourne Yellow Gum	LOT	-38.21100	144.35972
634	OP	Melbourne Yellow Gum	LOT	-38.20901	144.36410
635	OP	Melbourne Yellow Gum	ST	-38.20920	144.36435
636	OP	Melbourne Yellow Gum	ST	-38.20922	144.36448
637	VVP	River Red-gum	LOT	-38.21321	144.36515
638	VVP	River Red-gum	LOT	-38.21252	144.36564
639	VVP	River Red-gum	VLOT	-38.21215	144.36388
643	VVP	River Red-gum	LOT	-38.21590	144.37099
644	VVP	River Red-gum	ST	-38.21574	144.37097
650	VVP	River Red-gum	ST	-38.21499	144.37109
651	VVP	River Red-gum	MOT	-38.21487	144.37106
652	VVP	River Red-gum	MOT	-38.21502	144.37116
653	VVP	River Red-gum	MOT	-38.21427	144.37123
702	OP	Melbourne Yellow Gum	LOT	-38.20952	144.34694
703	OP	Melbourne Yellow Gum	ST	-38.20974	144.34640
710	OP	Melbourne Yellow Gum	LOT	-38.21014	144.34524
711	OP	Melbourne Yellow Gum	ST	-38.21048	144.34333
745	OP	Melbourne Yellow Gum	MOT	-38.21785	144.36746
746	OP	Melbourne Yellow Gum	ST	-38.21762	144.36752
747	OP	Melbourne Yellow Gum	LOT	-38.21705	144.36777
748	OP	Melbourne Yellow Gum	ST	-38.21697	144.36773
752	OP	Melbourne Yellow Gum	MOT	-38.22697	144.37163

Survey Number	Bioregion	Species	Size	Latitude	Longitude
757	OP	Melbourne Yellow Gum	LOT	-38.21776	144.36662
790	OP	Melbourne Yellow Gum	MOT	-38.21871	144.36549
794	VVP	River Red-gum	ST	-38.21564	144.36565
795	VVP	River Red-gum	ST	-38.21553	144.36579
797	VVP	Melbourne Yellow Gum	ST	-38.21530	144.36457
804	VVP	River Red-gum	ST	-38.21576	144.36703
2014	OP	Drooping Sheoak	MOT	-38.21905	144.35669
2015	OP	River Red-gum	ST	-38.20784	144.35919
2022	OP	Swamp Gum	ST	-38.21479	144.34518
2025	OP	River Red-gum	LOT	-38.21816	144.34297
2028	OP	Melbourne Yellow Gum	ST	-38.21744	144.36411
2039	OP	Drooping Sheoak	LOT	-38.21252	144.35339
2040	OP	Drooping Sheoak	LOT	-38.21723	144.35080
2041	OP	Melbourne Yellow Gum	MOT	-38.21199	144.35588
2042	OP	River Red-gum	LOT	-38.20723	144.35674
2043	OP	Drooping Sheoak	LOT	-38.20688	144.35758
2044	OP	Melbourne Yellow Gum	LOT	-38.20868	144.36361
2045	OP	Melbourne Yellow Gum	MOT	-38.20873	144.36360
2046	OP	River Red-gum	LOT	-38.20877	144.36351
2047	OP	River Red-gum	LOT	-38.20854	144.36342
2048	OP	Melbourne Yellow Gum	ST	-38.20844	144.36266
2049	OP	Melbourne Yellow Gum	ST	-38.20843	144.36258
2051	OP	Melbourne Yellow Gum	LOT	-38.20821	144.36156
2052	OP	Melbourne Yellow Gum	ST	-38.20810	144.36163
2053	OP	Melbourne Yellow Gum	LOT	-38.20797	144.36168
2054	OP	Melbourne Yellow Gum	LOT	-38.20758	144.36189
2055	OP	River Red-gum	ST	-38.21140	144.35943
2056	OP	Melbourne Yellow Gum	MOT	-38.21111	144.36041
2059	OP	Melbourne Yellow Gum	LOT	-38.21330	144.36083
2060	OP	Melbourne Yellow Gum	LOT	-38.21490	144.36062
2061	OP	Melbourne Yellow Gum	LOT	-38.21492	144.36067
2062	VVP	Dead- Eucalypt	ST	-38.21525	144.36459
2063	VVP	Dead- Eucalypt	MOT	-38.21528	144.36476
2064	OP	Melbourne Yellow Gum	LOT	-38.21474	144.36017
2065	OP	Melbourne Yellow Gum	MOT	-38.21470	144.35998
2066	OP	Melbourne Yellow Gum	LOT	-38.21462	144.35932
2067	OP	Dead- Eucalypt	VLOT	-38.21503	144.35904
2068	OP	Melbourne Yellow Gum	LOT	-38.21815	144.35867
2069	OP	Melbourne Yellow Gum	MOT	-38.21815	144.35876
2070	OP	Melbourne Yellow Gum	MOT	-38.21683	144.36208
2071	OP	Melbourne Yellow Gum	MOT	-38.21619	144.36221

Survey Number	Bioregion	Species	Size	Latitude	Longitude
2072	OP	Melbourne Yellow Gum	LOT	-38.21566	144.36226
2075	OP	Dead- Eucalypt	ST	-38.22833	144.35244
2076	OP	Dead- Eucalypt	ST	-38.22832	144.35256
2077	OP	Dead- Eucalypt	ST	-38.22835	144.35257
2078	OP	Dead- Eucalypt	ST	-38.22902	144.35193
2079	OP	Dead- Eucalypt	ST	-38.22899	144.35210
2080	OP	Drooping Sheoak	MOT	-38.22605	144.35080
2082	OP	Dead- Eucalypt	LOT	-38.22317	144.35114
2083	OP	Dead- Eucalypt	LOT	-38.22324	144.35120
2084	OP	Dead- Eucalypt	MOT	-38.22335	144.35126
2085	OP	Dead- Eucalypt	MOT	-38.22325	144.35114
2086	OP	Dead- Eucalypt	LOT	-38.22346	144.35112
2088	OP	Dead- Eucalypt	LOT	-38.22354	144.35066
2089	OP	Dead- Eucalypt	MOT	-38.22354	144.35062
2090	OP	Swamp Gum	LOT	-38.22277	144.35028
2091	OP	Dead- Eucalypt	MOT	-38.22149	144.34989
2092	OP	Melbourne Yellow Gum	MOT	-38.22146	144.34987
2093	OP	Drooping Sheoak	MOT	-38.22254	144.35143
2094	OP	Drooping Sheoak	MOT	-38.22229	144.35158
2102	OP	Drooping Sheoak	LOT	-38.22057	144.34710
2103	OP	Drooping Sheoak	LOT	-38.22055	144.34702
2104	OP	Drooping Sheoak	LOT	-38.21531	144.35534
2107	OP	Melbourne Yellow Gum	ST	-38.20836	144.36229
2108	OP	Melbourne Yellow Gum	LOT	-38.20831	144.36198
2109	OP	Melbourne Yellow Gum	ST	-38.20750	144.36182
2110	OP	Melbourne Yellow Gum	ST	-38.20760	144.36171
2111	OP	Melbourne Yellow Gum	LOT	-38.20786	144.36129
2112	OP	Melbourne Yellow Gum	MOT	-38.20766	144.36132
2116	OP	Dead- Eucalypt	LOT	-38.21026	144.36299
2122	VVP	River Red-gum	MOT	-38.20769	144.37459
2123	VVP	River Red-gum	ST	-38.20772	144.37491
2124	VVP	River Red-gum	LOT	-38.20838	144.37497
2125	VVP	Dead- Eucalypt	LOT	-38.20857	144.37491
2126	VVP	River Red-gum	LOT	-38.20850	144.37513
2127	VVP	River Red-gum	LOT	-38.20838	144.37616
2128	VVP	River Red-gum	LOT	-38.20859	144.37711
2129	VVP	River Red-gum	ST	-38.20892	144.37749
2130	VVP	River Red-gum	ST	-38.20899	144.37724
2131	VVP	River Red-gum	MOT	-38.20900	144.37715
2132	VVP	River Red-gum	ST	-38.20899	144.37705
2133	VVP	River Red-gum	ST	-38.20900	144.37691

Survey Number	Bioregion	Species	Size	Latitude	Longitude
2134	VVP	River Red-gum	ST	-38.20900	144.37684
2135	VVP	River Red-gum	ST	-38.20900	144.37681
2136	VVP	River Red-gum	ST	-38.20896	144.37667
2138	VVP	River Red-gum	ST	-38.20885	144.37601
2139	VVP	Dead- Eucalypt	LOT	-38.21325	144.37222
2140	VVP	Dead- Eucalypt	MOT	-38.21340	144.37248
2141	VVP	Dead- Eucalypt	LOT	-38.21441	144.37260
2143	VVP	Dead- Eucalypt	LOT	-38.21393	144.37140
2144	OP	Melbourne Yellow Gum	ST	-38.21785	144.36741
2145	OP	Melbourne Yellow Gum	ST	-38.21874	144.36555
2146	VVP	Dead- Eucalypt	MOT	-38.21545	144.36627
2147	VVP	River Red-gum	MOT	-38.21046	144.37591
2148	VVP	Melbourne Yellow Gum	ST	-38.20919	144.37744

Note: OP = Otway Plain, VVP = Victorian Volcanic Plain, VLOT = Very Large Old Tree, LOT = Large Old Tree, MOT = Medium Old Tree, ST = Small Tree.