Warburton Bike Trail Feasibility Study: Desktop Flora and Fauna Assessment

FINAL REPORT

Prepared for World Trail Pty Ltd.

11 September 2013

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- World Trail: Gerard McHugh
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- James Sheperd and Paul Angus for mapping

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Summary

Biosis Pty Ltd was commissioned by World Trail Pty Ltd to undertake a preliminary desktop flora and fauna assessment of an area of public land located near Warburton, Victoria. A mountain bike trail is proposed to be developed within the area. The study area is located near Warburton and approximately 60 km east of the Melbourne CBD (Figure 1).

Ecological values

A thorough search of flora and fauna databases and modelled vegetation mapping was conducted in order to provide a high-level summary of the ecological values that may be present within the study area. This report assesses the likelihood that species identified in database searches will occur within the study area. Database searches and modelled vegetation mapping identified the following key values in the broader study area:

- The study area is dominated by relatively high quality intact native vegetation. Department of Environment and Primary Industries (DEPI) mapping indicates that seven ecological vegetation classes (EVCs) and one EVC complex may be present including Damp Forest, Wet Forest, Cool Temperate Rainforest, Riparian Forest, Lowland Forest, Herbrich Foot-hill Forest, Shrubby Foothill Forest and Riparian Scrub/Swampy Riparian Woodland Complex.
- NaturePrint mapping indicates that the study area is part of a broader area of native vegetation that makes a significant contribution to Victoria's Biodiversity, based on the abundance and diversity of threatened species records and high habitat connectivity values.
- Vegetation mapping indicates that the FFG Act listed Cool Temperate Rainforest Community is likely to be present in some moist sheltered gullies.
- 28 threatened flora species are likely to be present within the study area.
- 21 threatened fauna species are likely to be present within the study area, including a number of species that could potentially be impacted by the construction of the proposed trail.

Government legislation and policy

An assessment of the project in relation to key biodiversity legislation and policy is provided and summarised below. Note that reforms to the native vegetation permitted clearing regulations are underway and are due to be introduced in September. They will include amendments to clauses in the Victorian Planning Provisions in all planning schemes in Victoria and to Victoria's Native Vegetation Management Framework. For more information on these reforms refer to www.depi.vic.gov.au/nativevegetation.

Legislation / Policy	Relevant ecological feature on site	Notes
EPBC Act	Leadbeater's Possum is known to occur within the study area. Southern Brown Bandicoot, Grey-headed Flying-fox, Macquarie Perch and Tall Astelia likely to be present	Proposed trail should avoid core habitat and reserves for the Leadbeater's Possum and ensure that canopy connectivity is not impacted by the proposed trail in order to avoid impacting on this species. A field assessment should be undertaken to assess the habitat values within the proposed alignment and to determine the extent of any potential impacts on these listed species.

Legislation / Policy	Relevant ecological feature on site	Notes
FFG Act	The listed Cool Temperate Rainforest community is likely to be present. Protected flora species are likely to be present.	Survey is required to confirm the presence of threatened species and communities. The study area is on public land and a permit would be required if any impact is proposed on FFG Act listed values.
Planning & Environment Act	Intact native vegetation present on site.	Any removal of native vegetation will require a planning permit, including permission to lop or remove native vegetation. Permit application needs to address relevant overlays including Environmental Significance Overlays and Bushfire Management Overlays. Survey required to determine the impact of the trails on native vegetation.
Water Act	Designated waterways within study area	Works on waterways permit required for all crossings of designated waterways.
SEPP	Waterways within the study area	Water quality monitoring not required provided sediment controls are implemented.

Note: Guidance provided in this report does not constitute legal advice.

Recommendations

The information presented in this report should be incorporated into the next phase of design for the project in order to minimise impacts on flora and fauna. The primary measure to reduce impacts to biodiversity values within the study area is to minimise removal of native vegetation and terrestrial and aquatic habitat. The following steps could be incorporated into the design phase to minimise the impact of the trails on flora and fauna:

- Trails should utilise previously disturbed areas and existing trails wherever possible. These areas will typically contain lower value native vegetation and have a lower likelihood of threatened species being present.
- Where possible the trail alignment should avoid the removal of trees, particularly large old trees containing a diversity of hollows.
- Ensure that canopy connectivity is not impacted by the construction of the trail, which is of particular importance for the Leadbeater's Possum. This includes midstorey canopy connectivity (e.g. dense thicket along waterways and areas containing a midstorey dominated by *Acacia* spp.).
- Ensure that the Leadbeater's Possum reserve system is not impacted by the construction of the trail.
- Use sensitive construction techniques that minimise disturbance such as elevated platforms over areas of sensitivity and the use of equipment that minimises construction impacts beyond the trail footprint.
- Designs should seek to avoid waterways , low lying damp areas and wet gullies. These habitats are sensitive to disturbance and sedimentation associated with construction can impact on aquatic habitats and species.

- Avoid gullies that may contain the FFG Act listed Cool Temperate Rainforest community.
- Undertake a micro-siting survey to refine the location of the final trail alignment in order to avoid areas of ecological sensitivity.

Further Survey

As the impacts of the proposed mountain bike trail is likely to be quite small and localised relative to the overall size of the study area a detailed field survey of the entire area would not be feasible. Rather, a targeted field assessment of areas outlined in future trail designs that integrate the findings of this desktop assessment could be undertaken to accurately assess the impact of the proposed trail alignment on threatened species, determine the presence of threatened vegetation communities and quantify any associated vegetation losses according to Net Gain policy. For some rare and cryptic threatened species and communities targeted survey may be required to determine potential impacts. Our previous experience with the assessment of similar trails has been that early field assessment of proposed trail alignments can be valuable in identifying and avoiding areas of sensitivity.

1. Introduction

1.1 Project background

Biosis Pty Ltd was commissioned by World Trail Pty Ltd to undertake a preliminary desktop flora and fauna assessment of an area of public land located near Warburton, Victoria (Figure 1). A mountain bike trail is proposed to be developed within the area.

1.2 Scope of assessment

The objectives of this desktop investigation are to:

- Review databases relating to flora and terrestrial fauna issues relevant to the study area, including the Victorian Biodiversity Atlas (VBA), Victorian Flora Information System (FIS), and EPBC Act Protected Matters Search Tool.
- Review the DEPI Biodiversity Interactive Map to determine likely Ecological Vegetation Classes present.
- Assess the potential for the study area to support habitat for threatened species.
- Identify the potential implications of state and federal biodiversity legislation and local policy and planning approvals relevant to the project.
- Recommend any further assessments of the study area that may be required (such as Net Gain impact / offset assessment or targeted searches for listed species).

1.3 Location of the study area

The study area is located near Warburton and approximately 60 km east of the Melbourne CBD (Figure 1).

The study area is within the:

- Shire of Yarra Ranges.
- Highlands Southern Fall Bioregion
- Port Phillip and Westernport, and West Gippsland Catchment Management Authorities (CMA)
- Melbourne Water and Yarra Valley Water management areas.

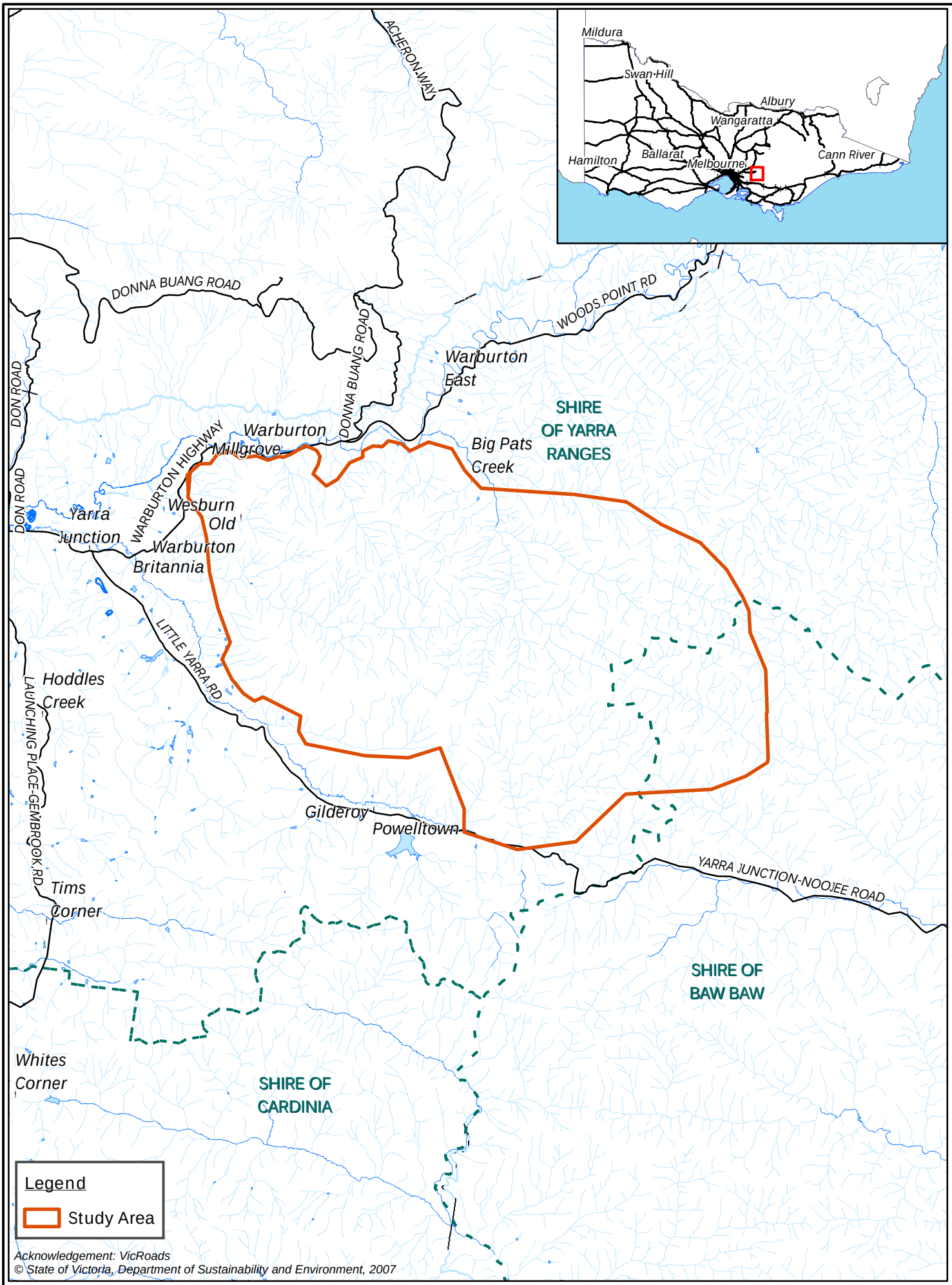

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Figure 1: Location of the Study Area - Warburton, Victoria

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Metres

Scale 1:150,000 @ A4, GDA 1994 MGA Zone 55

2. Methods

2.1 Literature and database review

In order to provide a context for the study site, information about flora and fauna from within 5 km of the study area (the 'local area') was obtained from relevant public databases. Records from the following databases were collated and reviewed:

- Flora Information System which includes records from the Victorian Biodiversity Atlas 'VBA_FLORA25, FLORA100 & FLORA Restricted' August 2012 © The State of Victoria, Department of Environment and Primary Industries (DEPI). The contribution of the Royal Botanical Gardens Melbourne to the database is acknowledged.
- Victorian Biodiversity Atlas 'VBA_FAUNA25, FAUNA100 & FAUNA Restricted' August 2012 © The State of Victoria,
- DEPI Biodiversity Interactive Map (BIM)
- Protected Matters Search Tool of the Australian Government Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) for matters protected by the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Other sources of biodiversity information:

- DEPI NaturePrint; accessed through the Biodiversity Interactive Map
- Biosis records that have been submitted to DEPI and Melbourne Water but do not yet appear on the VBA, FIS or MWF)

2.2 Definitions of significance

2.2.1 Species and ecological communities

The significance of a species or community is determined by its listing as rare or threatened under Commonwealth or State legislation / policy. The sources used to categorise significance of species and communities in this report are summarised below in Table 1.

Table 1: Criteria for determining significance of species & ecological communities

Significance	
National	Listed as threatened (critically endangered, endangered, vulnerable or conservation dependent) under the Environment Protection and Biodiversity Conservation Act 1999
State	Listed as threatened (critically endangered, endangered, vulnerable) or rare for flora species, in Victoria on a DEPI Advisory List (DSE 2005, 2013a) Listed as threatened under the Flora and Fauna Guarantee Act 1988

Fauna species listed as near threatened or data deficient are listed in Appendix 2, however in accordance with advice from DEPI these fauna species are not considered to be at the same level of risk as higher categories of threat. These species are generally not discussed in detail in this report.

2.2.2 NaturePrint areas

Areas of conservation significance were formerly documented in the DEPI Biodiversity Interactive Map as Biosites ranked as significant at national, state and regional levels. DEPI have advised that the Biosite reports are obsolete and their replacement layer on the Biodiversity Interactive Map is now NaturePrint which identifies areas that contribute most to protecting a range of biodiversity values and identifies their relative contribution.

2.3 Likelihood of occurrence

The likelihood of occurrence is a broad categorisation used by Biosis to indicate the potential for a species to occur within the site: it is based on expert opinion and implies the relative value of a site for a particular species.

The likelihood of species occurring within the site is ranked as negligible, low, medium or high. The rationale for the rank assigned is provided for each species in Appendix 1 (flora) and Appendix 2 (fauna).

Species which have at least medium likelihood of occurrence are given further consideration in this report.

2.4 Qualifications

Flora and fauna databases provide records of flora and fauna that have been recorded in an area at some stage in the past. These records range from recent to old and have varying levels of spatial accuracy. Database records give a broad indication of the species that are likely to be present in an area. They do not provide an exhaustive list of the threatened flora and fauna in the region.

Vegetation mapping provided by DEPI is based on a mixture of modeled and ground truthed data. It is intended to give an indication of the vegetation patterns across a landscape and is not intended for use at small spatial scales. This mapping should be used as a guide only and more detailed survey would be required to determine the precise boundaries of vegetation types.

2.5 Legislation and policy

The implications for the project were assessed in relation to key biodiversity legislation and policy including:

- Matters listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act); associated policy statements, significant impacts guidelines, listing advice and key threatening processes
- Threatened taxa, communities and threatening processes listed under Section 10 of the *Flora & Fauna Guarantee Act 1988* (FFG Act); associated action statements and listing advice
- Victoria's Native Vegetation Management – a Framework for Action (the Framework; DNRE 2002).
- Native Vegetation Management Plans prepared by Catchment Management Authorities
- *Planning and Environment Act 1987* – specifically Clauses 12.01-2, 52.17 and 66.02 and Overlays in the relevant Planning Scheme
- Noxious weeds and pest animals lists under the *Catchment and Land Protection Act 1994* (CaLP Act)
- *Wildlife Act 1975* and associated Regulations
- *Water Act 1989*
- *Environment Protection Act 1971*: State Environmental Protection Policy (Waters of Victoria) 2003.

2.6 Mapping

Mapping has been produced using a Geographic Information System (GIS). Electronic GIS files which contain our flora and fauna spatial data are available to incorporate into design concept plans. However this mapping is not sufficiently precise for detailed design purposes.

3. Results

The following presents results of the desktop flora and fauna assessment.

3.1 Vegetation and habitat

DEPI's modelled EVC mapping shows that seven EVC's and one EVC Complex are likely to occur within the study area (Figure 2). The area also contains a large number of rivers, streams and drainage lines that my provide habitat for aquatic species. The following includes a general description of the vegetation and fauna habitat predicted to occur within the study area based on the data reviewed.

Damp forest (EVC 29) is dominated by a tall eucalypt tree layer to 30 m tall over a medium to tall dense shrub layer of broadleaved species typical of wet forest mixed with elements from dry forest types. The ground layer includes herbs and grasses as well as a variety of moisture-dependent ferns including occasional tree ferns. Damp forest has a bioregional conservation status of 'least concern' within the Highlands - Southern Fall Bioregion.

Wet Forest (EVC 30) is typically restricted to protected sites in gullies and on southern aspects of hills and mountains where rainfall is high and cloud cover at ground level is frequent. It is characterised by a tall eucalypt overstorey to 30 m with scattered understorey trees over a tall broad-leaved shrubby understorey and a moist, shaded, fern-rich ground layer that is usually dominated by tree-ferns. Wet Forest has a bioregional conservation status of 'least concern' within the Highlands - Southern Fall Bioregion.

Cool Temperate Rainforest (EVC 31) is a closed forest to 25 m tall. It contains a canopy dominated by Myrtle Beech *Nothofagus cunninghamii* and Southern Sassafrass *Atherosperma moschatum* with occasional emergent eucalypts. It occurs in high rainfall areas protected from fire within Wet Forest. The understorey characterised by tree ferns and a rich epiphytic flora. The ground layer is dominated by a diversity of ground ferns. Cool Temperate Rainforest has a bioregional conservation status of 'Endangered' within the Highlands - Southern Fall Bioregion.

Riparian Forest (EVC 18) is a tall forest typically found along river banks and associated alluvial terraces with occasional occurrences in the heads of gullies leading into creeks and rivers. The soil is fertile alluvium, regularly inundated and permanently moist. Dominated by tall eucalypts to 30 m tall, but also has an open to sparse secondary tree layer of wattles and scattered dense patches of shrubs, ferns, grasses and herbs. Riparian Forest has a bioregional conservation status of 'least concern' within the Highlands - Southern Fall Bioregion.

Lowland Forest (EVC 16) is a Eucalypt forest to 25 m tall on relatively fertile, moderately well-drained soils in areas of relatively high rainfall. It is characterised by the diversity of life forms and species in the understorey including a range of shrubs, grasses and herbs. Lowland Forest has a bioregional conservation status of 'least concern' within the Highlands - Southern Fall Bioregion.

Shrubby Foothill Forest (EVC 45) occurs on ridges and mainly on southern and eastern slopes in association with Damp Forest or Wet Forest on moderately fertile soils and at a range of elevations. The overstorey is a medium eucalypt forest to 25 m tall over an understorey characterised by a distinctive middle strata dominated by a diversity of narrow-leaved shrubs and a paucity of ferns, graminoids and herbs in the ground stratum. Shrubby Foothill Forest has a bioregional conservation status of 'least concern' within the Highlands - Southern Fall Bioregion.

Herb-rich Foothill Forest (EVC 23) typically occupies easterly and southerly aspects mainly on lower slopes and in gullies. A medium to tall open forest to 25 m tall with a large shrub or understorey tree layer over a sparse to dense medium shrub layer. A high cover and diversity of herbs and grasses in the ground layer which characterises this EVC. Herb-rich Foot-hill Forest has a bioregional conservation status of 'least concern' within the Highlands - Southern Fall Bioregion.

Riparian Scrub/Swampy Riparian woodland Complex is a vegetation type that retains characters of the Riparian Scrub and Swampy Riaprian Woodland EVCs at spatial scales that are difficult to differentiate at the scale of mapping provided by DEPI. The EVCs within this community could be more accurately assessed during a site visit.

Rivers and water courses are present within the study area. The study area contains rivers, such as the Ada River, numerous creeks, smaller tributaries and drainage lines.

Modified Vegetation appears to be present in a small proportion of the study area. Aerial photography for the site indicates that the study area is likely to contain some small areas of modified agricultural or peri-urban land. This area is likely to have retained some of the characteristics of the nearby indigenous vegetation but is likely to be significantly disturbed by past agriculture or development. These areas may be characterised by a high proportion of introduced species with smaller patches of indigenous vegetation.

3.2 Landscape context

The study area falls within the Yarra State Forest which is part of a larger area of contiguous vegetation within Victoria's Central Highlands, encompassing the Yarra Ranges National Park to the north of the study area, Bunyip State Park to the south and a number of state forest areas such as the Latrobe State Forest and Noojee State forest to the east.

The study area has a history of disturbance from logging over the past century or more but the vegetation remains largely intact and large areas of high quality native vegetation exist in the study area. DEPI's 'Natureprint' mapping layer shows that the study area contains vegetation that makes a high contribution to Victoria's Biodiversity which is largely based on the diversity and abundance of rare and threatened species combined with high habitat connectivity values.

A number of threatened fauna species are known to occur within the broader study area, including threatened large forest owls and the EPBC-listed Leadbeater's Possum. DEPI have declared a Leadbeater's Possum reserve system across the range of the species. Several of these reserves are located within and adjacent to the study area. The GIS data for these reserves has restricted access and the map depicted in Figure 4 was prepared by DEPI.

3.3 Significant species and ecological communities

3.3.1 EPBC Act, FFG Act & DEPI Advisory listed species

Lists of significant species recorded or predicted to occur within 5 km of the study area or from the relevant catchment (aquatic species) are provided in Appendix 1 (flora) and Appendix 2 (fauna) and are displayed in Figure 3 (Flora) and Figure 4 (Fauna). An assessment of the likelihood of these species occurring in the study area and an indication of where within the site (i.e. which habitats or features of relevance to the species) is included.

A total of 29 significant flora species and 21 significant fauna species have a medium or higher likelihood of occurring within the broader study area, however many of these species are unlikely to be impacted by the construction of a mountain bike trail. A summary of those significant species more likely to be impacted by the proposed mountain bike trail is provided in Table 2.

Table 2: Summary of significant species most likely to occur in the study area

Species name	Area of value within the study area
EPBC Act listed species	
Fauna	
Leadbeater's Possum	This species is known to occur within the study area (Areas of damp and wet forest with a midstory dominated by *Acacia* spp. are likely to be of particular importance, however the species should be assumed present throughout and appropriate measures implemented to avoid impacts to this species.
Southern Brown Bandicoot	Areas with a heathy understorey.
Macquarie Perch	Potential habitat occurs in the Little Yarra River within and

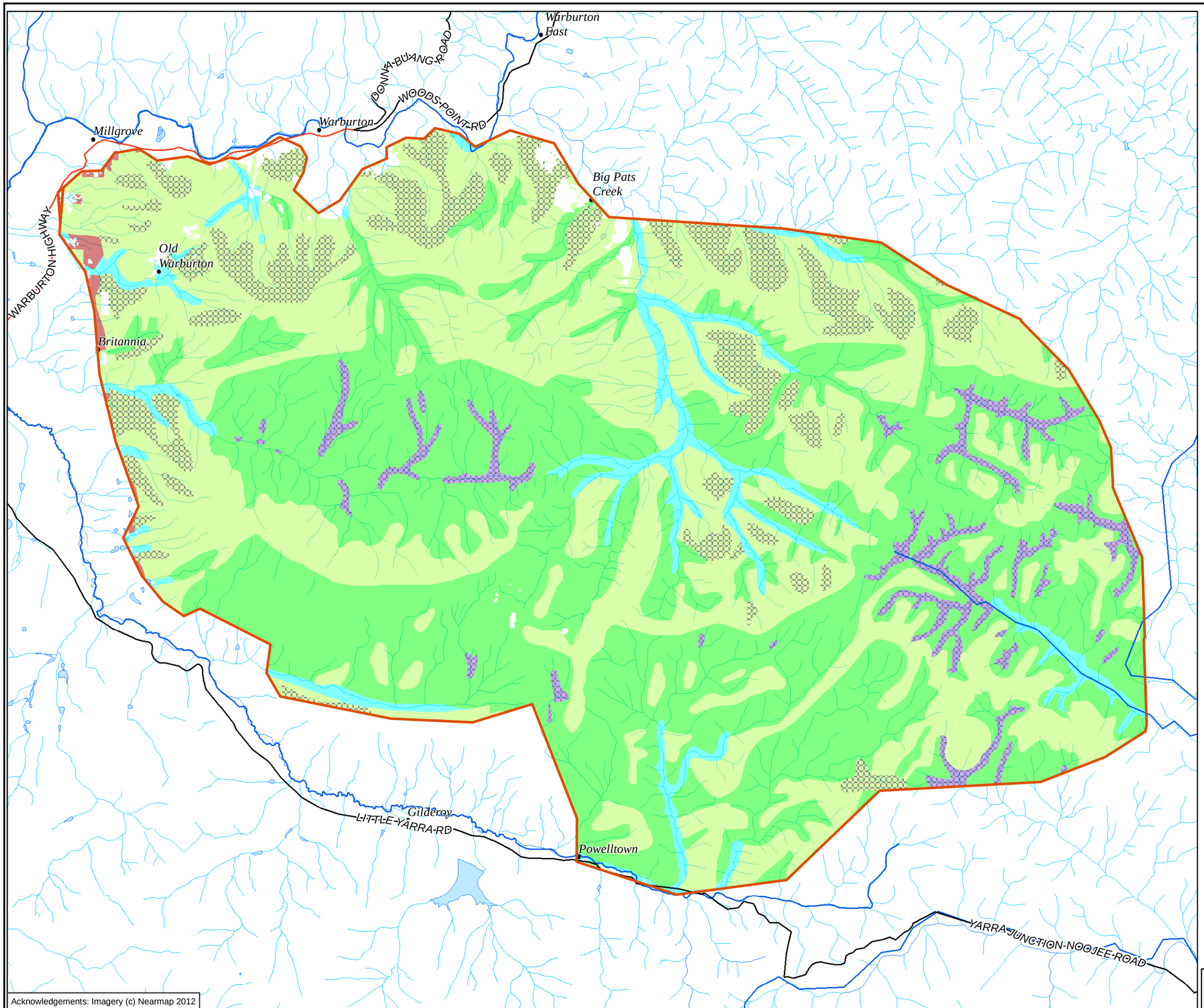
Species name	Area of value within the study area
	downstream of the study area.
Flora	
Tall Astelia	Cool temperate rainforest.
FFG Act / DEPI Advisory List species	
Fauna	
Broad-toothed Rat	Areas dominated by sedges and grass tussocks within close proximity to drainage lines.
White-footed Dunnart	Drier vegetation types associated with ridgelines.
Lace Monitor	Known to occur within the study area, likely to occur throughout. Utilises coarse woody debris.
Brown Toadlet	Damp and occasionally inundated areas.
Curve-tail Burrowing Crayfish, Gippsland Burrowing Crayfish, Tubercle Burrowing Crayfish, Dandenong Burrowing Crayfish and Foothill Burrowing Crayfish.	Multiple species of *Engaeus* are likely to occur within damp and occasionally inundated areas within the study area.
Flora	
Upper Yarra Swamp-gum	Poorly-drained clay-loam soils near rivers usually at high altitudes
Silurian Leek-orchid	Dry foothill forest with shrubby understorey.
Fairy Lanterns	Deep organic loamy soil in damp forests
Jungle Bristle-fern	Humid rainforests, growing on tree ferns especially the Rough Treefern
Beech Finger-fern	On tree branches and trunks, especially soft tree-ferns, on logs and rocks in sheltered gullies of wet forest in the Central Highlands
Tree Geebung	Moist to wet mountain gullies and forests
21 state listed 'rare' flora species	See Appendix 1 for full details

3.3.2 Significant ecological communities

The EPBC listed 'Alpine Sphagnum Bogs and Associated Fens' community is predicted to occur within 5 km of the study area. This community is typically found at elevations above 1600 m above seal level and is not likely to occur within the study area.

Mapping of vegetation communities listed under the FFG Act provided by DEPI indicates that the listed Cool Temperate Rainforest community occurs within the study area. This community is largely consistent with the

Cool Temperate Rainforest EVC which DEPI mapping predicts will occur in moist sheltered gullies within the study area.



Legend

- Study Area

EVC

- 16 Lowland Forest
- 17 Riparian Scrub/Swampy Riparian Woodland Complex
- 18 Riparian Forest
- 23 Herb-rich Foothill Forest
- 29 Damp Forest
- 30 Wet Forest
- 31 Cool Temperate Rainforest
- 45 Shrubby Foothill Forest

Figure 2: Ecological vegetation classes within the study area, Warburton, Victoria

0 1 2 3

Kilometers

Scale: 1:58,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

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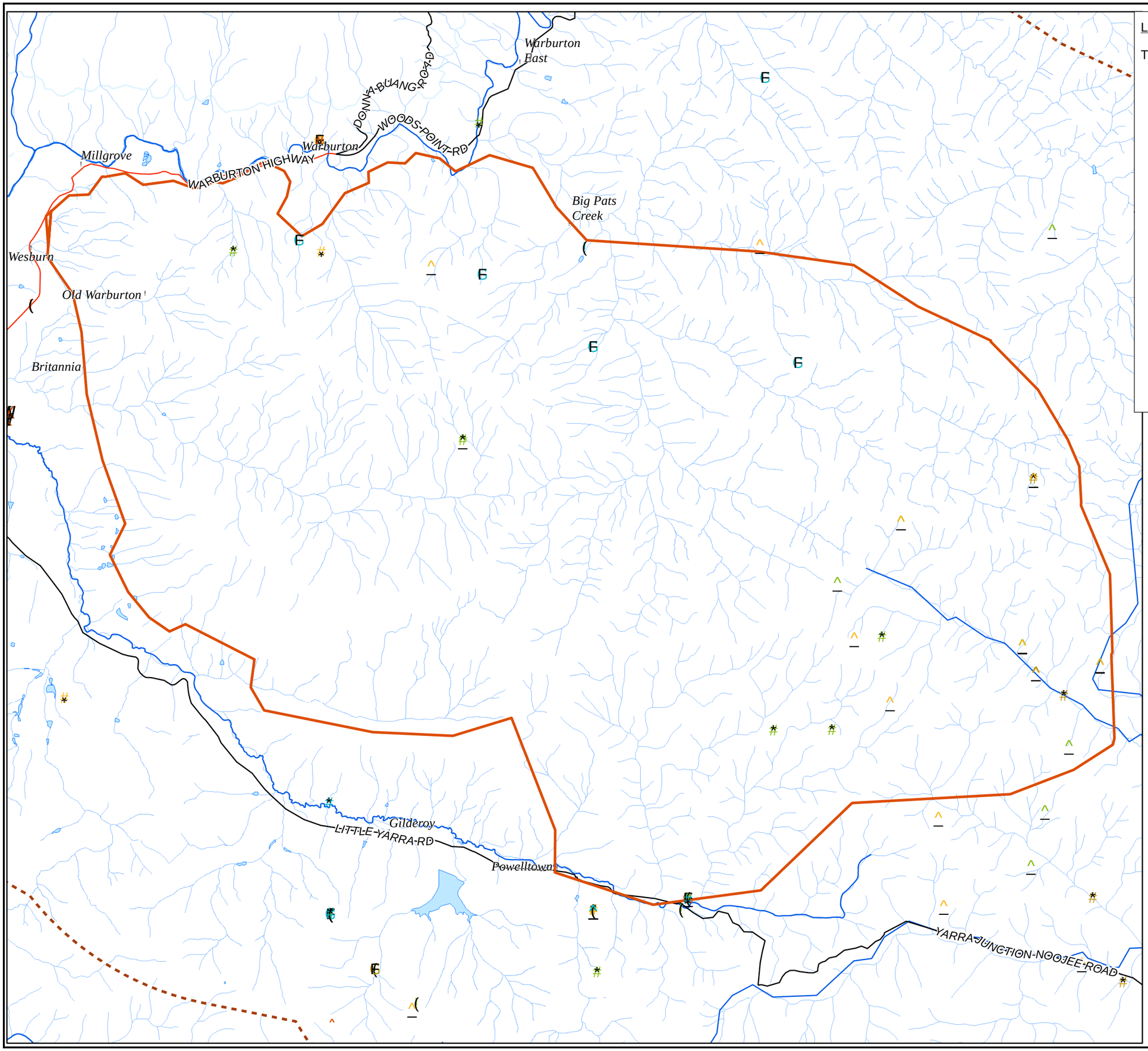

Legend

Threatened Flora Species

- Bristly Shield-fern
- Brown's Mitre-moss
- Forest Phebalium
- Forest Sedge
- Green Scentbark
- Jungle Bristle-fern
- Lacy Wedge-fern
- Long Pink-bells
- Madeira Moss
- Notched Leionema
- Powelltown Correa
- Prickly Beauty
- River Leafless Bossiaea
- Rough Hovea
- Silurian Leek-orchid
- Single Bladderwort
- Small Fork-fern
- Striped Pomaderris
- Swamp Bush-pea
- Tall Astelia
- Tasman Fan-fern
- Toothed Leionema
- Tree Geebung
- Twin-tooth Featherwort
- Upper Yarra Swamp-gum
- Veined Spear-grass
- Wiry Bossiaea
- Study Area
- 5 km buffer zone

Figure 3: Threatened flora species locations within the broader Study Area, Warburton, Victoria

0 1 2 3 4

Kilometers

Scale: 1:61,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

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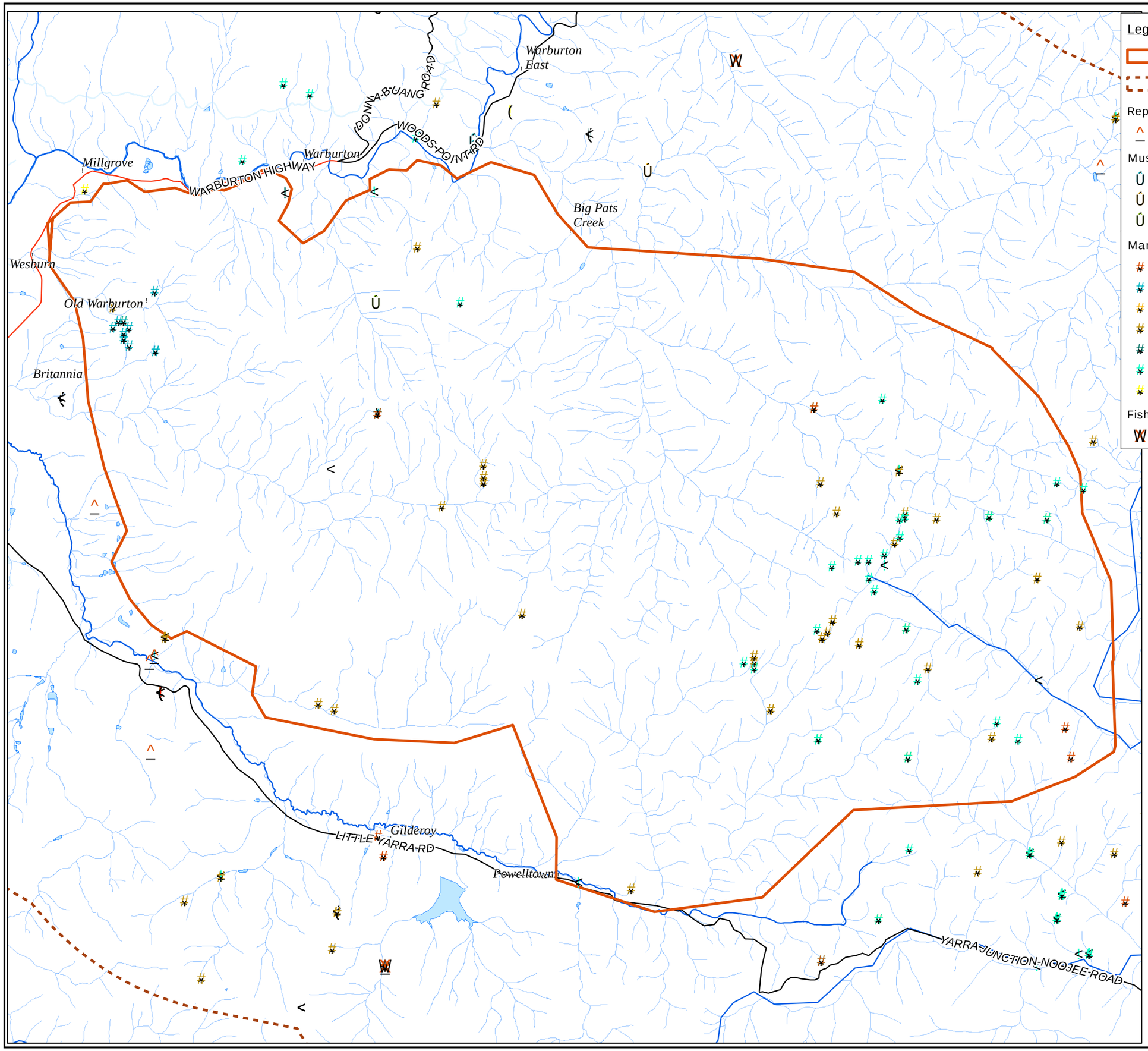

Legend

Study Area

5 km buffer zone

Reptiles

- Lace Goanna

Mussels, decopods, crustaceans

- Curve-tail Burrowing Crayfish
- Gippsland Burrowing Crayfish
- Tubercle Burrowing Crayfish

Mammals

- Broad-toothed Rat
- Common Bent-wing Bat
- Eastern Horseshoe Bat
- Greater Glider
- Grey-headed Flying-fox
- Leadbeater's Possum
- Southern Brown Bandicoot

Fish

- Australian Grayling

Birds

- Barking Owl
- Eastern Great Egret
- Grey Goshawk
- Hardhead
- Hooded Robin
- King Quail
- Lewin's Rail
- Powerful Owl
- Regent Honeyeater
- Sooty Owl
- White-bellied Sea-Eagle
- White-throated Needletail

Amphibians

- Growling Grass Frog

Figure 4: Threatened fauna species recorded within the broader Study Area, Warburton, Victoria

0 1 2 3 4

Kilometers

Scale: 1:61,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

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4. Biodiversity Legislation and Government Policy

This section provides an assessment of the project in relation to key biodiversity legislation and government policy.

Where available, links to further information are provided. This section does not describe the legislation and policy in detail and guidance provided here does not constitute legal advice.

4.1 Commonwealth

4.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act applies to developments and associated activities that have the potential to significantly impact on Matters of National Environmental Significance (MNES) protected under the Act.

Link for further information including a guide to the referral process is available at: http://www.environment.gov.au/epbc/index.html

Matters of National Environmental Significance relevant to the project are summarised in Table 3. It includes an assessment against the EPBC Act policy statements published by the Australian Government which provide guidance on the practical application of EPBC Act.

Table 3: Assessment of project in relation to the EPBC Act

Matter of NES	Project specifics	Assessment against Guidelines
Threatened species and ecological communities	17 listed species and one listed community have been predicted to occur in the project search area. The likelihood of threatened species occurring in the study area is assessed in Appendix 1 (flora) and Appendix 2 (fauna).	A number of these species are likely to occur within the study area. A more detailed field assessment is required to determine whether the project will constitute a significant impact.
Migratory species	A total of 16 migratory species have been recorded or predicted to occur in the project search area (Appendix 2).	While some of these species would be expected to use the study area on occasions, and some of them may do so regularly or may be resident, it does not provide important habitat for an ecologically significant proportion of any of these species.
Wetlands of international importance (Ramsar sites).	The study area is identified as being within the catchment of two Ramsar sites: Gippsland Lakes and Westernport.	The study area does not drain into either Ramsar site and the development is not likely to result in a significant impact.

Database searches identify that a number of MNES are likely to be present within the study area. A field survey could confirm the presence and location of these species and the impact of the proposed mountain bike trail on MNES could be assessed following completion of detailed designs.

4.2 State

4.2.1 Flora and Fauna Guarantee Act 1988 (FFG Act)

The FFG Act is the key piece of Victorian legislation for the conservation of threatened species and communities and for the management of potentially threatening processes. Under the FFG Act a permit is required from DEPI to 'take' protected flora species from public land or private land owned by a public entity (e.g. local government). A permit is generally not required for removal of protected flora from private land. Authorisation under the FFG Act is required to collect, kill, injure or disturb listed fish.

Link for further information: http://www.dse.vic.gov.au/plants-and-animals/native-plants-and-animals/threatened-species-and-communities/flora-and-fauna-guarantee-act

The study area is likely to contain a listed community (cool temperate rainforest), and protected flora species such as Acacias and members of the Asteraceae family. The presence of these species could be confirmed during a site assessment. The study area is on public land and if protected species are present a permit from DEPI would be required if any of these species will be affected by the proposal.

4.2.2 Catchment and Land Protection Act 1994 (CaLP Act)

The CaLP Act identifies and classifies certain species as noxious weeds or pest animals, and provides a system of controls on noxious species.

The proponent must take all reasonable steps to 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. The State is responsible for eradicating State prohibited weeds from all land in Victoria.

Link for further information: http://www.dpi.vic.gov.au/agriculture/pests-diseases-and-weeds/protecting-victoria-pest-animals-weeds/legislation,-policy-and-permits/legislation

4.2.3 Planning and Environment Act 1987 (incl. Planning Schemes)

The *Planning and Environment Act 1987* controls the planning and development of land in Victoria, and provides for the development of planning schemes for all municipalities. As part of the planning process regard needs to be given to Action Statements that have been produced under the FFG Act.

Reforms to the native vegetation permitted clearing regulations are underway and will include amendments to clauses in the Victorian Planning Provisions in all planning schemes in Victoria. For more information on these reforms refer to www.depi.vic.gov.au/nativevegetation.

Of particular relevance to the proposed development are controls over the removal of native vegetation contained within the Yarra Ranges Planning Scheme, including permit requirements. The Planning Scheme defines 'native vegetation' as 'Plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses' (Clause 72). Clause 12.01-2 of the State Planning Policy Framework Clause (Native Vegetation Management) requires that a net gain in the extent and quality of native vegetation is achieved and planning must consider as relevant Victoria's Native Vegetation Management – a Framework for Action.

Clause 52.17 (Native Vegetation) requires a planning permit to remove, destroy or lop native vegetation including dead native vegetation. Decision guidelines are contained in Clause 52.17-5.

The need for a permit to remove native vegetation may also be triggered by overlays within the Yarra Ranges Planning Scheme. The location of the overlays in relation to the study area can be determined via the following link: http://planningschemes.dpcd.vic.gov.au/index.html. The provisions of the following overlays apply to the study area:

Environmental Significance Overlay (ESO1 – Z19#) covers part of the study area. Protects the Zoological significance of the Black Sands Creek area and Yarra State Forest. A permit is required to 'construct bicycle pathways and trails' under this overlay.

Environmental Significance Overlay (ESO1 – B55#) covers part of the study area. Protects the botanical significance of the Britannia Creek area. A permit is required to 'construct bicycle pathways and trails' under this overlay.

Bushfire Management Overlay covers the entire study area and requires a permit for works on projects relating to 'leisure and recreation'.

4.2.4 Native Vegetation Management Framework

The Framework provides State Government policy (referred to as the Net Gain policy) for the protection, enhancement and revegetation of native vegetation in Victoria (DNRE 2002) and is an incorporated document in all planning schemes. The Framework is due to be replaced with the *Permitted clearing of native vegetation – Biodiversity assessment guidelines* (DEPI 2013b) as part of reforms to the Victoria Planning Provisions. The reforms are currently scheduled for introduction in September 2013.

Link for further information: http://www.dse.vic.gov.au/land-management/victorias-native-vegetation-management-a-framework-for-action

If the proposed mountain bike trails require the removal of vegetation an application will need to be made under clause 52.17 of the Yarra Ranges Planning Scheme to remove, destroy or lop native vegetation. Within the application World Trail must explain (Clause 52.17-3) its response to the three step approach to Net Gain that has been taken to:

- avoid adverse impacts, particularly through the removal of native vegetation clearance, where possible.
- minimise impacts from removal of native vegetation through appropriate consideration during planning processes and expert input to project design and/or management. if impacts cannot be avoided
- Identify appropriate offset option for the loss of native vegetation if required.

Detailed quantification of the vegetation losses associated with this project can be provided following a field assessment and the provision of detailed design drawings for the trails.

4.2.5 Water Act 1989

The primary purpose of the *Water Act 1989* is to provide a framework for the allocation and management of surface water and groundwater throughout Victoria. It provides a principal mechanism for maintenance of ecosystem functions including those of aquatic ecosystems. Under By-Laws created by the relevant Authority under the Act, the authorities regulate the works within and in the vicinity of waterways. In Melbourne Water's management area this applies to all waterways with a catchment area of 60ha or more. These waterways are deemed to be Melbourne Water assets, while all smaller watercourses are deemed the responsibility of the local government.

The construction of mountain bike trails may involve construction or maintenance activities that affect beds and banks of waterways, riparian vegetation or quality or quantity of water in creeks and waterways.

Construction of trails within the study area may require a permit from Melbourne Water. The need for a permit could be further assessed following field assessment and the development of detailed design drawings. Guidelines and application forms are available from Melbourne Water and can be obtained from Melbourne Water's Asset Service team – 9235 1414.

4.2.6 Environment Protection Act 1970: State Environmental Protection Policy (Waters of Victoria) 2003

The Environment Protection Act underpins the State Environmental Protection Policy (SEPP) - Waters of Victoria which provides a legal framework for the protection and rehabilitation of Victoria's surface water environments.

Depending on the final trail designs the project may directly and/or indirectly impact upon waterways and their aquatic ecosystems. The SEPP requires that aquatic ecosystem values be protected. Environmental quality objectives and indicators are defined to protect beneficial uses (i.e. the uses and values of the water environment) and an attainment program provides guidance on protection of the beneficial uses.

Impacts to surface water quality must not result in changes that exceed background levels and/or the water quality objectives specified for the Forest-A segment to protect surface water uses and values. World Trail needs to ensure that direct and indirect (e.g. runoff) impacts to surface water quality do not exceed the background levels and/or water quality objectives.

Link to further information: http://www.epa.vic.gov.au/water/epa/wov.asp.

4.2.7 Regional Catchment Strategy and River Health Strategy

State Planning Policy Framework Clause 14.02-1 (Catchment planning and management) states that planning must consider as relevant, Regional Catchment Strategies (RCS) and any associated implementation plan or strategy including any regional river health and wetland strategies.

Strategies of relevance to the study area are the:

- Port Phillip and Westernport Regional Catchment Strategy (PPWCMA 2004)
- West Gippsland Catchment Management Strategy (WGCMA 2012)
- Port Phillip and Westernport Regional River Health Strategy (Melbourne Water 2007)
- West Gippsland River Health Strategy (WGCMA 2005)

These documents provide recommendations on the protection of existing high-value rivers and creeks that are in good condition and strategic improvement of other rivers and creeks.

5. Key Ecological Values and Recommendations

This section identifies the key ecological features of the study area, provides an outline of potential implications of the proposed construction of mountain bike trails on those values and includes recommendations to assist World Trail to design trails that minimise impacts on biodiversity.

This report provides a broad overview of the range of flora and fauna values that may occur within the study area based on available data and expert knowledge. It provides mapping that describes the predicted extent of vegetation communities within the study area and describes the importance of these vegetation communities for threatened flora and fauna species.

The study area is part of a large area of contiguous intact native forest and any works within the area are likely to involve the removal of native vegetation. DEPI vegetation mapping predicts that seven EVCs are likely to be present within the study area and any removal of native vegetation would require compliance with the Yarra Ranges Planning Scheme under the Planning and Environment Act and Victoria's Native Vegetation Management Framework as set out in section 4. A detailed assessment would therefore be required to assess the quality and extent of native vegetation to be impacted.

The FFG Act listed Cool Temperate Rainforest community is likely to be present in some moist gullies within the study area and there are a significant number of threatened species that occur within 5 km. Given the relatively undisturbed nature of the study area there are 29 significant flora species and 21 threatened fauna species that have a medium or higher likelihood of occurrence. The threatened species that have been identified in database searches are typically found in a range of environments that occur across the study area. This includes areas ranging from wet gullies to open forest and aquatic environments. The implication of these findings is that the majority of the study area could be considered potential habitat for threatened species.

The information presented in this report should be incorporated into the next phase of design for the project in order to minimise impacts on biodiversity values. The primary measure to reduce impacts to biodiversity values within the study area is to minimise removal of native vegetation and terrestrial and aquatic habitat. The following steps could be incorporated into the design phase to minimise the impact of the trails on flora and fauna:

- Utilise previously disturbed areas and existing trails wherever possible. These areas will typically contain lower value native vegetation and have a lower likelihood of threatened species being present.
- Where possible the trail alignment should avoid the removal of trees, particularly large old trees containing a diversity of hollows.
- Ensure that canopy connectivity is not impacted by the construction of the trail, which is of particular importance for the Leadbeater's Possum. This includes midstorey canopy connectivity (e.g. dense thicket along waterways and areas containing a midstorey dominated by *Acacia* spp.)
- Avoid impact to the Leadbeater's Possum reserve system. Obtaining the GIS layer for these reserves will be required for future planning.
- Use sensitive construction techniques that minimise disturbance such as elevated platforms over areas of sensitivity and the use of equipment that minimises construction impacts beyond the trail footprint.

- Designs should seek to avoid waterways, low lying damp areas and wet gullies. These habitats are sensitive to disturbance and sedimentation associated with construction can impact on aquatic habitats and species.
- Avoid gullies that may contain the FFG Act listed Cool Temperate Rainforest community.
- Undertake a micro-siting survey to refine the location of the final trail alignment, in order to avoid areas of ecological sensitivity.

As the impacts of the proposed mountain bike trail are likely to be relatively low and localised in comparison to the overall size of the study area a detailed survey of the entire area would not be feasible. Rather, a field assessment of areas outlined in future trail designs that integrate the findings of this desktop assessment could be undertaken to accurately assess the impact of the proposed trail alignment on threatened species, determine the presence of threatened vegetation communities and quantify any associated vegetation losses according to relevant policy. For some rare and cryptic threatened species and communities targeted survey may be required to determine potential impacts.

Our previous experience with the assessment of similar trails has been that early field assessment of proposed trail alignments can be valuable in identifying and avoiding areas of sensitivity.

References

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WGCMA 2012, *West Gippsland Regional Catchment Strategy 2013 - 2019*, West Gippsland Catchment Management Authority, Traralgon

Appendices

Appendix 1: Flora

Notes to tables:

EPBC Act: CR - Critically Endangered EN - Endangered VU - Vulnerable	**DSE 2005:** e - endangered v - vulnerable r - rare
PMST – Protected Matters Search Tool	**FFG Act:** L - listed as threatened under FFG Act P - protected under the FFG Act (public land only)

A1.1 Significant flora species

The following table includes a list of the significant flora species that have potential to occur within the study area. The list of species is sourced from the Victorian Flora Information System and the Protected Matters Search Tool (DSEWPaC; accessed on 14.08.2013).

Table A1.1. Significant flora species recorded / predicted to occur within 5 km of the study area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	DEPI	FFG					
National Significance									
Astelia australiana	Tall Astelia	VU	v	L	2007	PMST	Cool temperate rainforest in gullies on undulating, upland plateaus; typically in association with *Nothofagus cunninghami.*	**Medium**	Restricted to Cool Temperate Rainforest
Dianella amoena	Matted Flax-lily	EN	e	L	#	PMST	Lowland grassland and grassy woodland, on well-drained to seasonally waterlogged fertile sandy loam soils to heavy cracking clays.	**Negligible**	No suitable habitat
State Significant									
Austrostipa rudis subsp. *australis*	Veined Spear-grass		r		2005		Cooler areas of moderate altitude, in open-forest on sandy or sandstone derived soils.	**Medium**	Lower elevation grassy/shrubby forests
Bossiaea cordigera	Wiry Bossiaea		r		2007		Moist well drained soils in heathy open forests	**Medium**	Suitable habitat present
Bossiaea riparia	River Leafless Bossiaea		r		1900		Moist wet positions along watercourses	**Medium**	Suitable habitat present
Calochilus	Naked Beard-		r		1980		Drier forests and woodlands	**Medium**	Lower elevation

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	DEPI	FFG					
imberbis	orchid								grassy/shrubby forests
Cardamine papillata	Forest Bitter-cress		r		n.d.		Moist soils in wet mountain forests	**Medium**	Suitable habitat present
Carex alsophila	Forest Sedge		r		1994		Moist to wet soils in forests of mountain gullies and swamps	**Medium**	Suitable habitat present
Cephalomanes caudatum	Jungle Bristle-fern		v		1980		Humid rainforests, growing on tree ferns especially the Rough Treefern	**Medium**	Suitable habitat present
Correa reflexa var. *lobata*	Powelltown Correa		r		1985		Moist well drained soils in foothill forests	**High**	Suitable habitat present
Eucalyptus aff. *camphora* (Upper Yarra)	Upper Yarra Swamp-gum		e		2007		Poorly-drained clay-loam soils near rivers usually at high altitudes	**Medium**	Suitable habitat present
Eucalyptus fulgens	Green Scentbark		r		2008		Forests and woodlands of the Gippsland Plain and adjacent foothills.	**High**	Suitable habitat present
Grammitis magellanica subsp. *nothofageti*	Beech Finger-fern		v		1999		On tree branches and trunks, especially soft tree-ferns, on logs and rocks in sheltered gullies of wet forest in the Central Highlands	**Medium**	Restricted to Cool Temperate Rainforest
Hovea asperifolia subsp. *spinosissima*	Rough Hovea		r		1983		Dry well drained slopes in forests	**Medium**	Suitable habitat present
Lastreopsis hispida	Bristly Shield-fern		r		1977		Moist soils in wet forest and rainforest gullies	**High**	Suitable habitat present

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	DEPI	FFG					
Leionema bilobum subsp. *serrulatum*	Toothed Leionema		r		1994		Moist well drained soil in moist to wet forests	**High**	Suitable habitat present
Lindsaea microphylla	Lacy Wedge-fern		r		1993		Moist soils in open forests and heaths	**High**	Suitable habitat present
Persoonia arborea	Tree Geebung		v		2006		Moist to wet mountain gullies and forests	**High**	Wet Forest and Margins of Cool Temperate Rainforest
Phebalium squamulosum subsp. *squamulosum*	Forest Phebalium		r		1989		Moist to dry well drained soils in moist forests	**High**	Suitable habitat present
Pomaderris pilifera subsp. *pilifera*	Striped Pomaderris		r		2003		Moist well drained soils in drier open forests and woodland east of Warburton	**High**	Suitable habitat present
Prasophyllum pyriforme s.s.	Silurian Leek-orchid		e		n.d.		Dry foothill forest with shrubby understorey.	**Medium**	Suitable habitat present
Pultenaea juniperina s.s.	Prickly Beauty		r		1904		Wet and dry forests, heaths and woodlands	**Medium**	Suitable habitat present
Pultenaea weindorferi	Swamp Bush-pea		r		1903		Moist depressions in moist forest.	**Medium**	Suitable habitat present
Sticherus tener s.s.	Tasman Fan-fern		r		1976		Moist clay soils along watercourses in wet and riparian forests and in disturbed sites	**High**	Suitable habitat present

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	DEPI	FFG					
Tetratheca stenocarpa	Long Pink-bells		r		1990		Moist to well drained soils in tall mountain forests.	**High**	Suitable habitat present
Thismea rodwayi	Fairy Lanterns		e		-		Deep organic loamy soil in damp forests	**High**	Poorly surveyed species known in the area to Biosis Botanists
Tmesipteris parva	Small Fork-fern		r		1979		Grows on trunks of tree-ferns, especially Rough Tree-fern, in gullies of moist to wet forests	**Medium**	Rainforest and rainforest margins
Utricularia gibba	Floating Bladderwort#		v		2007		Aquatic environments	**Low**	Requires open water, slow flowing or stagnant
Westringia senifolia	Alpine Westringia		r		1980		Subalpine woodlands.	**Negligible**	No suitable habitat
Wittsteinia vacciniacea	Baw Baw Berry		r		1996		Moist soils in rainforest and alpine ash forest in sheltered positions	**Negligible**	Out of natural range

Appendix 2: Fauna

Notes to tables:

EPBC Act: EX - Extinct CR - Critically Endangered EN - Endangered VU - Vulnerable CD - Conservation dependent PMST – Protected Matters Search Tool	**DEPI 2013:** ex - extinct cr - critically endangered en - endangered vu - vulnerable nt - near threatened dd - data deficient rx - regionally extinct
## - Species not recorded within relevant databases but predicted to occur by Biosis based on expert knowledge.	**FFG Act:** L - listed as threatened under FFG Act N - nominated for listing as threatened I - determined ineligible for listing

Fauna species in these tables are listed in alphabetical order within their taxonomic group.

A2.1 Significant fauna species

The following table includes a list of the significant fauna species that have potential to occur within the study area. The list of species is sourced from the Victorian Biodiversity Atlas and the Protected Matters Search Tool (DSEWPaC; accessed on 14.08.2013).

Table A2.1. Significant fauna species recorded, or predicted to occur, within 5 km of the study area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	DEPI	FFG					
Mammals									
Cercartetus nanus	Eastern Pygmy-possum		nt	I	1998		Occurs throughout south-eastern Australia in a variety of vegetation communities including subalpine woodland, wet forest, Box Ironbark Forest, coast scrub, heathy woodland and subalpine heath. Floristic diversity thought to be an important determinant of habitat quality.	**Recorded**	Previously recorded within study area, suitable habitat present.
Dasyurus maculatus maculatus	Spot-tailed Quoll	EN	en	L	-	PMST	The Spot-tailed Quoll is a large carnivorous marsupial that occupies a broad range of forest and woodland habitats. Den sites include rock crevices, caves and hollow logs and trees.	**Low**	No records within local area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	DEPI	FFG					
Gymnobelideus leadbeateri	Leadbeater's Possum	EN	en	L	2008	PMST	Until the early 1990s, extant populations of Leadbeater's Possum were believed to be confined to ash-dominated forests in Victoria's Central Highlands, with an outlying population in lowland swamp forest at Yellingbo. However, the species has been discovered using Sub-alpine Woodland at a number of locations including Lake Mountain, Mt Bullfight and Mt Baw Baw. The species is associated with areas regenerating from fire with a diversity of hollows for nesting and the presence of *Acacia* spp.	**Recorded**	Known to occur in the area, suitable habitat present.
Isoodon obesulus obesulus	Southern Brown Bandicoot	EN	nt	L	1999	PMST	Typically occurs in heathland, shrubland, heathy forest and woodland habitat across southern Victoria. Previously recorded on the outskirts of Stawell and also known from within the Grampians National Park.	**Medium**	Species has previously been recorded to the west (around Yarra Junction), however suitable habitat elements (e.g. heathy understorey) may not be present within the study area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	DEPI	FFG					
Mastacomys fuscus mordicus	Broad-toothed Rat		en	N	1992		Occupies structurally dense vegetation communities in high rainfall areas in south-eastern Australia. Typically inhabits closed vegetation communities such as heathland, grassland and sedgeland and is a specialist feeder on the stems of plants from the families Poaceae and Cyperaceae.	**Recorded**	Previously recorded within the broader area, suitable habitat likely to occur, particularly in close proximity to drainage lines.
Miniopterus schreibersii oceanensis	Eastern Bent-wing Bat		vu	L	2000		A range of open forests in relatively high rainfall areas. The species has a requirement for caves (or similar human-built structures such as mineshafts) for roosting, mating and raising young. Some caves may hold many thousands of animals from a wide catchment area.	**Recorded**	Previously recorded within study area, likely to regularly forage over the study area.
Myotis macropus	Large-footed Myotis		nt		1991		Generally roosts in caves, tunnels and tree hollows and feeds over water bodies, with most Victorian records associated with wetlands or waterways.	**Recorded**	Likely to forage over watercourses and wetlands within the study area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	DEPI	FFG					
Petauroides volans	Greater Glider		vu		2011		This hollow-dependent, gliding possum feeds largely on eucalypt leaves. It occurs throughout eastern Australia, where it is most common within damp and wet forest with a high density of hollow-bearing trees, especially at higher altitudes.	**Recorded**	Known to occur in local area, suitable habitat present.
Petrogale penicillata	Brush-tailed Rock-wallaby	VU	cr	L	-	PMST	Currently known only from the tributaries of the Snowy River in East Gippsland and the Grampians in the west. Found in a variety of habitat types, including rainforest gullies, wet and dry sclerophyll forest, and open woodlands, preferring rock faces with large tumbled boulders, ledges and caves and areas that are relatively open and receiving direct sunlight for much of the day.	**Negligible**	No habitat present.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	DEPI	FFG					
Pseudomys fumeus	Smoky Mouse	EN	en	L	-	PMST	Disjunct Victorian distribution with populations in the Snowfields, Eastern Highlands, East Gippsland, Otway Range and the Grampians. Recorded from a variety of vegetation communities ranging form coastal heath and heathy woodland in East Gippsland to subalpine heath and dry forest. The understorey vegetation is typically dominated by heathy shrubs, with seeds and berries providing an important food resource.	**Low**	Lack of suitable habitat elements, no records within local area.
Pteropus poliocephalus	Grey-headed Flying-fox	VU	vu	L	1982	PMST	Utilises a wide range of habitats from lowland rainforest in East Gippsland and coastal Stringybark forests to agricultural land and suburban gardens, with permanently established colonies in Melbourne, Geelong and Mallacoota.	**Medium**	Wide-ranging and highly mobile species likely to utilise habitat within the study area on occasion.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	DEPI	FFG					
Rhinolophus megaphyllus megaphyllus	Eastern Horseshoe Bat		vu	L	1998		Occurs in tropical and temperate rainforest, deciduous vine forest, dry and wet sclerophyll forest, open woodland, coastal scrub and grassland areas. More active in mature forests than regrowth and commonly forages along tracks and waterways. Lives in caves as well as abandoned mines, rock piles, buildings, tree hollows, old railway tunnels, tree roots in undercut creek banks, stormwater drains and culverts.	**Recorded**	Suitable habitat present, likely to forage over the study area.
Sminthopsis leucopus	White-footed Dunnart		nt	L	1978		Occurs in coastal areas and adjacent plains and foothills, also extending inland along some major river valleys. Preferred habitats include coastal tussock grassland and sedgeland, wet heath, and forest or woodland with a dense heathy understorey or mid-storey vegetation.	**Medium**	Historically recorded from the local area, may occur in drier vegetation communities located along ridgelines.
Birds									
Accipiter novaehollandiae	Grey Goshawk		vu	L	2001		Favours tall, wet forests in gullies but can occur in woodlands, dry forests, wooded farmlands and suburban parks. Relies on mature forests for breeding.	**Recorded**	Previously recorded within the local area, suitable habitat present.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	DEPI	FFG					
Anthochaera phrygia	Regent Honeyeater	EN	cr	L	1985	PMST	Inhabits dry woodlands and forests dominated by Box Ironbark eucalypts. Distribution currently restricted to the Chiltern - Mt Pilot National Park in north-eastern Victoria following severe range contraction and population decline.	**Low**	Mostly confined to box-ironbark communities.
Ardea modesta	Eastern Great Egret		vu	L	2002	PMST	Usually found in terrestrial wetland, estuarine and wet grassland habitats particularly permanent well-vegetated water bodies but also use freshwater meadows, channels and larger dams. Forages by wading in shallow open water. Uses estuarine mudflats as summer-autumn or drought refuges.	**Low**	While known from the local area, habitat unlikely to be present within the study area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	DEPI	FFG					
Aythya australis	Hardhead		vu		2001		A mainly aquatic species preferring large, deep freshwater environments with abundant aquatic vegetation, including slow moving areas of rivers. Also occurs in brackish wetlands and can be found in deep dams and water storage ponds. Occasionally in estuarine and littoral habitats such as saltpans, coastal lagoons and sheltered inshore waters. Avoids main streams or rivers, except in calm reaches where aquatic flora is developed.	**Low**	While known from the local area, habitat unlikely to be present within the study area.
Botaurus poiciloptilus	Australasian Bittern	EN	en	L	1972	PMST	Occurs in wetlands with tall, dense vegetation where it forages in shallow water at the edges of pools or waterways. Prefers permanent freshwater habitats, particularly when dominated by sedges, rushes and reeds.	**Negligible**	Habitat not likely to be present within the study area.
Ceyx azureus	Azure Kingfisher		nt		2000		Azure Kingfishers are associated with well vegetated freshwater wetlands and slow-flowing creeks and rivers, including artificial wetlands and drains, open riverine or swamp forest or woodland environments and occasionally among mangroves in sheltered coastal areas.	**Medium**	Suitable habitat present, previously recoded locally.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	DEPI	FFG					
Chthonicola sagittata	Speckled Warbler		vu	L	1896		Occurs in open forest and Box Ironbark Woodlands, usually with scattered shrubs and a cover of acacias. Seldom seen far from dense patches of shrubs.	**Low**	Lack of suitable habitat.
Cinclosoma punctatum	Spotted Quail-thrush		nt		1981		Occurs in drier forests, woodlands and scrub of south eastern Australia. Prefers areas with leaf litter, branches, rocks and tussocks. Often found on the sunny side of dry ridges.	**Medium**	Historically recorded from the local area, may occur in drier vegetation communities located along ridgelines.
Climacteris picumnus victoriae	Brown Treecreeper (south-eastern ssp.)		nt		1973		Often observed feeding on insects as it spirals up trees or when hopping along the ground or on fallen litter. Generally inhabits open eucalypt forests, woodlands and mallee, often where there are stands of dead trees.	**Medium**	Unlikely to occur in wet/damp forest communities.
Excalfactoria chinensis	King Quail		en	L	1927		This species has a preference for wet heath environments where they feed and nest on the ground, but have also been recorded in coastal heath. The current range of this species in Victoria is not known but it is likely to be severely restricted.	**Negligible**	No habitat present.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	DEPI	FFG					
Gallinago hardwickii	Latham's Snipe		nt		1988	PMST	A migrant to Australia from July to April occurring in a wide variety of permanent and ephemeral wetlands. Prefers open freshwater wetlands with nearby cover, but also recorded on the edges of creeks and rivers, river-pools and floodplains. Forages in soft mud at edge of wetlands and roosts in a variety of vegetation around wetlands including tussock grasslands, reeds and rushes, tea-tree scrub, woodlands and forests.	**Low**	Habitat within the study area unlikely to be suitable.
Haliaeetus leucogaster	White-bellied Sea-Eagle		vu	L	2001	PMST	Occurs in marine habitats and terrestrial wetlands along or near coastal areas in eastern Victoria, particularly around large open wetlands such as deep freshwater swamps, lakes, reservoirs and billabongs. Uses tall trees in or near water for breeding.	**Low**	No suitable habitat.
Hirundapus caudacutus	White-throated Needletail		vu		2001	PMST	An almost exclusively aerial species within Australia, occurring over most types of habitat, particularly wooded areas. Less often seen over open farm paddocks.	**Recorded**	A largely aerial species likely to forage over study area on occasion.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	DEPI	FFG					
Lathamus discolor	Swift Parrot	EN	en	L	-	PMST	Migrates to south-east mainland Australia during the winter months where it prefers dry, open eucalypt forests and woodlands, especially Box Ironbark Forest in north-central Victoria. Has also been recorded in urban parks, gardens, street trees and golf courses with flowering ornamental trees and shrubs.	**Low**	No suitable habitat.
Lewinia pectoralis	Lewin's Rail		vu	L	1988		Inhabits densely vegetated wetlands, including swamps, farm dams, saltmarshes, lakes and small pools that can range from fresh to saline water. May also use riparian forest.	**Recorded**	May occur along densely vegetated drainage lines and wetlands within the study area.
Melanodryas cucullata	Hooded Robin		nt	L	1976		Occupies a range of open woodlands including those dominated by Eucalypts, Acacias and Callitris with an understorey of smaller trees, shrubs and grasses.	**Low**	More commonly associated with drier woodland communities, not likely to occur within wet/damp forests.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	DEPI	FFG					
Ninox connivens	Barking Owl		en	L	2000		Prefers dry, open sclerophyll forests and woodlands across Australia including dense riparian galleries containing large hollow-bearing trees suitable for nesting. Often located at the interface between forests and cleared land containing abundant prey.	**Low**	Lack of preferred habitat, unlikely to be present.
Ninox strenua	Powerful Owl		vu	L	2003		Prefers tall open sclerophyll forest and woodlands and requires large, hollow-bearing eucalypts for breeding. While the species has been recorded from a wide range of woodland habitats, preferred habitat typically contains a dense understorey and suitable roost trees with a dense canopy cover. The species is more commonly associated with large tracts of continuous forest, but will also occur in more fragmented landscapes including suburban parklands.	**Recorded**	Known to occur within the local area; suitable habitat present.
Nycticorax caledonicus hillii	Nankeen Night Heron		nt		1971		Occurs in a variety of estuarine and terrestrial wetlands where it forages in shallow slow-moving water or exposed banks, mudflats and swamp vegetation. Also uses wet meadows and pastures, urban wetlands and ponds,	**Low**	While known from the local area, habitat unlikely to be present within the study area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	DEPI	FFG					
							preferring wetland areas with swampy fringing vegetation and nearby trees for roosting.		
Phalacrocorax varius	Pied Cormorant		nt		1969		Mainly inhabits marine environments and coastal waters including beaches, coastal lagoons, estuaries and rock platforms. Also found in terrestrial wetlands with open expanses of permanent water including rivers, inland lakes and billabongs. Breeds and roosts in trees or bushes along the edges of wetlands, as well as on artificial structures such as pylons.	**Low**	While known from the local area, habitat unlikely to be present within the study area.
Platalea regia	Royal Spoonbill		nt		1969		Prefers terrestrial wetlands and wet grassland areas, particularly large expanses of water such as lakes, swamps or lagoons. Also utilises rivers for foraging activities and has regularly been recorded in coastal habitats such as estuaries, inlets and intertidal mudflats.	**Low**	While known from the local area, habitat unlikely to be present within the study area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	DEPI	FFG					
Rostratula australis	Australian Painted Snipe	EN	cr	L	-	PMST	Generally found in shallow, terrestrial freshwater wetlands with rank, emergent tussocks of grass, sedges and rushes. Australian Painted Snipe can occur in well vegetated lakes, swamps, inundated pasture, saltmarsh and dams.	**Negligible**	No habitat present.
Tyto tenebricosa	Sooty Owl		vu	L	2008		Prefers tall old-growth montane forests, including rainforest in temperate and sub-tropical regions with sheltered gullies and slopes. Sometimes recorded in riparian habitat and younger forest if there is old-growth forest nearby or a high density of stags. Roosts in trees with dense foliage and requires large tree hollows for breeding.	**Recorded**	Known to occur within the local area; suitable habitat present.
Reptiles									
Lissolepis coventryi	Swamp Skink		vu	L	1995		Occupies swamp scrub habitat in cool, temperate, low-lying wetlands and swamp margins with a dense shrub layer, particularly in near-coastal areas ranging from the Mt Gambier region in the west, across southern Victoria to just beyond the NSW border to the east.	**Low**	Habitat unlikely to be present.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	DEPI	FFG					
Varanus varius	Lace Goanna		en		1925		Occurs in variety of wooded habitats. Shelters in hollow trunks, limbs and logs.	**Recorded**	Previously recorded within study area, suitable habitat present.
Frogs									
Litoria raniformis	Growling Grass Frog	VU	en	L	unknown	PMST	Occupies a variety of permanent and semi-permanent water bodies generally containing abundant submerged and emergent vegetation, within lowland grasslands, woodlands and open forests.	**Low**	Species not likely to occur in forested habitats.
Pseudophryne bibronii	Brown Toadlet		en	L	1962		Occurs in a variety of damp and occasionally inundated habitats at lower elevations, including watercourses and gullies in forest and woodland habitat, roadside ditches and table drains, wetlands, permanent ponds, and heaths and grasslands with abundant damp leaf litter required for shelter.	**Medium**	Species from this genus are more likely to be found on the flats of the Yarra River than within the study area
Fishes									

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	DEPI	FFG					
Galaxiella pusilla	Dwarf Galaxias	VU	en	L	-	PMST	Occurs in relatively shallow still or slow flowing water bodies including streams, wetlands, drains, that in many instances are ephemeral and partially dry up over summer. Typically requires abundant marginal and aquatic vegetation.	**Negligible**	No suitable habitat within the study area
Macquaria australasica	Macquarie Perch	EN	en	L	1993		A riverine fish preferring deep holes, its natural distribution extends north of the Great Dividing Range in tributaries of the Murray River. Early this century it was introduced to many waters south of the Great Dividing Range but has only been recorded in the Yarra with any regularity since.	**Medium**	Populations have been successfully established in the Yarra River Catchment and may occur within the study area.
Melanotaenia fluviatilis	Crimson-spotted Rainbowfish		vu	L	1905		Schooling, surface dwelling species that prefers wetlands, billabongs and slow flowing rivers. It is limited to the larger waterways such as the Murray, the Goulburn and Broken rivers in Victoria, due to cold winter temperatures in smaller systems.	**Negligible**	No suitable habitat within the study area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	DEPI	FFG					
Prototroctes maraena	Australian Grayling	VU	vu	L	2000	PMST	A diadromous species which spends most of its life in freshwater within rivers and large creeks. Juveniles inhabit estuaries and coastal seas. Adults occur in freshwater habitats, typically rivers and streams with cool, clear waters and gravel substrates, but occasionally also in turbid waters.	**Low**	Species is unlikely to occur within the study area, although limited suitable habitat may be present.
Invertebrates									
Riekoperla darlingtoni	Mt Donna Buang Wingless Stonefly		cr	L	1999		*Reikoperla darlingtoni* is a wingless stone fly restricted to the southern slopes of Mount Donna Buang. *R. darlingtoni* larval stages have been collected in trickles of water within its range, with adults being found in adjacent habitats of curled up strips of bark from Alpine Ash *Eucalyptus delegatensis*.	**Low**	Study area is outside of the very restricted range of the species.
Thaumatoperla alpina	Alpine Stonefly	EN	vu	L	1962		Found at altitudes >760m in streams above the treeline. Typically found in steep, stony, cool streams, often below a cascade of water underneath cobblestones or detritus. The Alpine Stonefly inhabits high altitude areas at least 760 m above sea level, including areas above the tree line.	**Negligible**	No suitable habitat within the study area above 760 m ASL. Study area outside of known distribution.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	DEPI	FFG					
Thaumatoperla robusta	Stonefly		dd		1972		No habitat information available. Only two available records of this species occur.	**High**	One of the two available records of this species occurs within the study area.
Crustaceans									
Boeckella nyoraensis	Calanoid copepod		dd		1910		Limited information available of the habitat requirements of the species, although the species is known to occur in vegetated still water bodies with low turbidity.	**Medium**	Limited suitable habitat likely to occur in the study area.
Engaeus curvisuturus	Curve-tail Burrowing Crayfish		en	L	1983		Occurs on grey clay and silty soils on flood-plains in a restricted area between the Mount Baw Baw region and Warbuton.	**Medium**	Multiple species of *Engaeus* are likely to occur within the study area.
Engaeus hemicirratulus	Gippsland Burrowing Crayfish		en		1963		This species typically occupies burrows in yellow orange clay dominated soils on hill slopes adjacent to watercourses or floodplains, usually above an altitude of 100m. The species is widespread in Victoria but has mostly been recorded from the Western and Eastern Strzelecki Ranges.	**Medium**	Multiple species of *Engaeus* are likely to occur within the study area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	DEPI	FFG					
Engaeus tuberculatus	Tubercle Burrowing Crayfish		en		1963		Eastern populations of this species occur in the flood-beds and clay-dominated hill-slopes of Eucalyptus regnans forest where there is an abundance of ferns at ground level. In western populations, where it occurs in sympatry with Engaeus urostrictus, the species tends to only inhabit burrows on the slopes above creek beds (independent of the water table).	**Medium**	Multiple species of *Engaeus* are likely to occur within the study area.
Engaeus urostrictus	Dandenong Burrowing Crayfish		cr	L	##		Most records occur within the Dandenong Ranges close to streams with abundant fern coverage in wet sclerophyll forest dominated by *Eucalyptus regnans*. The species is not thought to occur west of the Dandenong Ranges, however, records from Bunyip and Mt Donna Buang suggest that the eastern range may be extensive.	**Medium**	Multiple species of *Engaeus* are likely to occur within the study area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	DEPI	FFG					
Engaeus victoriensis	Foothill Burrowing Crayfish		e		##		Occurs in north-west, west and southern foothills of the Dandenong Ranges, with a disjunct population occurring on the Mornington Peninsula between Panton Hill and Flinders. The species has been recorded in grey, clay dominated soils of wet sclerophyll foothill forests and the low-lying parts of creek systems.	**Medium**	Multiple species of *Engaeus* are likely to occur within the study area.

A2.2 Migratory species (EPBC Act listed)

Table A2.2. Migratory fauna species recorded or predicted to occur within 5 km of the study area.

Scientific name	Common name	Most recent record
Acrocephalus stentoreus	Clamorous Reed Warbler	2001
Anthochaera phrygia	Regent Honeyeater	1985
Apus pacificus	Fork-tailed Swift	2001
Ardea modesta	Eastern Great Egret	2002
Bubulcus ibis	Cattle Egret	-
Chalcophaps indica	Emerald Dove	1800
Gallinago hardwickii	Latham's Snipe	1988
Haliaeetus leucogaster	White-bellied Sea-Eagle	2001
Hirundapus caudacutus	White-throated Needletail	2001
Lewinia pectoralis	Lewin's Rail	1988
Merops ornatus	Rainbow Bee-eater	-
Monarcha melanopsis	Black-faced Monarch	1998
Myiagra cyanoleuca	Satin Flycatcher	2000
Pandion cristatus	Eastern Osprey	-
Rhipidura rufifrons	Rufous Fantail	2001
Rostratula australis	Australian Painted Snipe	-