Mount Buller Sustainable Water Security Project – Off-stream Storage

Flora and Fauna Assessment

FINAL REPORT

Prepared for the Mount Buller and Mount Stirling Alpine Resort Management Board

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Glossary

AL	DELWP's Advisory List of rare or threatened species in Victoria (DSE 2009; DSE 2013; DEPI 2014a)
Alpine Bogs	Both the EPBC Act threatened ecological community (Alpine Sphagnum Bogs and Associated Fens) and the FFG Act threatened community (Alpine Bog Community)
ASL	Above Sea Level
BAG	Biodiversity Assessment Guidelines
BEUs	Biodiversity Equivalence Units, either general (GBEUs) or specific (SBEUs)
BIM	DELWP's Biodiversity Interactive Map
CaLP Act	Victorian *Catchment and Land Protection Act 1994*
CBD	Central Business District
CMA	Catchment Management Authority
DELWP	Victorian Government Department of Environment, Land, Water and Planning
DEPI	Victorian Government Department of Environment and Primary Industries, now DELWP
DEWHA	Australian Government Department of the Environment, Water, Heritage and the Arts, now DoE
DoE	Australian Government Department of the Environment
DSE	Victorian Government Department of Sustainability and Environment, now DELWP
DSEWPaC	Australian Government Department of Sustainability, Environment, Water, Population and Communities, now DoE
EE Act	Victorian *Environment Effects Act 1978*
EMP	Environmental Management Plan
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EVC	Ecological Vegetation Class
FFA	Flora and Fauna Assessment
FFG Act	Victorian *Flora and Fauna Guarantee Act 1988*
FIS	Flora Information System
GIS	Geographic Information System
HEMAMP	Hydrological and Ecological Monitoring and Adaptive Management Program
local area	The area within a 5 km radius of the study area
MNES	Matters of National Environmental Significance
NVIM system	DELWP's Native Vegetation Information Management (NVIM) system

PCF	Project Construction Footprint for the proposed Mount Buller Water Storage
PMST	DoE's Protected Matters Search Tool
project	The Mount Buller Sustainable Water Security Project, including the water storage and ancillary infrastructure
RMB	Mount Buller and Mount Stirling Alpine Resort Management Board
significant	Species or ecological community listed as threatened under the EPBC Act, FFG Act and/or DELWP Advisory List or species listed as migratory under the EPBC Act
study area	Broad 30-hectare area in and around the PCF
threatened	Species or ecological community listed as critically endangered, endangered or vulnerable under the EPBC Act, FFG Act or DELWP Advisory List
VBA	DELWP's Victorian Biodiversity Atlas
VFD	Victorian Fauna Database
water storage	The proposed 100 megalitre water storage at Mount Buller
WoNS	Weeds of National Significance

Summary

On behalf of the Mount Buller and Mount Stirling Alpine Resort Management Board (RMB), Meinhardt Pty Ltd commissioned Biosis Pty Ltd and GHD Pty Ltd to produce an updated flora and fauna assessment (FFA) for the proposed Mount Buller Sustainable Water Security Project – Off Stream Storage (the project) at Mount Buller. The project comprises a 100 megalitre (ML) water storage facility and associated infrastructure.

The proposed project would be within the Mount Buller Alpine Resort, approximately 150 kilometres northeast of the Melbourne CBD, Victoria. The Project Construction Footprint (PCF) is located on a gently to moderately sloping plateau 700 metres east of the Mount Buller summit and 250 metres west of Mount Buller village.

Ecological values and potential impacts

Key ecological values within the PCF include:

- 5.278 hectares of native vegetation, which would require removal for construction of the project.
- Habitat supporting small populations of Broad-toothed Rat *Mastacomys fuscus mordicus* (EPBC Act: vulnerable; FFG Act: threatened) and Alpine Bog Skink *Pseudemoia cryodroma* (FFG Act: threatened).

Key ecological values in the broader study area but outside the PCF include:

- 2.007 hectares of the Alpine Bog ecological community (EPBC Act: endangered; FFG Act: threatened) downslope of the PCF, of which 0.901 hectares could be indirectly impacted without successful implementation of mitigation measures.
- Potential non-core habitat for Mountain Pygmy-possum *Burramys parvus* (EPBC Act: endangered; FFG Act: threatened).

Government legislation and policy

Legislation / policy	Relevant ecological feature on site	Permit/approval required	Notes
EPBC Act	Broad-toothed Rat within PCF. Alpine Bogs and potential Mountain Pygmy-possum habitat within broader study area.	The project has been referred to the Commonwealth Minister for the Environment.	Significant impact on MNES is unlikely.
FFG Act	PCF is public land and supports 38 protected flora species, Alpine Bog Skink and Broad-toothed Rat.	Protected flora permit is required to remove these flora species.	No action statements exist for Broad-toothed Rat or Alpine Bog Skink.
Planning and Environment Act	All native vegetation proposed for removal.	Planning permit required to lop or remove native vegetation.	Permit application needs to address requirements of the Biodiversity Assessment Guidelines.
CaLP Act	Three noxious weeds and two pest animals.	N/A	Comply with requirements to control/eradicate.

Biodiversity Assessment Guidelines

The proposed water storage would require the removal of 5.278 hectares of native vegetation from location risk C. Therefore, the planning permit application will be assessed on the high risk-based pathway. The strategic biodiversity score of the native vegetation to be removed is 0.968.

If a permit is granted, offset requirements would include 1.102 GBEUs and specific offsets for 16 species. An Offset Strategy has been prepared to outline how these offsets could be provided within the resort under an alternative offset arrangement (Biosis 2016).

Recommendations

Ecological impacts have been minimised and avoided through an iterative redesign of the proposed project, which resulted in native vegetation removal being reduced by more than 10%. Ecological impacts will be further minimised and avoided through implementation of the habitat creation program, Hydrological and Ecological Monitoring and Adaptive Management Program and Site Environmental Management Plan.

1. Introduction

1.1 Project background

On behalf of the Mount Buller and Mount Stirling Alpine Resort Management Board (RMB), Meinhardt Pty Ltd (Meinhardt) commissioned Biosis Pty Ltd (Biosis) and GHD Pty Ltd (GHD) to produce an updated flora and fauna assessment (FFA) for the proposed Mount Buller Sustainable Water Security Project (the project) at Mount Buller.

GHD prepared a FFA in mid-2014, after conducting field surveys of the study area in late 2013 and early 2014. In mid-2015, the RMB engaged Biosis to conduct a desktop review of GHD's work. This updated FFA report is a joint work between Biosis and GHD, based on the original FFA and the desktop review. GHD ecologists conducted all field assessments and collected all data. In collaboration with GHD, Biosis has subsequently prepared this report.

1.2 Location of the study area

The proposed project would be within the Mount Buller Alpine Resort, approximately 150 kilometres northeast of the Melbourne CBD, Victoria. The proposed site (known as the 'Control Centre') is located on a gently to moderately sloping plateau 700 metres east of the Mount Buller summit and 250 metres west of Mount Buller village (Figure 1).

The study area for this FFA incorporates the broad 30-hectare area in and around the Project Construction Footprint (PCF). It extends beyond the PCF to encompass areas (such as Alpine Bogs) that may be indirectly affected by construction and operation of the proposed water storage (Figure 2).

The proposed PCF covers an area of 10.347 hectares. The proposed permanent and temporary construction footprint of the project would be located between the final section of the unsealed Mount Buller Summit Road and the Summit Nature Walking Track (Figure 2).

The proposed PCF extends beyond the water storage to include roads, stockpile areas and extensions of variable shape and length for ancillary infrastructure leading to and from the water storage. The PCF incorporates a section of the Mount Buller Summit Road and areas currently occupied by the Boggy Creek ski lift and a number of buildings (including the Control Centre building).

The PCF is located on Crown land that is permanently reserved for the purpose of the Mount Buller Alpine Resort, known as Crown Allotment 5A, Section A (SPI 5A~A\PP2370), Parish of Changue East, County of Wonangatta. The RMB is the public land manager. The PCF is within the:

- Victorian Alps Bioregion
- Goulburn River Basin
- Management area of Goulburn Broken Catchment Management Authority.

1.3 Scope of assessment

The objectives of this FFA are to:

- Describe the vascular flora (ferns, conifers and flowering plants) and vertebrate fauna (mammals, birds, reptiles and frogs) recorded within the PCF.

- Map native vegetation and other habitat features within the PCF.
- Assess the quality of native vegetation within the PCF.
- Undertake targeted survey for threatened species and ecological communities within the broader study area.
- Determine the likelihood of occurrence of rare or threatened flora and fauna within the PCF.
- Identify potential implications of the proposed project, including:
  - Direct impacts on ecological values within the PCF.
  - Indirect impacts on ecological values within the broader study area.
- Provide recommendations for avoiding and/or minimising direct and indirect ecological impacts.
- Review the regulatory requirements of the water storage project under relevant biodiversity legislation and policy, including:
  - The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
  - Victoria's *Flora and Fauna Guarantee Act 1988* (FFG Act)
  - Victoria's *Environment Effects Act 1978* (EE Act)
  - Victoria's *Planning and Environment Act 1987* and incorporated Biodiversity Assessment Guidelines.

2. Methods

2.1 Desktop assessment

In order to provide a context for the study area, information about ecological values from within 5 km of the study area (the "local area") was obtained from a range of sources, including relevant biodiversity databases, scientific literature and reports concerning the study area.

Records from the following databases were collated and reviewed:

- DoE's Protected Matters Search Tool (PMST) for matters protected under the EPBC Act.
- DELWP's Victorian Biodiversity Atlas (VBA), including the FLORA25, FLORA100, FLORA Restricted, FAUNA25, FAUNA100 and FAUNA Restricted datasets.
- DELWP's Biodiversity Interactive Map (BIM).
- The Victorian Fauna Database (VFD; Viridans 2014a).
- The Victorian Flora Information System (FIS; Viridans 2014b).
- BirdLife Australia's Atlas of Australian Birds.

Other sources of biodiversity information included:

- Alpine Planning Scheme, which details overlays relevant to biodiversity.
- DELWP's Habitat Importance Models.
- DELWP's Native Vegetation Information Management (NVIM) system, which provides access to native vegetation extent, condition and location risk maps.
- DELWP's EnSym Native Vegetation Regulations Tool, to estimate biodiversity offset requirements for the proposed removal of native vegetation.
- DELWP's Native Vegetation Support Team, for confirmation of offset requirements.
- Environmental Management Plan (EMP) for Mount Buller and Mount Stirling Alpine Resorts (Biosis Research 2007b).
- Recommended Net Gain offset sites and management strategies for Mount Buller and Mount Stirling Alpine Resorts (Biosis Research 2008).
- Mount Buller Ski Field Vegetation Management Plan (Biosis 2013).
- Targeted survey for Alpine Marsh-marigold *Psychrophila introloba* and associated species at Mount Buller and Mount Stirling (Biosis Research 2007a).
- Recovery Plan for Mountain Pygmy-possum on Mount Buller (RMB 2005; RMB 2013).
- Habitat mapping for the Mountain Pygmy-possum at Mount Buller (Biosis Research 2006).
- Distribution and habitat requirements of the Broad-toothed Rat at Mount Buller (Whisson 2009; Whisson *et al.* 2015).
- Results of surveys of herpetofauna on Mount Buller, including an annotated list of species known from the area (Clemann 2008).
- FFA report for the Mount Buller water storage feasibility study (Aecom 2009).

- Flora, terrestrial fauna and net gain assessment of the proposed water storage at Tirol Flat, Mount Buller (Biosis Research 2009; Biosis Research 2011b).
- Desktop flora and fauna assessment of the proposed water storage at Boggy Creek, Mount Buller (Biosis Research 2011c).
- Comparison of the proposed Tirol Flat and Boggy Creek water storage facilities at Mount Buller (Biosis Research 2011a).
- Preliminary flora and fauna review of the Koflers and Tirol Flat sites for the proposed water storage (GHD 2014b).
- Flora and fauna assessment of the proposed water storage at the Control Centre (GHD 2014a), which was used as the basis for this report.
- Mapping and assessment of Alpine Bogs at Mount Buller (Tolsma 2014).
- Various other sources referenced throughout this report.

2.2 Field assessment

A field assessment was undertaken by Dr Tim Wills (Principal Botanist) and Dr Richard Retallick (Senior Zoologist) on 2-6 December 2013. On two days (4-5 December), inclement weather (90 mm rain, then 24 hours of light snow) disrupted the field assessment, reducing the extent of information that could be collected during that time. Another site assessment was undertaken by Tim Wills and Anneka Ferguson (Ecologist) on 14-15 April 2014 to investigate additional small areas proposed for ancillary infrastructure. The results of both site assessments inform this report.

The field assessment involved walking across the study area using the random meander method (Cropper 1993), while making observations regarding the:

- Extent of disturbed areas.
- Location of waterways.
- Extent and condition of native vegetation.
- Presence or potential presence of significant ecological communities, significant species or habitat for significant species.

2.2.1 Flora assessment

The flora field assessment of the PCF involved:

- Recording all native and introduced flora species encountered.
- Identifying and mapping patches of remnant native vegetation.
- Describing the structure and composition of all patches of native vegetation (e.g. weed cover and dominant species in each stratum).
- Assessing the condition of all native vegetation patches according to the habitat hectares method (DSE 2004).
- Assessing the likelihood of occurrence of rare or threatened flora (based on known or predicted occurrence within 5 km of the PCF and the presence of suitable habitat within the PCF).
- Recording the location of threatened flora, if encountered.

A flora species list was compiled and submitted to DELWP for incorporation into the Victorian Biodiversity Atlas.

2.2.1.1 Mapping of native vegetation

Native vegetation is defined in the Victoria Planning Provisions as "plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses" (Clause 72). The Biodiversity Assessment Guidelines classify native vegetation into two categories (DEPI 2013):

- A **remnant patch** of native vegetation (measured in hectares), which is either:
  - An area of native vegetation, with or without trees, where at least 25 percent of the total perennial understorey cover is native plants.
  - An area with three or more indigenous canopy trees where the tree canopy cover is at least 20 percent.
- A **scattered tree** (measured by number of trees), which is a native canopy tree that does not form part of a remnant patch of native vegetation.

Remnant patch vegetation is classified into ecological vegetation classes (EVCs). An EVC contains one or more floristic (plant) communities and represents a grouping of broadly similar environments. Definitions of EVCs and benchmarks (conditions against which vegetation quality can be compared) are determined by DELWP.

A canopy tree is a mature tree that is greater than three metres in height and is normally found in the upper layer of a vegetation type. EVC descriptions provide a list of the typical canopy species. A condition score and extent is applied to each scattered tree based on information provided by DELWP's NVIM system.

All native vegetation within the PCF was mapped using hand-held (uncorrected) GPS units (Trimble Nomad) and aerial photo interpretation.

2.2.1.2 Vegetation quality assessment

During the site assessments, the quality of all remnant patch native vegetation within the PCF was assessed in accordance with the habitat hectare method (DSE 2004). Native vegetation was assessed with reference to EVC benchmarks for the Victorian Alps Bioregion. Vegetation was assigned to a particular EVC based on the biophysical characteristics outlined in the EVC benchmarks, such as geology, vegetation structure and species composition.

2.2.1.3 Significant ecological communities

The broader study area was surveyed for the presence of ecological communities listed under the EPBC Act and/or FFG Act, particularly Alpine Bogs. The presence of the EPBC Act threatened ecological community, Alpine Sphagnum Bogs and Associated Fens, was assessed in accordance with government policy advice for this community (DEWHA 2009). The presence of the FFG Act threatened community, Alpine Bog Community, was assessed in accordance with the distinguishing characteristics as outlined by the FFG Act Scientific Advisory Committee (FFG Act Scientific Advisory Committee 2013).

The extent of Alpine Bogs within the broader study area were mapped using hand-held (uncorrected) GPS units (Trimble Nomad) and aerial photo interpretation. The Alpine Bogs downslope (to the north) of the PCF were visited during both site visits to gain an appreciation of potential indirect impacts resulting from possible changes to the groundwater regime and how the proposed project activities may affect the ecology of the Alpine Bogs.

2.2.1.4 Weeds

Invasion of native vegetation by escaped garden plants or environmental weeds is a threatening process listed under the EPBC Act and FFG Act. During the field assessment, all observed flora species were recorded, including environmental weeds, noxious weeds listed under the Victorian *Catchment and Land Protection Act 1994* (CaLP Act) and Weeds of National Significance (WoNS).

2.2.2 Fauna assessment

The fauna field assessment involved:

- Identifying fauna habitat within the PCF, particularly habitat for threatened fauna species (e.g. waterways, rocky outcrops, Mountain Plum-pine shrubland).
- Assessing the condition of those habitats.
- Assessing the likelihood of occurrence of threatened fauna (based on known or predicted occurrence within 5 km of the PCF and the presence of suitable habitat within the PCF).
- Recording a list of fauna species (or signs of species) encountered incidentally within the study area.

A fauna species list was compiled and submitted to DELWP for incorporation into the Victorian Biodiversity Atlas. Fauna species were recorded with a view to characterising the values of the site and the investigation was not intended to provide a comprehensive survey of all fauna that has potential to utilise the site over time.

Fauna habitat values were determined primarily on the basis of the types and qualities of habitats present. Active searching for fauna was also undertaken, including direct observation, searching under rocks, examination of tracks and scats and identifying calls. Particular attention was given to searching for threatened fauna and their habitats, although targeted surveys were not undertaken (see sub-section 2.2.5).

2.2.3 Permits

All field investigations were undertaken in accordance with GHD's research permits, including:

- Permit to take protected flora under the Victorian *Flora and Fauna Guarantee Act 1988* (#10006247, expiry 1 March 2015)
- Wildlife permit under the Victorian *Wildlife Act 1975* (#10006509, expiry 30 June 2014)
- Scientific Procedures Fieldwork Licence under the Victorian *Prevention of Cruelty to Animals Act 1986* (#SPFL305, expiry 30 June 2014).

2.2.4 Nomenclature

Species nomenclature follows the Flora Information System (FIS) for flora species and Victorian Fauna Database (VFD) for fauna species (Viridans 2014a; Viridans 2014b). Native vegetation is classified into Ecological Vegetation Classes (EVCs), which are described according to a combination of floristic, life form and ecological characteristics and through an inferred fidelity to particular environmental attributes. Each EVC occurs under a common regime of ecological processes within a given biogeographic range, and may contain multiple floristic communities (DNRE 2002).

The EPBC Act and the FFG Act have vegetation classification systems that are separate from each other and also separate from the EVC classification system. As such, any single patch of native vegetation occurring within the study area is classified as a particular EVC and may also be separately classified as a threatened ecological community under the EPBC Act and/or as another threatened community under the FFG Act.

2.2.5 Qualifications

2.2.5.1 Survey scope

This ecological assessment considers vascular flora (ferns, conifers and flowering plants) and terrestrial vertebrate fauna (mammals, birds, reptiles and frogs). Non-vascular flora (e.g. mosses, liverworts, lichens), fungi, terrestrial invertebrates and aquatic fauna have not been considered in detail as part of this assessment, except where listed threatened species are known or suspected to occur or where bryophytes comprise part of the EVC benchmark used for the vegetation quality assessment (e.g. cover of bryophytes).

2.2.5.2 Survey timing

Ecological surveys provide a sampling of flora and fauna at a given time and season. There are a number of reasons why not all species will be detected during survey, such as low abundance, patchy distribution, species dormancy, seasonal conditions and migration or breeding behaviours.

This flora and fauna assessment was undertaken in early summer and mid-autumn, which is considered a suitable time of year for conducting ecological surveys in alpine areas. The timing of the field assessment was appropriate for detection of the majority (but not all) of the significant flora and fauna species known or predicted to occur within 5 km of the PCF (within the local area).

Additional species may have been recorded if the field assessment had been undertaken in mid-summer, when more ephemeral flora species are flowering and alpine fauna are particularly active. However, the timing of the field assessment is not a significant limitation to this assessment of the overall biodiversity values of a site.

2.2.5.3 Targeted survey

Targeted surveys for significant flora or fauna species, such as flora quadrat surveys or fauna trapping, were not undertaken as part of the field assessment. The desktop assessment suggested that targeted surveys may be required for certain significant fauna species with potential to occur within the PCF, including:

- Mountain Pygmy-possum *Burramys parvus* (EPBC Act: endangered; FFG Act: listed; Advisory List: critically endangered)
- Broad-toothed Rat *Mastacomys fuscus mordicus* (EPBC Act: vulnerable; FFG Act: listed; Advisory List: endangered)
- Alpine Bog Skink *Pseudemoia cryodroma* (FFG Act: listed; Advisory List: endangered)
- Tussock Skink *Pseudemoia pagenstecheri* (Advisory List: vulnerable).

The need for targeted surveys for these species was ruled out for the following reasons:

- The PCF contains no Mountain Pygmy-possum habitat (D. Heinze, pers. comm., 4 June 2015) and while individuals may occasionally disperse through the atypical habitat of the PCF to reach more optimal habitat, it is likely to be a very infrequent occurrence.
- The general fauna survey techniques employed were considered sufficient to detect the presence of Broad-toothed Rat, Alpine Bog Skink and Tussock Skink.

The absence of targeted surveys from this assessment is not considered to significantly constrain the conclusions reached within this report, due to the records obtained during the field assessment, the detailed habitat assessments undertaken and the detailed information available on the presence of species in the local area from the VBA, AVW, FIS and numerous other sources (see section 2.1).

2.2.5.4 GPS accuracy

A Trimble Nomad GPS unit was used to record site information. These units are generally accurate to within 10 metres. Therefore, the maps in this report presenting site information and species records provide a guide only. Before construction, an ecologist must assist in fencing off areas of native vegetation to be retained.

2.3 Assessing likelihood of occurrence of significant species

The significance of a species or ecological community is determined by its listing status under Commonwealth or State legislation. For the purposes of this FFA, significant species or ecological communities are:

- Listed as critically endangered, endangered, vulnerable and/or migratory under the EPBC Act.
- Listed as threatened or protected under the FFG Act.
- Listed as critically endangered, endangered or vulnerable in Victoria under a DELWP Advisory List (DSE 2009; DSE 2013; DEPI 2014a).

The desktop assessment involved searching biodiversity databases for significant species recorded or predicted to occur within 5 kilometres of the PCF (see section 2.1). These significant species are listed in Appendix 1 (flora) and Appendix 2 (fauna). The species have been assessed to determine their likelihood of occurrence within the PCF.

We have not assessed the likelihood of occurrence for flora species listed as rare on the DELWP advisory list (DEPI 2014a). These rare species are generally widespread in the Victorian Alps Bioregion but are considered rare due to the narrow biophysical growing conditions and limited geographic extent of the bioregion. These rare flora species are not discussed further in this report unless DELWP's Habitat Importance Modelling suggests that there is habitat for these species within the PCF.

Likelihood of occurrence indicates the potential for a species or ecological community to occur regularly within the study area. It is based on expert opinion, information gathered during the desktop assessment and an assessment of the habitat within the PCF. For the purposes of this FFA, likelihood of occurrence is ranked using the following rationale:

- **Present** – Species known to occur within the PCF or detected during the field assessment.
- **Likely** – The PCF supports potentially suitable habitat for the species and is within the known range for the species. The species has been recorded historically within 5 km of the PCF and generally within the last 30 years.
- **Unlikely** –The known range for the species encompasses the PCF but suitable habitat does not occur within the PCF or occurs within the PCF but with generally low quality and quantity. The species has been recorded historically within 5 km of the study area but generally not within the last 30 years.
- **Highly unlikely** – No historical records of the species within 5 km of the study area and/or no suitable habitat within the PCF.

Species that are unlikely or highly unlikely to occur within the PCF are not discussed further in this report unless DELWP's Habitat Importance Modelling suggests that there is habitat for these species within the PCF.

2.4 Consultation

Several stakeholders and authorities were consulted in the preparation of this FFA report, including:

- Louise Perrin (RMB), in relation to environmental management at Mount Buller.
- Jerry Alexander, Monique Claasz, Don Hough, Louisa Smith and Nigel Waterhouse (DELWP) in relation to native vegetation, threatened species, threatened ecological communities and the Offset Strategy.
- Arn Tolsma (Arthur Rylah Institute for Environmental Research, DELWP) in relation to distribution, mapping, monitoring and management of Alpine Bogs.
- Dean Heinze (Mountain Pygmy-possum expert) in relation to Mountain Pygmy-possum.
- Nick Clemann (Arthur Rylah Institute for Environmental Research, DELWP) and Maggie Haines (Museum Victoria) in relation to Alpine Bog Skink.

3. Results

The ecological features of the PCF and broader study area are described below. Species recorded during the flora and fauna assessment are listed in Appendix 1 (flora) and Appendix 2 (fauna). Unless of particular note, these species are not discussed further. Those species recorded or predicted to occur in the local area is also provided in those appendices, along with an assessment of the likelihood of the species occurring within the PCF.

3.1 Native vegetation and fauna habitats

The PCF is above 1,630 metres in elevation and mostly above the treeline. It is therefore largely characterised by a matrix of low shrub, heath and grassy habitats, although small parts of the PCF support woodland at the elevational limit for trees at Mount Buller. Native vegetation within the PCF is of moderate to high quality, belonging to one of two Ecological Vegetation Classes (EVCs): Sub-alpine Woodland (EVC 43) or Alpine Grassy Heathland (EVC 1004). Figure 3 shows the distribution and extent of these EVCs within the PCF. The EVCs are described in detail in Table 1 below.

The native vegetation within the PCF is well suited for a range of fauna that use alpine areas, as residents, seasonal visitors or occasional visitors. The study area is normally covered in snow in winter, so most fauna species tend to be seasonal visitors (e.g. elevational migrants such as Flame Robin *Petroica phoenicea*). Some small ground-dwelling species are residents and exploit the protection, resources and warmth of sub-nivean spaces during winter (e.g. Broad-toothed Rat *Mastacomys fuscus*). Overall, however, the PCF is relatively free of features that would offer substantial shelter to small fauna (e.g. logs, rocks). The PCF's fauna habitat values are described in detail in Table 1.

Table 1 Summary of native vegetation within the project constrution footprint

Vegetation or habitat type	Description	Location	Significant values
Sub-alpine Woodland EVC 43 Habitat Zones 4 and 7 Plate 1	Characterised by a tree canopy of Snow Gum *Eucalyptus pauciflora* over a shrubby understorey dominated by Alpine Rusty-pods *Hovea montana*, Alpine Shrub-violet *Melicytus* sp. aff. *dentatus* (snowfields variant), Dusty Daisy-bush *Olearia phlogopappa* var. *flavescens*, Kerosene Bush *Ozothamnus cupressoides* and Alpine Podolobium *Podolobium alpestre*. The ground layer is dominated by Snow Grass *Poa* spp., in association with scattered forbs such as Bidgee-widgee *Acaena novae-zelandiae*, Prickly Starwort *Stellaria pungens* and Orange Everlasting *Xerochrysum subundulatum*. Weed cover is generally low, with weeds including Sheep Sorrel *Acetosella vulgaris*, Sweet Vernal-grass *Anthoxanthum odoratum* and Flatweed *Hypochaeris radicata*. Represented by Habitat Zones 4 and 7, with habitat scores of 72 and 53 respectively.	Confined to three small patches (totalling 0.085 ha) within the PCF: one patch in the west and two patches in the northeast of the PCF, growing on skeletal clay loams with a rich humus topsoil layer (Figure 3).	Habitat for Lilac Bitter-cress *Cardamine lilacina*, Broad-toothed Rat *Mastacomys fuscus mordicus* and Alpine Bog Skink *Pseudemoia cryodroma*.
Alpine Grassy Heathland EVC 1004 Habitat Zones 1, 2, 3 and 10 Plate 2	Dominated by Alpine Rusty-pods *Hovea montana*, in association with a range of other low shrubs to 0.5 m high, including Alpine Star-bush *Asterolasia trymalioides*, Alpine Baeckea *Baeckea gunniana*, Alpine Grevillea *Grevillea australis*, Alpine Rice-flower *Pimelea alpina*, Mountain Daisy-bush *Olearia algida*, Dusty Daisy-bush *Olearia phlogopappa* var. *flavescens*, Kerosene Bush *Ozothamnus cupressoides* and Alpine Mint-bush *Prostanthera cuneata*. Graminoids and forbs are abundant and vary in cover depending on shrub density. Horny Snow-grass *Poa fawcettiae* dominates the ground layer, in association with a scattered or locally patchy distribution of species including Snow Aciphyll *Aciphylla glacialis*, Mountain Woodruff *Asperula gunnii*, Slender Snow Daisy *Celmisia pugioniformis*, Ashen Billy-buttons *Craspedia coolaminica*, Southern Woodrush *Luzula modesta*, Alpine Yam-daisy *Microseris lanceolata*, Snow-grass *Poa* spp., Gunn's Alpine Buttercup *Ranunculus gunnianus*, Alpine Wallaby-grass *Rytidosperma nudiflorum* and Common Triggerplant *Stylidium armeria*. The majority of this EVC supports low weed cover, with some moderate weed cover near heavily/frequently disturbed areas. Common weeds include Sheep Sorrel *Acetosella vulgaris*, Milfoil *Achillea millefolium*, Brown-top Bent *Agrostis capillaris*, Red Fescue *Festuca rubra*, Flatweed *Hypochaeris radicata* and Field Pansy *Viola arvensis*.	Most abundant EVC (totalling 5.194 ha) across the PCF. Various locations within the PCF, generally on slopes where exposure and frost limit tree growth (Figure 3).	Year-round habitat for Broad-toothed Rat *Mastacomys fuscus mordicus* in areas of dense shrub cover. Habitat for Alpine Bog Skink *Pseudemoia cryodroma* in warmer months. Potential habitat for Alpine Pennywort *Schizeilema fragoseum* and Tussock Skink *Pseudemoia pagenstecheri*.

Vegetation or habitat type	Description	Location	Significant values
Disturbed areas Predominantly introduced vegetation Plate 3	Parts of the PCF that have been previously disturbed for historical development and maintenance of the Resort, including roads, tracks, ski lifts, buildings, hardstands for buildings and heavily groomed ski runs. Where these areas support vegetation, it is predominantly introduced i.e. less than 25% of the perennial understorey cover comprises native species. Disturbed areas were not mapped and not subject to a formal vegetation quality assessment. Common introduced flora in these areas include Sheep Sorrel *Acetosella vulgaris*, Milfoil *Achillea millefolium*, Brown-top Bent *Agrostis capillaris*, Sweet Vernal-grass *Anthoxanthum odoratum*, Red Fescue *Festuca rub*ra, Flatweed *Hypochaeris radicata*, Timothy Grass *Phleum pratense* and Field Pansy *Viola arvensis*.	Almost half the PCF (covering 5.217 hectares).	Limited habitat value for generalist fauna such as Little Raven *Corvus mellori*, Australasian Pipit *Anthus novaeseelandiae* and Flame Robin *Petroica phoenicea*.

3.2 Landscape context

Native vegetation and fauna habitat within the PCF are contiguous with native vegetation and fauna habitats of the broader study area and surrounding Resort. Alpine Grassy Heathland and Sub-alpine Woodland extend beyond the PCF into the broader study area. In addition, the following EVCs were recorded from the broader study area but not within the PCF:

- Sub-alpine Shrubland (EVC 42)
- Sub-alpine Wet Heathland (EVC 210)
- Alpine Peaty Heathland (EVC 1011).

Sub-alpine Shrubland is characterised by extruding rocks within a matrix of dense shrubs (e.g. Mountain Plum-pine *Podocarpus lawrencei*) of variable heights in steeper areas of the surrounding landscape. This EVC provides potential habitat for Mountain Pygmy-possum *Burramys parvus*, which is listed as endangered under the EPBC Act and threatened under the FFG Act. A small (0.066 hectares) patch of Sub-alpine Shrubland occurs in the northeast of the study area but outside the PCF and outside preferred habitat for Mountain Pygmy-possum.

Sub-alpine Wet Heathland and Alpine Peaty Heathland are characterised by a ground layer of Peat Moss *Sphagnum* spp. underneath a dense shrub layer dominated by Alpine Baeckea *Baeckea gunniana*, Swamp Heath *Epacris paludosa* and Candle Heath *Richea continentis*. Both of these EVCs are collectively known as Alpine Bogs and meet the criteria for two threatened ecological communities: the Alpine Bog Community (listed as threatened under the FFG Act) and Alpine Sphagnum Bogs and Associated Fens (listed as endangered under the EPBC Act). A total of 2.023 hectares of Alpine Bog is within the study area but outside the PCF.

The PMST identified the PCF to be upstream of six Wetlands of International Significance (Ramsar sites), all of which are 150 kilometres or more downstream of the PCF:

- Banrock Station Wetland Complex (South Australia)
- Barmah Forest (Victoria)
- Coorong and Lakes Alexandrina and Albert (South Australia)
- Gunbower Forest (Victoria)
- Central Murray State Forests (New South Wales)
- Riverland (South Australia)

The proposed project would have no direct impact on native vegetation or fauna habitat outside the PCF. There is potential for indirect impacts on significant species and ecological communities in the broader study area, such as Mountain Pygmy-possum and Alpine Bogs. Potential indirect impacts and measures to mitigate them are discussed in chapter 4.

3.3 Significant species and ecological communities

The desktop assessment revealed that 32 significant species and two significant ecological communities had been recorded or were predicted to occur within 5 kilometres of the PCF. The significant species included seven flora species (Appendix 1) and 25 fauna species, including seven migratory species (Appendix 2). The

field assessment recorded 121 indigenous species within the PCF and broader study area: 93 flora species (Appendix 1) and 28 vertebrate fauna species (Appendix 2). Three significant species were recorded.

3.3.1 EPBC Act and FFG Act threatened species

Of the 32 significant species recorded or predicted to occur within 5 km of the PCF, 20 of those species are listed as threatened under the EPBC Act and/or FFG Act (in addition to their listing under an Advisory List). Figure 4 shows records of EPBC Act listed species within 5 kilometres of the PCF.

Appendix 1 (flora) and Appendix 2 (fauna) provide an assessment of the likelihood of these 26 EPBC Act and FFG Act threatened species occurring within the PCF. Likelihood of occurrence is based on the habitats present within the PCF, habitat condition, proximity of records to the PCF and whether records are relatively recent or historical. A summary of those EPBC Act and FFG Act threatened species recorded or considered likely to occur within the PCF is provided in Table 2.

Table 2 Summary of EPBC Act and FFG Act threatened species recorded in the PCF

Species name	Listing status	Area of value within the PCF
Broad-toothed Rat ***Mastacomys fuscus mordicus***	EPBC Act: vulnerable FFG Act: threatened Advisory List: endangered	Areas of dense heath and sedge cover in Alpine Heathy Grassland and Sub-alpine Woodland.
Alpine Bog Skink ***Pseudemoia cryodroma*** Plate 4	FFG Act: threatened Advisory List: endangered	Damp microhabitats in Alpine Grassy Heathland and Sub-alpine Woodland.

Most species are considered unlikely or highly unlikely to occur within the PCF, generally due to lack of suitable habitat. Broad-toothed Rat *Mastacomys fuscus mordicus* was detected within the PCF on the basis of indirect signs for the species (scats, tunnels and runs). Alpine Bog Skink *Pseudemoia cryodroma* was seen within the PCF.

3.3.2 EPBC Act migratory species

No migratory species were recorded during the field assessment. The PMST indicates that seven migratory species have been recorded or are predicted to occur within 5 kilometres of the PCF (Appendix 2). Most of these species are considered unlikely to occur within the PCF. Only two of these species have been recorded historically within 5 kilometres of the PCF: Satin Flycatcher *Myiagra cyanoleuca* and White-throated Needletail *Hirundapus caudacutus*. Satin Flycatcher uses treed habitats that are not present within the PCF. White-throated Needletail is a non-breeding, seasonal, aerial migrant to Australia and rarely (if ever) lands while here. While these and other migratory species may be present within or flying above the PCF during the warmer months, the PCF is unlikely to provide important habitat for them.

3.3.3 Significant ecological communities

No significant ecological communities occur within the PCF. The desktop assessment revealed that two significant ecological communities were known from within 5 kilometres of the PCF:

- Alpine Bogs, known as Alpine Sphagnum Bogs and Associated Fens (endangered) under the EPBC Act and as the Alpine Bog Community (threatened) under the FFG Act.
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (listed as critically endangered under the EPBC Act).

White Box *Eucalyptus albens*, Yellow Box *Eucalyptus melliodora* and Blakely's Red Gum *Eucalyptus blakeyi* are lowland species, rarely found at elevations higher than 500 metres ASL. The presence of this grassy woodland and derived native grassland community within the PCF (which is higher than 1630 metres ASL) could therefore be discounted. The field assessment confirmed this.

Alpine Bogs, on the other hand, are known to occur at Mount Buller. Through aerial photographic interpretation Tolsma (2014) identified 2.158 hectares of Alpine Bog at Mount Buller, with 2.016 hectares (93.4%) occurring on the northern side of the mountain, downslope from the PCF. GHD refined this mapping on ground, identifying 2.149 hectares of Alpine Bog at Mount Buller, with 2.023 hectares (94.1%) within the broader study area and 2.007 hectares (93.4%) found downslope of the PCF. No areas of Alpine Bog occur within the PCF.

3.3.4 DELWP Advisory List species

To support decision making under the Biodiversity Assessment Guidelines (BAG), DELWP has produced models of the extent of important habitat for most species listed as rare or threatened under an Advisory List (DSE 2009; DSE 2013; DEPI 2014a). These habitat importance models assign a score to a location based on the importance of that location as habitat for each rare or threatened species, relative to other suitable habitat for that species (DEPI 2013).

Under the BAG, habitat importance models form the basis for determining the impact of proposed native vegetation clearing on rare and threatened species. The habitat importance scores are used to calculate the type and quantity of biodiversity offsets required for native vegetation removal. The habitat importance models and scores only apply to proposed native vegetation removal that is assessed on either the moderate or high risk-based application pathway.

Table 3 provides a summary of those DELWP Advisory List species for which important habitat is modelled in native vegetation within the PCF. These data were provided by DELWP's Native Vegetation Support Team and DELWP's full output report is provided in Appendix 4. Determination of the requirement for a specific offset based on the extent of impact to one or more rare or threatened species is addressed in chapter 31.

In addition to the species listed in Table 3, three other Advisory List significant species were recorded or considered likely to occur within the PCF, despite having no important habitat modelled in native vegetation within the PCF. They are:

- Lilac Bitter-cress *Cardamine lilacina s.s.* (vulnerable), recorded within the PCF.
- Alpine Pennywort *Schizeilema fragoseum* (vulnerable), considered likely to occur.
- Tussock Skink *Pseudemoia pagenstecheri* (vulnerable), considered likely to occur.

Table 3 Summary of Advisory List species with modelled important habitat in native vegetation within the PCF

Species name	Advisory List status	Database records from local area	Recorded during field assessment
Flora			
Alpine Marsh-marigold *Psychrophila introloba*	Rare	Yes	
Alpine Sedge *Carex blakei*	Rare		
Alpine Stackhousia *Stackhousia pulvinaris*	Rare		
Alpine Sundew *Drosera arcturi*	Rare		
Broad-leaf Flower-rush *Carpha nivicola*	Rare	Yes	
Carpet Sedge *Carex jackiana*	Rare	Yes	Yes
Cliff Cudweed *Euchiton umbricola*	Rare	Yes	
Dusty Daisy-bush *Olearia phlogopappa* var. *flavescens*	Rare		Yes
Eichler's Buttercup *Ranunculus eichlerianus*	Rare		
Felted Buttercup *Ranunculus muelleri*	Vulnerable		
Fog Club-sedge *Isolepis montivaga*	Rare		Yes
Green Billy-buttons *Craspedia aurantia* subsp. *jamesii* (syn. *C. jamesii*)	Rare		
Gunn's Alpine Buttercup *Ranunculus gunnianus*	Rare	Yes	Yes
Lilac Berry *Trochocarpa clarkei*	Rare	Yes	
Mat Cudweed *Euchiton traversii*	Rare		
Milfoil Speedwell *Veronica nivea* (syn. *Derwentia nivea*)	Rare		
Mossy Knawel *Scleranthus singuliflorus*	Rare	Yes	Yes
Mountain Aciphyll *Aciphylla simplicifolia*	Rare		Yes
Mountain Daisy *Brachyscome* sp. 3	Vulnerable		Yes
Mountain Wallaby-grass *Rytidosperma oreophilum*	Rare		Yes
Mountain Willow-herb *Epilobium sarmentaceum*	Rare		
Mueller's Bent *Agrostis muelleriana*	Rare	Yes	Yes
Snow Aciphyll *Aciphylla glacialis*	Rare	Yes	Yes
Snow Coprosma *Coprosma nivalis*	Rare		Yes
Spinning Gum *Eucalyptus perriniana*	Rare	Yes	
Sticky Fleabane *Pappochroma nitidum* (syn. *Erigeron nitidus*)	Rare		Yes
Thick Bent-grass *Deyeuxia crassiuscula*	Rare	Yes	Yes
Tussock Woodrush *Luzula alpestris*	Rare		Yes
Veined Plantain *Plantago alpestris*	Rare		Yes

Species name	Advisory List status	Database records from local area	Recorded during field assessment
Fauna			
Mountain Pygmy-possum *Burramys parvus*	Critically endangered	Yes	
Alpine Tree Frog *Litoria verreauxii alpina*	Critically endangered	Yes	
Broad-toothed Rat *Mastacomys fuscus mordicus*	Endangered	Yes	Yes
Alpine Bog Skink *Pseudemoia cryodroma*	Endangered	Yes	Yes
Planarian *Spathula tryssa*	Vulnerable	Yes	

4. Ecological impacts

This chapter considers the direct and indirect impacts of the proposed water storage on native vegetation, fauna habitat and threatened species or ecological communities listed under the EPBC Act or FFG Act. Species that are significant only by way of their listing on an Advisory List (DSE 2009; DSE 2013; DEPI 2014a) are not considered in this chapter. As noted in section 3.3, habitat importance models form the basis for determining the impact of proposed native vegetation clearing on rare and threatened species. These impacts are summarised in the project-specific Biodiversity Impact and Offset Requirements (BIOR) report issued by DELWP (Appendix 4), which is discussed sub-section 1.1.1.

4.1 Direct impacts

4.1.1 Removal of native vegetation

The proposed project would require the removal of 5.278 hectares of native vegetation, including 5.194 hectares of Alpine Grassy Heathland (EVC 1011) and 0.085 hectares of Sub-alpine Woodland (EVC 43) (Figure 3). Removal of native vegetation is discussed in the context of Victoria's Biodiversity Assessment Guidelines in section 1.1. Efforts to avoid and minimise removal of native vegetation are discussed in section 6.1.

4.1.2 Broad-toothed Rat

The Broad-toothed Rat *Mastacomys fuscus mordicus* is listed as threatened under the FFG Act and was recently listed as vulnerable under the EPBC Act. The species is nocturnal. It has a characteristic scat and prefers dense, wet heathlands and grasslands of high rainfall areas. It occurs in alpine and sub-alpine areas of Victoria and is documented to occur at Mount Buller (Whisson 2009; Figure 4).

Biosis detected indirect signs (scat) of the species in the broader study area (Biosis Research 2009). GHD detected indirect signs of the species (scat, tunnels and runs) in the PCF during the field assessment. Tunnels and runs were seen in dense heathy vegetation and are likely to indicate the presence of native rats, including Broad-toothed Rat.

There have been several trapping surveys for Broad-toothed Rat at Mount Buller over the past ten years. From October 2009 to March 2010, Whisson *et al.* (2015) conducted intensive trapping for Broad-toothed Rat across Mount Buller. This area comprised a mosaic of sub-alpine woodland and ski runs with either exotic grasses or managed indigenous vegetation. Between 50 and 294 traps were set for four consecutive nights each month and checked each morning and late afternoon, making a total of 3564 trap nights for the study (Whisson *et al.* 2015).

Fifteen Broad-toothed Rat were trapped and 14 were fitted with radio transmitters. Indirect signs of the species (scat) were also recorded. In total, Broad-toothed Rat was detected by its characteristic scat in two locations within the PCF, one location in the broader study area and 13 locations further afield (Whisson *et al.* 2015). This is in addition to the Broad-toothed Rat faecal sample detected by GHD near the northwestern perimeter of the PCF (Figure 4).

Whisson *et al.* (2015) demonstrated that Broad-toothed Rat is patchily distributed at Mount Buller (33% of survey sites occupied) and restricted to small home ranges within dense native vegetation, although it has the ability to cross narrow cleared tracks and to occasionally undertake long-distance movements (Whisson *et al.* 2015). The species is tolerant of some level of habitat disturbance (e.g. slashing and pruning of native vegetation to a minimum height of 30 centimetres) and has the ability to persist in managed native vegetation within ski runs and near buildings. Of the 14 radio-collared individuals that

Whisson *et al.* (2015) tracked, all had home ranges that comprised more the 20% ski runs with managed native vegetation and the core home range of two individuals were entirely within such ski runs.

The Broad-toothed Rat is likely to be found in the PCF in low numbers and likely to be restricted mainly to wet and dense areas of Alpine Grassy Heathland. Construction of the proposed water storage and ancillary infrastructure would result in the removal of some native vegetation that provides habitat for Broad-toothed Rat. To mitigate impacts on this species, removal of Alpine Grassy Heathland (EVC 1011) should be minimised and post-construction rehabilitation of the PCF will involve dense revegetation with indigenous heath species. These mitigation measures are discussed further in chapter 6.

4.1.3 Alpine Bog Skink

The Alpine Bog Skink *Pseudemoia cryodroma* is listed as threatened under the FFG Act. It is well known to occur at Mount Buller and has been reported in recent years in or near the PCF. Biosis recorded the species at three locations within 50 metres of the study area and therefore outside the PCF (Biosis Research 2009). GHD recorded Alpine Bog Skink in five locations within or at the edge of the PCF during the field assessment.

Most of the locations in the PCF where the species has been detected are wet or damp heathland where there is standing or slow-flowing water and small protruding rocks. Although the species is not considered to be limited to this habitat, it is thought to be the primary habitat for this species. Individuals are likely to use other heathy and grassy habitats across the PCF for dispersal or foraging and Alpine Bog Skink was seen in drier habitat in the broader study area during the field assessment.

All native vegetation within the PCF is likely to provide habitat for Alpine Bog Skink, meaning that removal of 5.278 hectares of native vegetation for the proposed water storage and ancillary infrastructure would result in the removal of habitat for Alpine Bog Skink. Drainage lines, rocky areas, Alpine Bogs and other wet heathland vegetation are likely to provide core microhabitat for the species and should be avoided as a primary mitigation measure. Post-construction rehabilitation of the PCF will involve dense revegetation with indigenous heath species and the establishment of rocky areas. These mitigation measures are discussed further in chapter 6.

4.2 Indirect impacts

4.2.1 Mountain Pygmy-possum

Mountain Pygmy-possum *Burramys parvus* is well studied and has been the subject of intensive and ongoing monitoring at Mount Buller. Since its discovery at Mount Buller in 1996, considerable effort has been made to document the distribution and ecology of the species. Detailed trapping and radio tracking surveys have indicated that the Mountain Pygmy-possum population at Mount Buller is largely confined to boulderfield and adjacent shrubby heathland habitat, particularly those that support Mountain Plum-pine *Podocarpus lawrencei* (Biosis Research 2006). The species avoids habitats with low protective cover, such as groomed ski runs, grassland and low open heathland. The highest population densities occur within the deepest boulderfields at 1500-1600 metres elevation (D. Heinze, pers. comm., 4 June 2015).

A Mountain Pygmy-possum Management Area has been defined at Mount Buller (Figure 5). The Management Area encompasses preferred Mountain Pygmy-possum habitat, the vegetation communities or topographical features that provide the highest degree of protective cover and potentially important links between habitat patches (Heinze 2002). Preferred Mountain Pygmy-possum habitat at Mount Buller is categorised as Type I or Type II according to its core values (Figure 5). Type I habitat includes accumulations of boulders, either in blockfields near mountain peaks or blockstreams in gullies (Biosis Research 2006). The boulders serve to buffer extreme temperatures and provide year-round shelter for the species, even under snow. Type II habitat includes the surrounding shrubby heathland that the Mountain Pygmy-possum prefers,

often with Mountain Plum-pine *Podocarpus lawrencei* present (Biosis Research 2006). Patches of core habitat can be widely separate, but there is evidence that the Mountain Pygmy-possum disperses between patches up to 1 km apart, particularly males and dispersing juveniles (DoE 2014).

The PCF avoids patches of preferred habitat (Type I and Type II) and potentially important links between these patches. Construction and operation of the proposed project will not result in the loss of Mountain Pygmy-possum habitat. A minimum 200-metre buffer exists between the PCF and preferred Mountain Pygmy-possum habitat (Figure 5). This exceeds the 30-metre buffer requirement of the Mount Buller Mountain Pygmy-possum Recovery Plan, which was first prepared in 2005 (RMB 2005) and updated for the 2011-2016 period (RMB 2013).

While the proposed water storage would not result in the direct loss, degradation or modification of Mountain Pygmy-possum habitat, potential indirect effects on the species include:

- Population fragmentation
- Increased threats or disturbances.

4.2.1.1 Potential population fragmentation

The PCF contains no suitable habitat for Mountain Pygmy-possum and it is highly unlikely that Mountain Pygmy-possum would disperse through the PCF, meaning that the proposed project is unlikely to cause fragmentation of the surrounding Mountain Pygmy-possum population (D. Heinze, pers. comm., 4 June 2015). The PCF contains broad extents of Alpine Grassy Heathland and disturbed exotic vegetation (Figure 3), neither of which constitute habitat that Mountain Pygmy-possum is known to use. While individuals may occasionally disperse through atypical habitats to reach more optimal habitat, this is likely to be a very infrequent occurrence and animals making such movements would be vulnerable to predation due to the lack of appropriate cover.

Ample alternative and higher quality dispersal habitat is available to Mountain Pygmy-possum within the areas surrounding the PCF. When the Mountain Pygmy-possum Management Area was first defined, the area in and around the PCF was excluded as it provided little, if any, protective cover for Mountain Pygmy-possum (D. Heinze, pers. comm., 4 June 2015).

While impacts on Mountain Pygmy-possum are considered highly unlikely, post-construction rehabilitation of the PCF will involve dense revegetation with indigenous heath species and the establishment of rocky areas. Surface and subsurface rock from the PCF will be salvaged, stockpiled and reinstated in a strategic manner to provide the potential for additional Mountain Pygmy-possum habitat. The aim of this rehabilitation will be to increase the capacity for Mountain Pygmy-possum to move between existing dispersed areas of preferred habitat across Mount Buller. The RMB will undertake habitat reinstatement works in accordance with strategies outlined in the Mount Buller Mountain Pygmy-possum Recovery Plan (RMB 2013). These mitigation measures are discussed further in chapter 6.

4.2.1.2 Potential increased threats or disturbances

Construction of the project would take place during the Resort's summer construction period, which is when Mountain Pygmy-possum is most active. Noise, lighting, sedimentation and other disturbances from construction activities are highly unlikely to disrupt the activities of Mountain Pygmy-possum on Mount Buller because:

- The PCF is outside the defined Management Area for the Mountain Pygmy-possum population (Figure 5).

- Construction noise will not exceed background noise by more than 10 dB outside normal working hours.
- Although construction lighting has the potential to attract adult Bogong Moths *Agrotis infusa* and therefore affect the availability of a favoured food source of the Mountain Pygmy-possum, construction lighting is unlikely to exceed the output of existing lighting at the Mount Buller village and will be minimised by limiting construction to daylight hours over the summer construction period.
- Sedimentation will be minimised through installation of erosion control measures, such as stormwater infrastructure, geofabric and sediment fences.

In addition, the proposed project is not anticipated to result in significant changes to recreational activities in the area or increase the predation risk to Mountain Pygmy-possum. Ongoing population monitoring, predator control and reconnecting fragmented habitat will continue through the established Mount Buller Mountain Pygmy-possum Recovery Plan, with a primary aim of protecting and enhancing Mountain Pygmy-possum habitat. These mitigation measures are discussed further in chapter 6.

4.2.2 Alpine Bogs

Alpine Bogs are groundwater dependent ecosystems with a scattered distribution in alpine, sub-alpine and montane environments across the Australian Alps, typically above the climatic tree line (1200 metres ASL or higher) (DEWHA 2009; FFG Act Scientific Advisory Committee 2013). Alpine Bogs are restricted to wet sites and are generally characterised by the presence of Peat Moss (*Sphagnum* spp.). They are particularly susceptible to climate change given that they have a fragmented distribution and are already at their environmental tolerance limit (DEWHA 2009; Macdonald 2009).

Alpine Bogs have an inherent ecological value. Not only are they a threatened ecological community, listed as endangered under the EPBC Act and threatened under the FFG Act, but they also provide habitat for threatened species, such as Alpine Bog Skink *Pseudemoia cryodroma*, Alpine Stonefly *Thaumatoperla flaveola* and Stonefly *Riekoperla isosceles*, all of which are listed as threatened under the FFG Act. Conservation and restoration of Alpine Bogs is also crucial to maintaining inland water resources because these systems issue water to major north and south flowing rivers from the Great Dividing Range (DEWHA 2009).

The present extent of Alpine Bogs is estimated to be approximately 8000 hectares on mainland Australia, 4500 hectares in Victoria and 61.5 hectares within the Goulburn Broken Catchment, which includes Mount Buller (TSSC 2008; Tolsma 2014). Around 2.149 hectares of Alpine Bog are found at Mount Buller, of which 2.023 hectares (94.1%) are within the broader study area and 2.007 hectares (93.4%) downslope of the PCF (Figure 6).

While the PCF avoids all direct impacts on Alpine Bogs and allows for a buffer around Alpine Bogs, the proposed project has the potential to affect the hydrology of 0.901 hectares of Alpine Bog downslope of the PCF, of which 0.898 hectares could be significantly impacted (Figure 7; Table 4). Without implementation of management and mitigation measures, the proposed water storage has the potential to affect the natural water run-off and drainage patterns into downslope catchments, resulting in changes to the water regime that sustains the Alpine Bogs. Reductions in water run-off and natural discharge to the bogs could result in a drying effect and it is likely that this would lead to a reduction in the condition and extent of downslope Alpine Bogs.

4.2.2.1 Deterioration in condition

The Alpine Bogs that would be affected by the proposed project are of high quality, but are relatively disturbed compared with other Alpine Bogs in the bioregion. Although the Alpine Bogs on Mount Buller are "long unburnt", they have a long history of disturbance from alpine resort activities, meaning they are of a

relatively poorer quality than other Alpine Bogs in the catchment, such as those on Lake Mountain (Tolsma 2014).

During the field assessment, GHD conducted a vegetation quality assessment of Sub-alpine Wet Heathland (EVC 210, synonymous with the threatened Alpine Bog ecological community) within the study area and closest to the PCF. These areas of Alpine Bog achieved a score of 81 out of 100. The Alpine Bog Community lacked species diversity but scored perfectly for recruitment of new plants, organic litter cover and lack of weeds. Weed cover was recorded as less than 5%, with no high threat weeds present. Tolsma (2014) noted that weed infestation was severe around all Alpine Bogs on Mount Buller, due to a long history of disturbance, but was minor within the Alpine Bogs themselves.

If allowed to dry out, the Alpine Bogs are therefore at risk of weed invasion, which would reduce the quality of the Alpine Bogs and the habitat that they provide. Weed control in affected Alpine Bogs is outlined in the project-specific Hydrological and Ecological Monitoring and Adaptive Management Program (HEMAMP) that the RMB has commissioned (Biosis and GHD 2016). The HEMAMP is explained in more detail in chapter 6.

4.2.2.2 Indirect loss of extent

The proposed water storage is likely to reduce the catchment area of several downslope Alpine Bogs, resulting in the potential indirect loss of 0.901 hectares of Alpine Bog. Figure 7 reproduces the catchment areas of Alpine Bogs on the northern slopes of Mount Buller. The footprints of the proposed water storage and earth embankment would impact on the catchment areas of Alpine Bogs 4.2, 6, 8, 9, 10, 11.2, 12 and 13 (Table 4).

The water storage and earth embankment footprint would impact on 11% of the catchment area of Alpine Bog 13 (Figure 7; Table 4). This is not considered to be a significant impact on the recharge capacity of Bog 13. The catchment area of Bog 13 is one order of magnitude larger than the catchment area for any of the other bogs and yet Bog 13 is one of the smallest of the Alpine Bogs on the northern slopes of Mount Buller. Therefore, Bog 13 is unlikely to be indirectly impacted by the proposed water storage.

However, the water storage and earth embankment footprint would impact on 30-51% of the catchment areas of Alpine Bogs 4.2, 6, 8, 9, 10, 11.2 and 12 (Figure 7; Table 4). This has the potential to significantly impact on the recharge capacity of these Alpine Bogs and has potential to cause drying of the Alpine Bogs. Construction of the project without implementation of appropriate mitigation measures (as outlined in the HEMAMP) would potentially result in the indirect loss of Bogs 4.2, 6, 8, 9, 10, 11.2 and 12 (amounting to 0.898 hectares of Alpine Bog).

The HEMAMP makes provisions for environmental watering of affected Alpine Bogs (Biosis and GHD 2016; see chapter 6). Successful implementation of the HEMAMP's mitigation and management measures will minimise the indirect loss of Alpine Bogs to no more than 0.090 hectares, which is approximately 4.2% of the Alpine Bog ecological community at Mount Buller, 0.15% within the Goulburn Broken Catchment, 0.002% in Victoria and 0.001% of the ecological community on mainland Australia.

While up to 0.090 hectares of Alpine Bog may be indirectly lost through changes to hydrology, this does not necessarily equate to permanent removal of native vegetation from the landscape. If indirect impacts do occur this will mean Alpine Bog vegetation is likely to transition to a drier native vegetation community through encroachment by atypical indigenous species, rather than native vegetation cover being permanently lost.

Table 4 Summary of indirect impacts on Alpine Bogs from the proposed water storage.

Alpine Bog #	Bog area (ha)	Bog catchment area (ha)	Overlap with water storage and earth embankment footprint (ha)	Percentage catchment area impacted	Likely impact assessment (without mitigation measures)	Expected 'worst case scenario' outcome with mitigation measures
4.2	0.373	3.511	1.468	42%	0.373 ha lost	0.037 ha lost
6	0.253	4.829	1.468	30%	0.253 ha lost	0.025 ha lost
8	0.040	0.624	0.321	51%	0.040 ha lost	0.004 ha lost
9	0.010	0.203	0.078	38%	0.010 ha lost	0.001 ha lost
10	0.008	0.236	0.094	40%	0.008 ha lost	0.001 ha lost
11.2	0.127	1.581	0.701	44%	0.127 ha lost	0.013 ha lost
12	0.087	1.540	0.701	46%	0.087 ha lost	0.009 ha lost
13	0.012	23.398	2.591	11%	0.000 ha lost	0.000 ha lost
Total	**0.910**	**23.398**	**2.591**	**N/A**	**0.898 ha lost**	**0.090 ha lost**

5. Legislative and policy implications

This section provides an assessment of the project in relation to key biodiversity legislation and government policy. This section does not describe the legislation and policy in detail. Information contained herein does not constitute legal advice.

5.1 Commonwealth EPBC Act

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (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. Table 5 outlines relevant MNES and provides an assessment of whether the proposed action (construction and operation of the proposed water storage) is likely to significantly impact on these MNES, as per criteria outlined in the EPBC Act Significant Impact Guidelines (DoE 2013; DSEWPaC 2013). While the proposed water storage is unlikely to significantly impact upon any MNES, referral of the project to the Commonwealth Minister for the Environment is still recommended.

Table 5 Assessment of the proposed water storage in relation to EPBC Act

MNES	Project specifics	Assessment against significant impact guidelines
Threatened species	One threatened species has been recorded within the PCF: Broad-toothed Rat (vulnerable). There is potential for indirect impacts on another threatened species within the broader study area but outside the PCF: Mountain Pygmy-possum (endangered).	The proposed project is not considered likely to trigger criteria for a significant impact on any listed threatened species. Impacts on Broad-toothed Rat are not considered to be significant given that the Broad-toothed Rat has a relatively wide distribution and inhabits Mount Buller, including the area of the PCF, at low density. Potential impacts on Mountain Pygmy-possum are not considered to be significant given that preferred Mountain Pygmy-possum habitat would not be affected by the water storage, that the species is highly unlikely to disperse across the PCF and that rehabilitation of the PCF will establish more favourable habitat than currently exists.
Migratory species	Seven listed migratory species have been recorded or predicted to occur in the PCF.	No migratory species is expected to show a strong association with habitats within the PCF. Consequently, the PCF is not considered to provide important habitat for any migratory species and the proposed water storage is not considered likely to trigger criteria for a significant impact on any listed migratory species.

MNES	Project specifics	Assessment against significant impact guidelines
Threatened ecological communities	No threatened ecological community occurs within the PCF. However, there is potential for indirect impacts on Alpine Sphagnum Bogs and Associated Fens (Alpine Bogs), an endangered ecological community, within the broader study area downslope of the PCF.	The proposed project has potential to trigger one significant impact criterion by modifying at least one abiotic factor (water regimes) necessary for the survival of the Alpine Bogs. However, successful implementation of the HEMAMP, involving weed control and environmental watering, will minimise the impact. The residual indirect impact would be limited to a maximum 0.090 ha loss of Alpine Bog extent. This is not considered to be a significant impact, given that it amounts to approximately 0.001% of the ecological community on mainland Australia.
Wetlands of international importance (Ramsar sites).	The PCF is upstream of six Ramsar sites: • Banrock Station Wetland Complex (South Australia) • Barmah Forest (Victoria) • Coorong and Lakes Alexandrina and Albert (South Australia) • Gunbower Forest (Victoria) • Central Murray State Forests (New South Wales) • Riverland (South Australia)	The PCF is 150 km or more upstream from these Ramsar sites and does not drain directly into them. The proposed water storage is not likely to result in a significant impact on these distant wetlands.
National heritage places	The PCF is within one national heritage place: Australian Alps National Parks and Reserves.	The proposed project will not significantly impact upon any of the attributes for which the national heritage place is listed.

5.2 Victorian FFG Act

The Victorian *Flora and Fauna Guarantee Act 1988* (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 DELWP to take protected flora species from public land, such as the Mount Buller Alpine Resort. The PCF is on public land and 38 protected flora species were recorded within the study area, with most occurring within the PCF (Appendix 1). A protected flora permit will therefore be required to remove these species for the proposed project.

While the PCF supports populations of Broad-toothed Rat and Alpine Bog Skink (both listed as threatened under the FFG Act), no FFG Act action statements exist for these species.

5.3 Victorian *Wildlife Act 1975*

The Victorian *Wildlife Act 1975* (Wildlife Act) protects and manages wildlife. Under this Act, wildlife includes indigenous vertebrate species (except declared pest species), invertebrate species listed under the FFG Act and some introduced game species. Handling and relocation (salvage) of fauna during construction of the proposed water storage would require authorisation under the Wildlife Act.

5.4 Victorian *Environmental Effects Act 1978*

The Victorian *Environment Effects Act 1978* (EE Act) establishes a process to assess the environmental impacts of a project. If applicable, the Act requires that an Environment Effects Statement (EES) be prepared by the proponent. The EES enables the Minister for Planning to assess the potential environmental effects of the proposed development. The general objective of the EES process is to provide for the transparent, integrated and timely assessment of the environmental effects of projects capable of having a significant effect on the environment (DSE 2006).

The Ministerial Guidelines for Assessment of Environmental Effects under the *Environment Effects Act 1978* (DSE 2006) provide a range of criteria that can be used to determine whether an EES may be required for a project. Many of the criteria relate to impacts on flora and fauna. Having reviewed these criteria, referral under the EE Act is not considered necessary on the basis of flora and fauna issues. This is because:

- The proposed water storage would require less than 10 hectares of native vegetation to be removed.
- No FFG Act listed flora species are known to occur within the PCF
- A significant area of a listed ecological community is unlikely to be removed.
- FFG Act listed fauna species that occur within the PCF (Broad-toothed Rat and Alpine Bog Skink) are not restricted to the PCF and have populations that extend beyond the area of impact, meaning that there is low potential for loss of a genetically important population of a threatened species and for loss of critical habitat.
- Migratory bird species may occasionally visit the PCF but not to the extent that those species are supported by the PCF or to the extent that those species might not survive without such visitation.

5.5 Victorian CaLP Act

The Victorian *Catchment and Land Protection Act 1994* (CaLP Act) identifies and classifies certain species as noxious weeds or pest animals. A total of 27 introduced species were recorded in the PCF during the field assessment: 25 flora species and two fauna species.

Of the 25 introduced flora species, three are listed as noxious weeds under the CaLP Act: Spear Thistle *Cirsium vulgare* (restricted weed), St John's Wort *Hypericum perforatum* (regionally controlled weed) and Blackberry *Rubus fruticosus* spp. agg. (regionally controlled weed). Blackberry is also regarded as a Weed of National Significance (WoNS). These three species are highly localised and restricted to only a few specimens within the PCF. It should be noted that Orange Hawkweed *Hieracium aurantiacum* subsp. *carpathicola*, a serious weed in alpine areas and listed on the National Alert List for Environmental Weeds, was not recorded within the PCF or broader study area. The landholder must take all reasonable steps prevent the growth and spread of regionally controlled weeds.

The two introduced fauna species recorded within the PCF were European Rabbit *Oryctolagus cuniculus* and Red Fox *Vulpes vulpes*. Both species are declared established pest animals under the CaLP Act. Landholders have a legal duty to prevent the spread of these species on their land and eradicate them as far as possible.

5.6 Victorian *Planning and Environment Act 1987* and Alpine Resorts Planning Scheme

The Victorian *Planning and Environment Act 1987* controls the planning and development of land in Victoria and outlines the Victorian Planning Provisions that form the basis of all municipal planning schemes in Victoria, including the Alpine Resorts Planning Scheme. The Alpine Resorts Planning Scheme contains clauses relating to the removal, destruction or lopping of native vegetation.

Clause 72 defines native vegetation as "plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses". Clause 52.17 stipulates that a planning permit is required to remove, destroy or lop native vegetation including some dead native vegetation. It is an objective of Clause 12.01-2 that permitted clearing of native vegetation results in no net loss in the contribution made by native vegetation to Victoria's biodiversity.

5.6.1 Overlays

The need for a permit to remove native vegetation may also be triggered by overlays within the Planning Scheme. The provisions of the following overlays apply to the PCF:

- Environmental Significance Overlay (ESO1)
- Erosion Management Overlay (EMO1)
- Wildfire Management Overlay (WMO).

ESO1 (Schedule 1 to the Environmental Significance Overlay) is most relevant to the propose water storage and relates specifically to Mountain Pygmy-possum *Burramys parvus* at Mount Buller (Figure 5). ESO1 has four environmental objectives:

- Preserve and enhance Mountain Pygmy-possum habitat and identified linkages.
- Prevent the destruction and fragmentation of the existing Mountain Pygmy-possum habitat.
- Provide movement corridors for the Mountain Pygmy-possum.
- Ensure development does not have an adverse impact on the Mountain Pygmy-possum habitat.

These environmental objectives will be met through post-construction rehabilitation of the PCF involving dense revegetation with indigenous heath species and the establishment of rocky areas. A permit will still be required to remove native vegetation within the ESO.

5.6.2 Victoria's Biodiversity Assessment Guidelines

The Biodiversity Assessment Guidelines are incorporated into the Victoria Planning Provisions (DEPI 2013). They guide how impacts to biodiversity should be considered when assessing a permit application to remove, destroy or lop native vegetation. The objective for permitted clearing of native vegetation in Victoria is "no net loss in the contribution made by native vegetation to Victoria's biodiversity".

This objective is to be achieved through Victoria's planning system using a risk-based approach that relies on strategic planning and the permit and offset system. The key strategies for achieving no net loss at the permit level are:

- Avoiding the removal of native vegetation that makes a significant contribution to Victoria's biodiversity
- Minimising impacts to Victoria's biodiversity from the removal of native vegetation

- Where native vegetation is permitted to be removed, ensuring it is offset in a manner that makes a contribution to Victoria's biodiversity that is equivalent to the contribution made by the native vegetation to be removed.

The steps that have been taken to avoid, minimise and offset impacts are outlined in chapter 6.

5.6.2.1 Determining the risk-based pathway

DELWP provides biodiversity information tools to assist with determining the risk associated with permitted clearing and the contribution that native vegetation within the PCF makes to Victoria's biodiversity. All planning permit applications to remove native vegetation are assigned to a risk-based pathway determined by the extent and location of proposed clearing. The risk-based pathway will dictate the information to be provided in a planning permit application and the decision guidelines that DELWP (as a referral authority) will use to assess the permit application.

The biodiversity information tools have two components:

- Site-based information, which is observable at a particular site (in this case, within the PCF and broader study area). Site-based information is presented in chapters 3 and 4 above.
- Landscape scale information, which requires consideration of information beyond the PCF. This information is managed by DELWP and can be accessed via the NVIM system.

Biosis has submitted the site-based data to DELWP and a Biodiversity Information and Offset Requirements (BIOR) report has been prepared to accompany the planning application. Using landscape scale information, the BIOR report identifies the risk-based pathway under which the planning application will be assessed. The full BIOR report can be viewed in Appendix 4. A glossary of terms used in relation to the BIOR report is provided in Appendix 5.

The proposed water storage would require the removal of 5.2784 hectares of native vegetation, including 5.194 hectares of Alpine Grassy Heathland (EVC 1011) and 0.0846 hectares of Sub-alpine Woodland (EVC 43) (Figure 3). To determine the risk-based pathway for the proposed removal of native vegetation, two factors are considered: location risk and extent risk. Location risk has been pre-determined by DELWP for all locations in Victoria and can be ascertained by consulting the Native Vegetation Location Risk Map available through the NVIM system. The extent risk is based on the extent of native vegetation proposed to be removed, which, in this case, is the area of remnant patch native vegetation within the PCF (5.194 hectares).

Since the proposed water storage would require the removal of more than one hectare of native vegetation from within location risk C, the application for removal of this native vegetation must meet the requirements of and be assessed under the high risk-based pathway. The requirements of a high risk-based pathway application include a vegetation quality assessment according to the habitat hectares method (DSE 2004).

5.6.2.2 Habitat hectares

The condition of the native vegetation within the PCF was assessed using the habitat hectares method (DSE 2004). Areas of uniform quality for each EVC (habitat zones) were assessed separately. The condition score of the habitat zone is multiplied by the extent of the zone to give a value in habitat hectares. The PCF supports 4.517 habitat hectares within six habitat zones (Table 6).

Table 6 Habitat hectares assessment of native vegetation within the PCF.

Habitat Zone (HZ) ID			HZ1	HZ2	HZ3	HZ4	HZ7	HZ10	
EVC # Name			1004 AGH	1004 AGH	1004 AGH	43 SAW	43 SAW	1004 AGH	
		Max	Score	Score	Score	Score	Score	Score	Total
Site Condition	Large Old Trees	10	N/A	N/A	N/A	6	0	N/A	
	Canopy Cover	5	N/A	N/A	N/A	5	5	N/A	
	Understorey	25	25	20	20	15	10	15	
	Lack of Weeds	15	13	9	13	15	7	4	
	Recruitment	10	10	10	5	6	6	5	
	Organic Matter	5	2	5	5	3	5	5	
	Logs	5	N/A	N/A	N/A	2	0	N/A	
	Total Site Score		**50**	**44**	**43**	**52**	**33**	**29**	
	EVC Standardiser		1.36	1.36	1.36	N/A	N/A	1.36	
	Adjusted Site Score	**75**	**68**	**60**	**59**	**52**	**33**	**40**	
Landscape Value	Patch Size	10	8	8	8	8	8	8	
	Neighbourhood	10	8	8	8	8	8	8	
	Distance to Core	5	4	4	4	4	4	4	
	Total Landscape Score		**20**	**20**	**20**	**20**	**20**	**20**	
HABITAT SCORE		100	88.18	80.00	78.64	72.00	53.00	59.55	
Habitat points = #/100		1	0.88	0.80	0.79	0.72	0.53	0.60	
Habitat Zone area (ha)			**4.029**	**0.984**	**0.093**	**0.069**	**0.015**	**0.087**	**5.278**
Habitat hectares (hha)			**3.546**	**0.787**	**0.074**	**0.050**	**0.008**	**0.052**	**4.517**

5.6.2.3 Offset requirements

In order to ensure a gain to Victoria's biodiversity that is equivalent to the loss resulting from permitted clearing of native vegetation, compensatory offsets are required. Losses and gains are measured in biodiversity equivalence units (BEUs).

For a planning permit application on the high risk-based pathway, the specific-general offset test will determine if a general offset, specific offset or combination of both is required. The results of the specific-general offset test are provided in Appendix 3 and summarized in Table 7.

Table 7 Summary of DELWP Biodiversity Impacts and Offset Requirements report

Attribute	Outcome	Notes
Location risk	C	
Native vegetation removal extent	5.278 ha	
Risk-based pathway	High	
Habitat hectares to be removed	4.517 hha	
Strategic biodiversity score	0.968	Measure of the native vegetation's importance for Victoria's biodiversity, relative to other locations across the landscape.
Modelled habitat for rare or threatened species	Yes	See sub-section 3.3.4.
Offset type	Both	Specific and general offsets required.
Offset risk factor	1.5-2	Specific offsets: 2. General offsets: 1.5.
Offset amount	1.102 GBEUs 6.065 SBEUs 1.218 SBEUs 5.322 SBEUs 7.048 SBEUs 1.274 SBEUs 6.844 SBEUs 6.690 SBEUs 7.112 SBEUs 5.566 SBEUs 6.984 SBEUs 5.609 SBEUs 0.796 SBEUs 5.840 SBEUs 5.285 SBEUs 7.046 SBEUs 5.520 SBEUs	General Offsets Alpine Bog Skink Alpine Stackhousia Broad-leaf Flower-rush Carpet Sedge Felted Buttercup Fog Club-sedge Green Billy-buttons Gunn's Alpine Buttercup Mossy Knawel Mountain Daisy Mountain Wallaby-grass Planarian Snow Aciphyll Sticky Fleabane Tussock Woodrush Veined Plantain
General offset vicinity	Catchment or municipality	Goulburn Broken CMA Area or Mount Buller Alpine Resort
General offset minimum strategic biodiversity score	0.774	

6. Mitigation measures

This chapter briefly outlines the steps that have been taken to avoid, minimise and offset the ecological impacts that are likely to arise from construction and operation of the proposed project.

6.1 Avoiding and minimising impacts

GHD, in consultation with Biosis and the RMB, has refined the design of the proposed project to:

- Avoid all Alpine Bogs.
- Reduce proposed native vegetation removal by more than 10%.
- Minimise removal of habitat for Broad-toothed Rat, Alpine Bog Skink and other fauna.
- Increase the minimum buffer between the PCF and preferred Mountain Pygmy-possum habitat from 70 metres for the original PCF to 200 metres for the current revised PCF.

The results of this redesign process, shown in Figure 8, are the primary means by which ecological impacts have been avoided and/or minimised for the proposed water storage. The results have been achieved through an iterative process, involving (but not limited to):

- Realignment and narrowing of pipelines and access corridors.
- Moving stockpile locations to existing disturbed areas of non-native vegetation in preference to areas of native vegetation.
- Reducing the overall size of the PCF by almost one hectare.

Additional mitigation measures, monitoring programs and management plans for avoiding and minimising ecological impacts are summarised in Appendix 3. Two important mitigation measures to be taken from Appendix 3 include the habitat creation program and the HEMAMP (Biosis and GHD 2016).

6.1.1 Habitat creation program

The post-construction habitat creation program involves rehabilitation of habitat for Broad-toothed Rat and Alpine Bog Skink and active creation of new habitat for Mountain Pygmy-possum within the PCF, in accordance with the Mountain Pygmy-possum Recovery Program (RMB 2013).

Rock salvaged during construction will be used afterwards to create shelter and basking locations within the PCF. A Project Revegetation Plan will be prepared to reinstate all temporarily disturbed areas using salvaged sods, salvaged plants and/or locally indigenous tube stock appropriate to the pre-disturbance Ecological Vegetation Class.

Revegetation will re-establish dense native vegetative cover, which will minimise the potential for weed colonisation and create suitable habitat for Mountain Pygmy-possum (pockets of shrubby heathland, particularly around salvaged rock) and for Broad-toothed Rat and Alpine Bog Skink (dense heathy vegetation in wet areas, such as depressions and drainage lines).

6.1.2 HEMAMP

The Hydrological and Ecological Monitoring and Adaptive Management Program (HEMAMP) provides a protocol for monitoring and managing Alpine Bogs downslope of the proposed water storage, with the aim of maintaining the extent and condition of these Alpine Bogs. The HEMAMP specifies performance criteria that limit the indirect loss of Alpine Bogs, in a worst case scenario, to no more than 0.090 hectares (Biosis and GHD 2016).

The provision of environmental water to the bogs will be a critical feature of the adaptive plan to mitigate impacts (Appendix 3). If monitoring reveals that one or more triggers for adaptive management have been met and environmental watering is required, environmental water held within the water storage will be re-directed to the Alpine Bogs.

The RMB will provide environmental water through the following means:

- Drainage and landscaping around the periphery of the storage and access tracks will be constructed to direct water runoff along the natural flow paths towards downslope Alpine Bogs. Overflow and perimeter drains will also divert water towards the Alpine Bogs (incorporating appropriate sediment protection).
- The water storage and earth embankment will incorporate an internal drainage system to control groundwater pressure. Groundwater seepage under the footprint of the water storage will be collected to a centralised point and redistributed through a drainage outlet pipe under natural groundwater pressure to the aqueduct that runs through the downslope Alpine Bogs. The drainage outlet pipe will also be connected to the watering system to provide contributions to environmental watering of the Alpine Bogs, if required.
- A watering system will be installed during the construction phase to allow for environmental watering of priority Alpine Bogs (Bogs 4.2, 6, 8, 9, 10, 11.2 and 12). The watering system will incorporate an above ground distribution pipeline and will be designed to mimic the natural pre-construction groundwater seepage and baseflow discharge patterns.

Importantly, the RMB is committed to the water storage project meeting environmental needs, as a first priority. This means that demands for environmental water for Alpine Bogs will take priority over other demands, such as demands for snowmaking or potable water, for the lifetime of the water storage facility.

6.2 Offsetting impacts

The RMB has commissioned an Offset Strategy, which demonstrates that the general and specific offset requirements of the water storage project (as summarised in sub-section 5.6.2) can be met through an alternative offset arrangement (Biosis 2016).

The specific offset requirements for the project cannot be achieved through purchase of credits via a third party credit provider because all species requiring offsets are restricted to Crown land in the Victorian Alps bioregion. Biosis has identified a 262-hectare area of remnant native vegetation at and around the summit of Mount Stirling as having potential to meet all general and specific offset requirements, except for those relating to Fog Club-sedge *Isolepis montivaga*. Other locations within the Mount Buller and Mount Stirling Alpine Resorts or offset programs being scoped by other alpine resorts (e.g. Falls Creek and Mount Hotham) would provide alternative options to secure the shortfall in specific offsets for Fog Club-sedge.

The RMB will prepare an Offset Management Plan to secure and maintain the proposed offset area at Mount Stirling. In addition, the RMB will secure EPBC Act offsets for any indirect loss of Alpine Bogs resulting from the water storage project.

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Figures

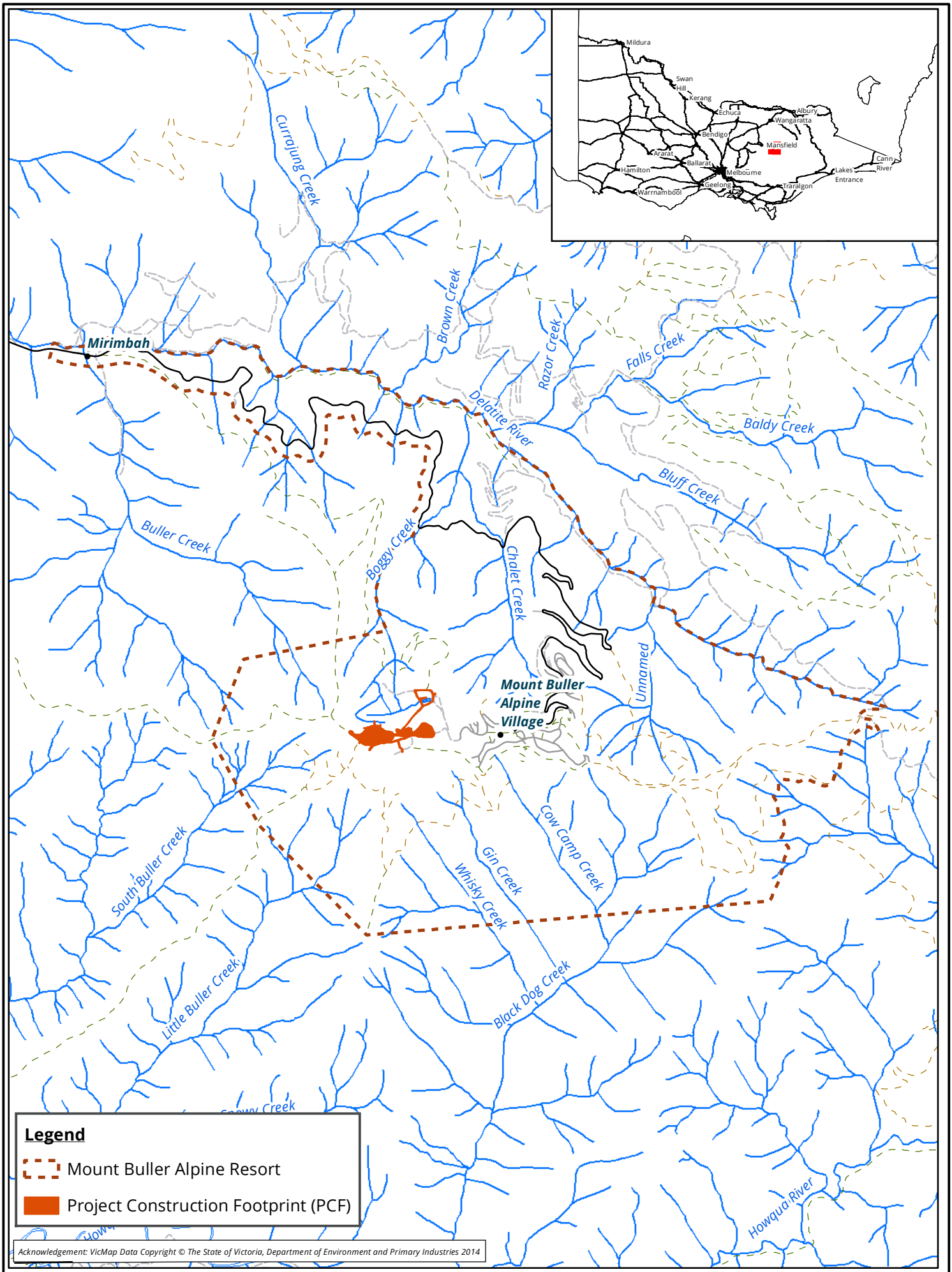

Figure 1: Location of the project construction footprint, Mount Buller, Victoria.

Matter: 22610,
Date: 04 August 2016,
Checked by: MG, Drawn by: LH, Last edited by: lharley
Location:P:\22600s\22610\Mapping\

0 500 1,000 1,500 2,000
Metres
Scale 1:50,000 @ A4, GDA 1994 MGA Zone 55

N

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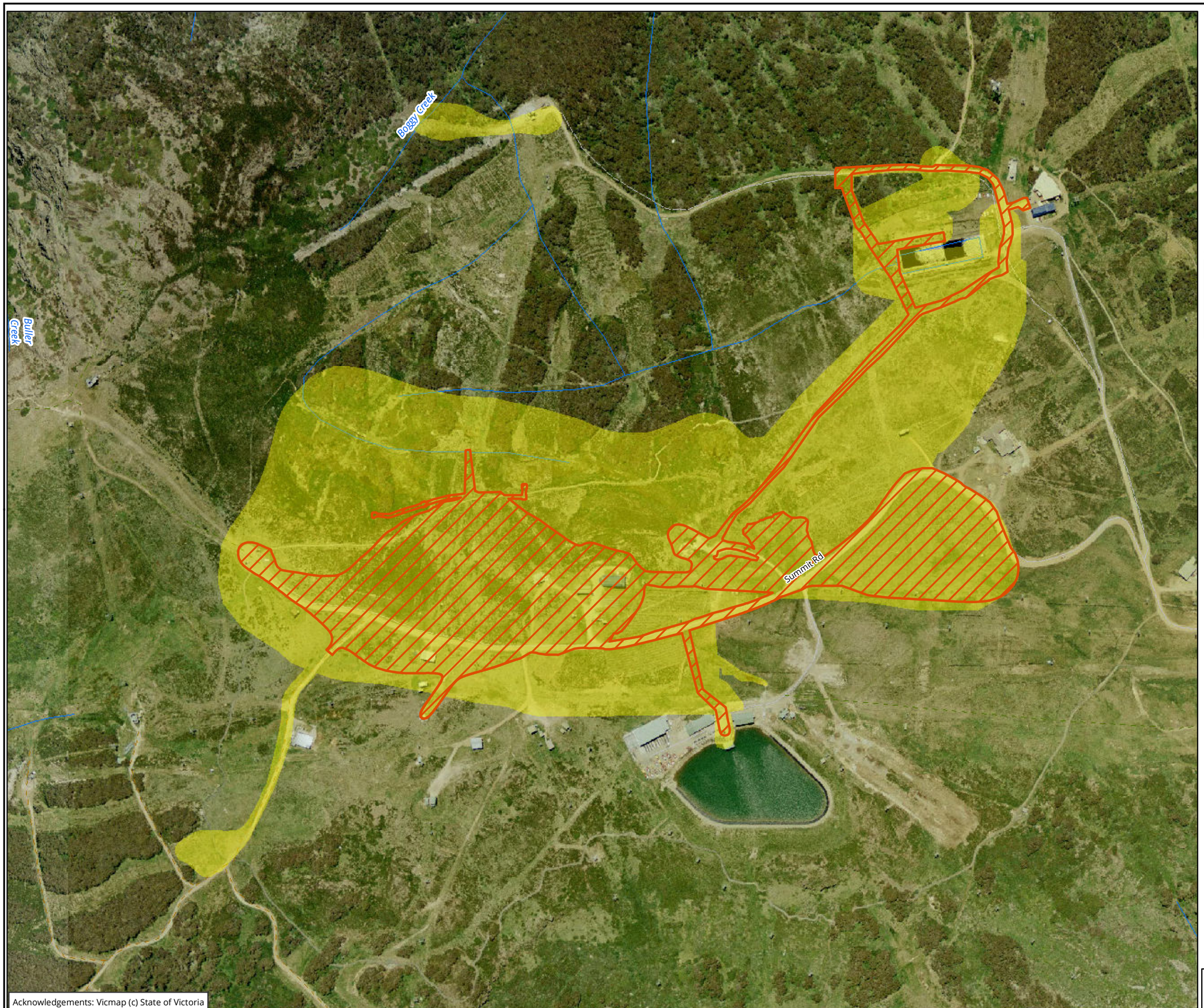

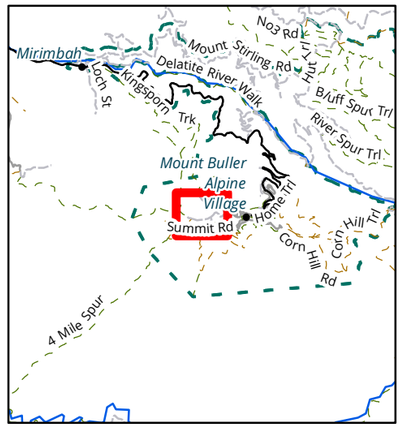

Legend

- Study Area
- Project Construction Footprint (PCF)

Figure 2: The project construction footprint and broader study area within the Mount Buller Alpine Resort, Victoria.

0 40 80 120 160 200

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

N

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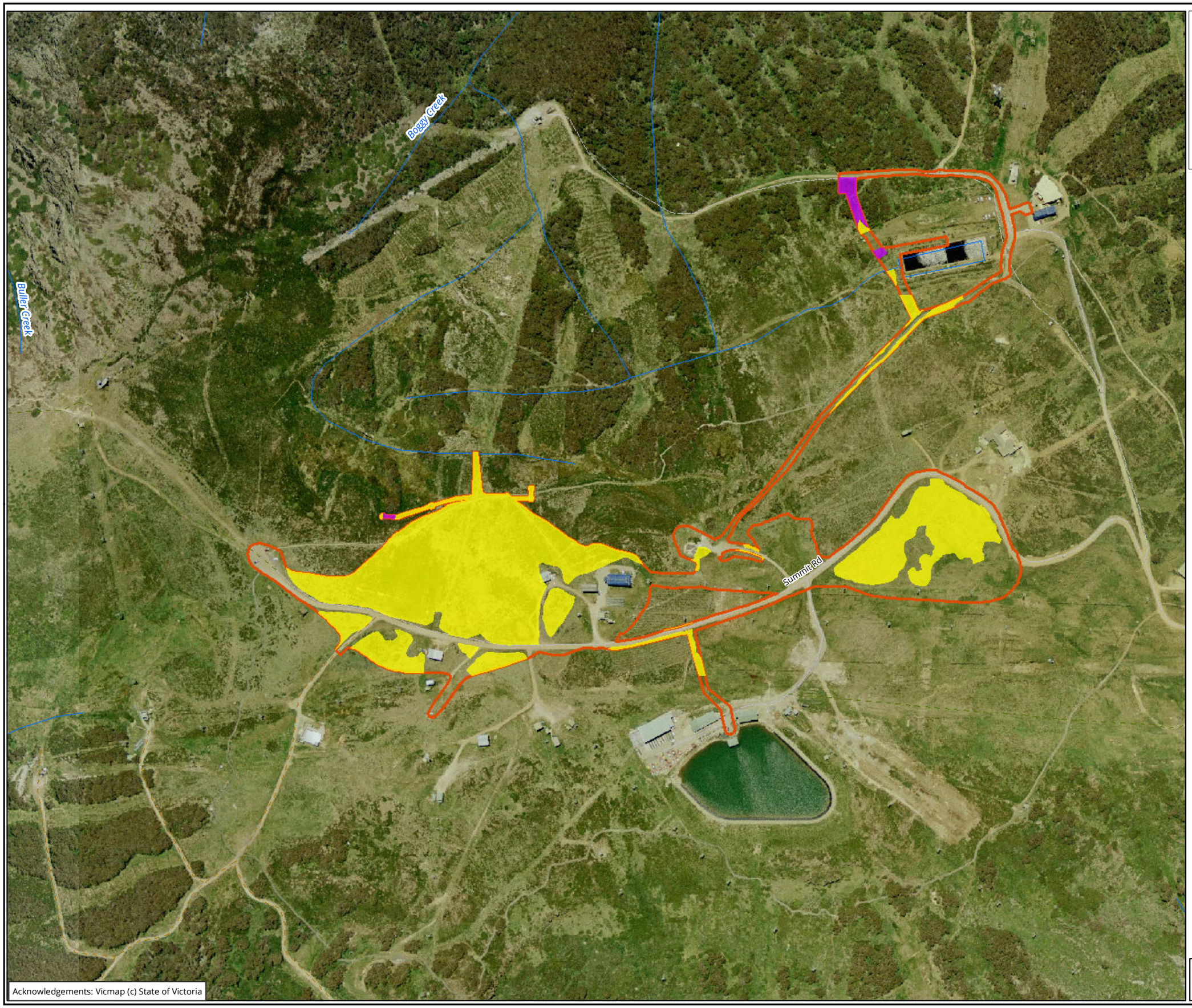
Matter: 22610,
Date: 28 July 2016,
Checked by: MG, Drawn by: LH, Last edited by: lharley
Location:P:\22600s\22610\Mapping
22610_FFA_F2_StudyArea

Acknowledgements: Vicmap (c) State of Victoria



Acknowledgements: Vicmap (c) State of Victoria

Legend

Project Construction Footprint (PCF)

Ecological Vegetation Classes (GHD)

EVC 1004 - Alpine Grassy Heathland

EVC 43 - Sub-Alpine Woodland

Figure 3: Native vegetation within the project construction footprint, Mount Buller, Victoria.

0 40 80 120 160 200

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

N

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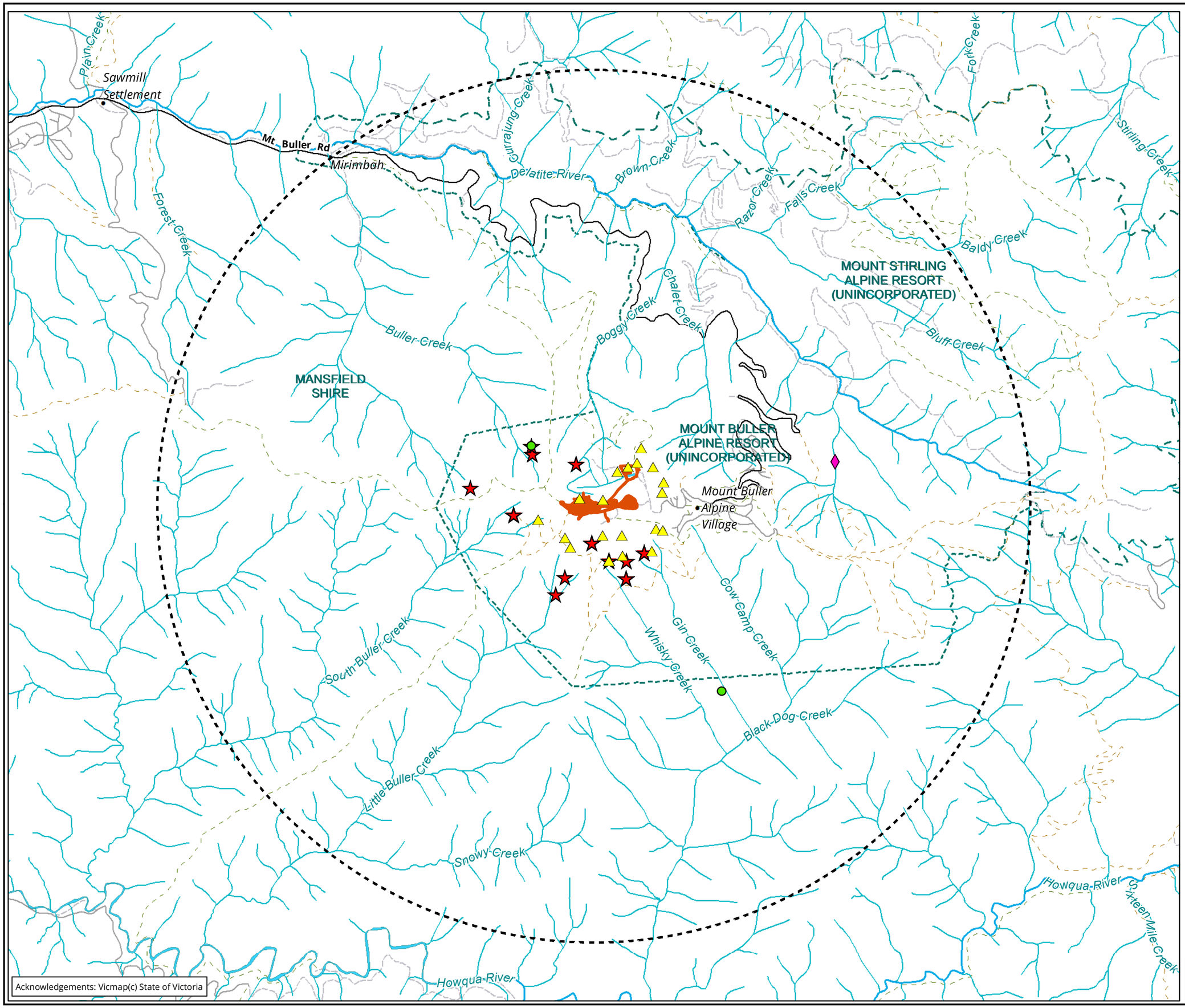
Matter: 22610,
Date: 01 August 2016,
Checked by: MG, Drawn by: LH, Last edited by: lharley
Location:P:\22600s\22610\Mapping
22610_FFA_F3_NativeVeg



Legend

- Alpine Tree Frog
- Barred Galaxias
- Mountain Pygmy-possum
- Broad-toothed Rat
- Project Construction Footprint (PCF)
- Search Area

Note: no EPBC Act listed flora species have been recorded within this search area (5 km radius).

Figure 4: Records of EPBC Act listed species within 5 km of the project construction footprint, Mount Buller, Victoria.

0 400 800 1,200 1,600 2,000

Metres

Scale: 1:40,000 @ A3

Coordinate System: GDA 1994 VICGRID94

N

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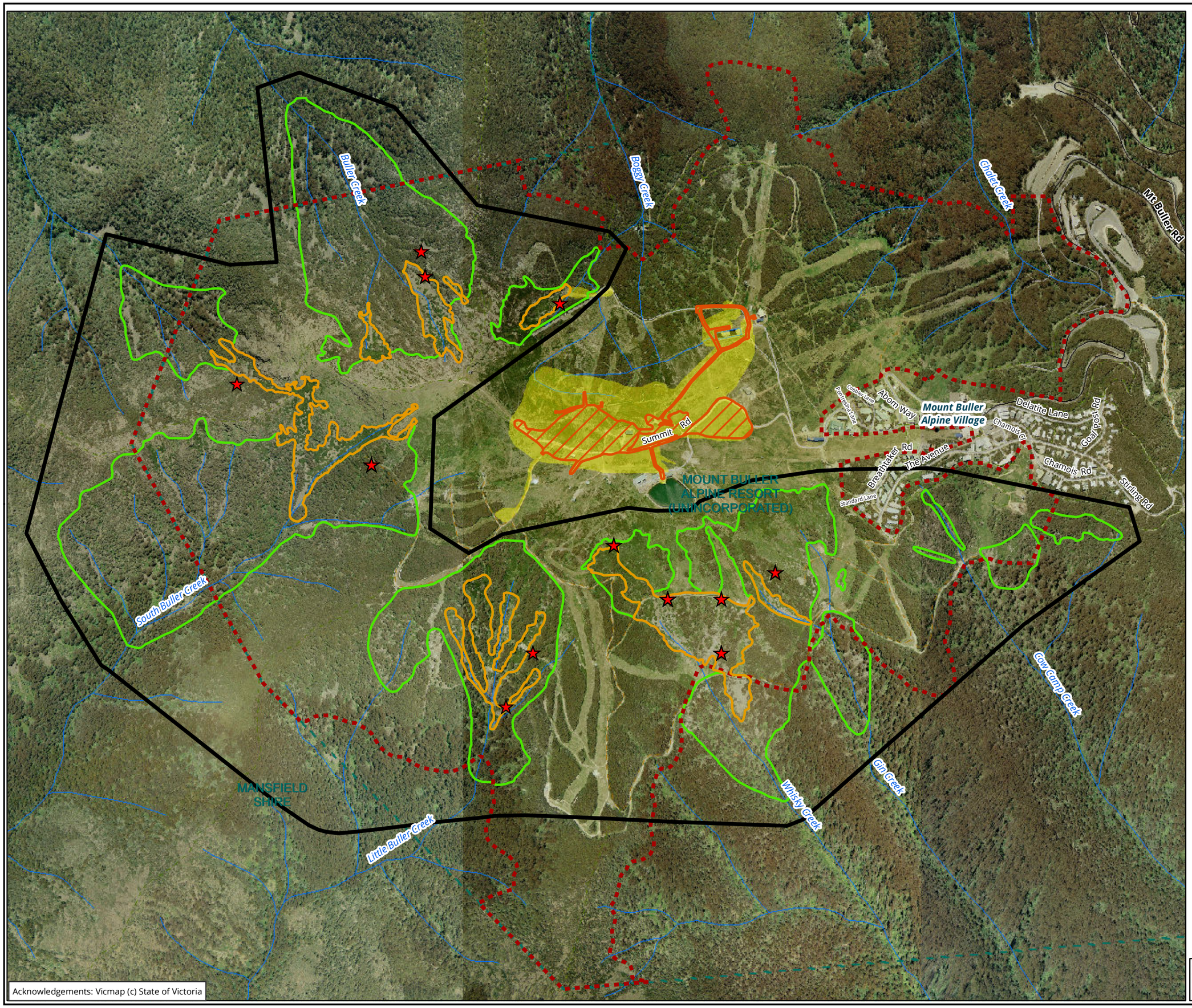
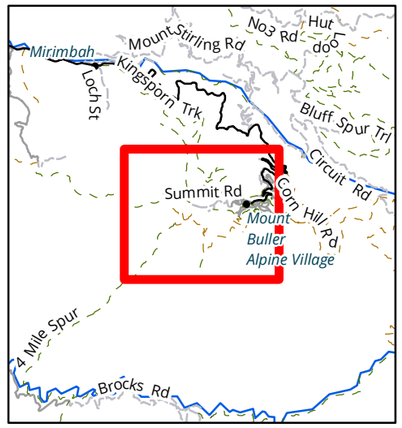
Matter: 22610
Date: 08 August 2016,
Checked by: MG, Drawn by: LH, Last edited by: lharley
Location:P:\22600s\22610\Mapping\22610_FFA_F4_EPBCFauna





Legend

- Study Area
- Project Construction Footprint (PCF)
- Environmental Significance Overlay (ESO1 Mountain Pygmy-possum)
- Mountain Pygmy-possum Management Area
- Mountain Pygmy-possum (*Burramys parvus*)

Preferred Habitat

- Type I
- Type II

Figure 5: Records, habitat and management areas for Mountain Pygmy-possum at Mount Buller.

0 130 260 390 520 650

Metres

Scale: 1:13,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

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Matter: 22610,
Date: 28 July 2016,
Checked by: MG, Drawn by: LH, Last edited by: lharley
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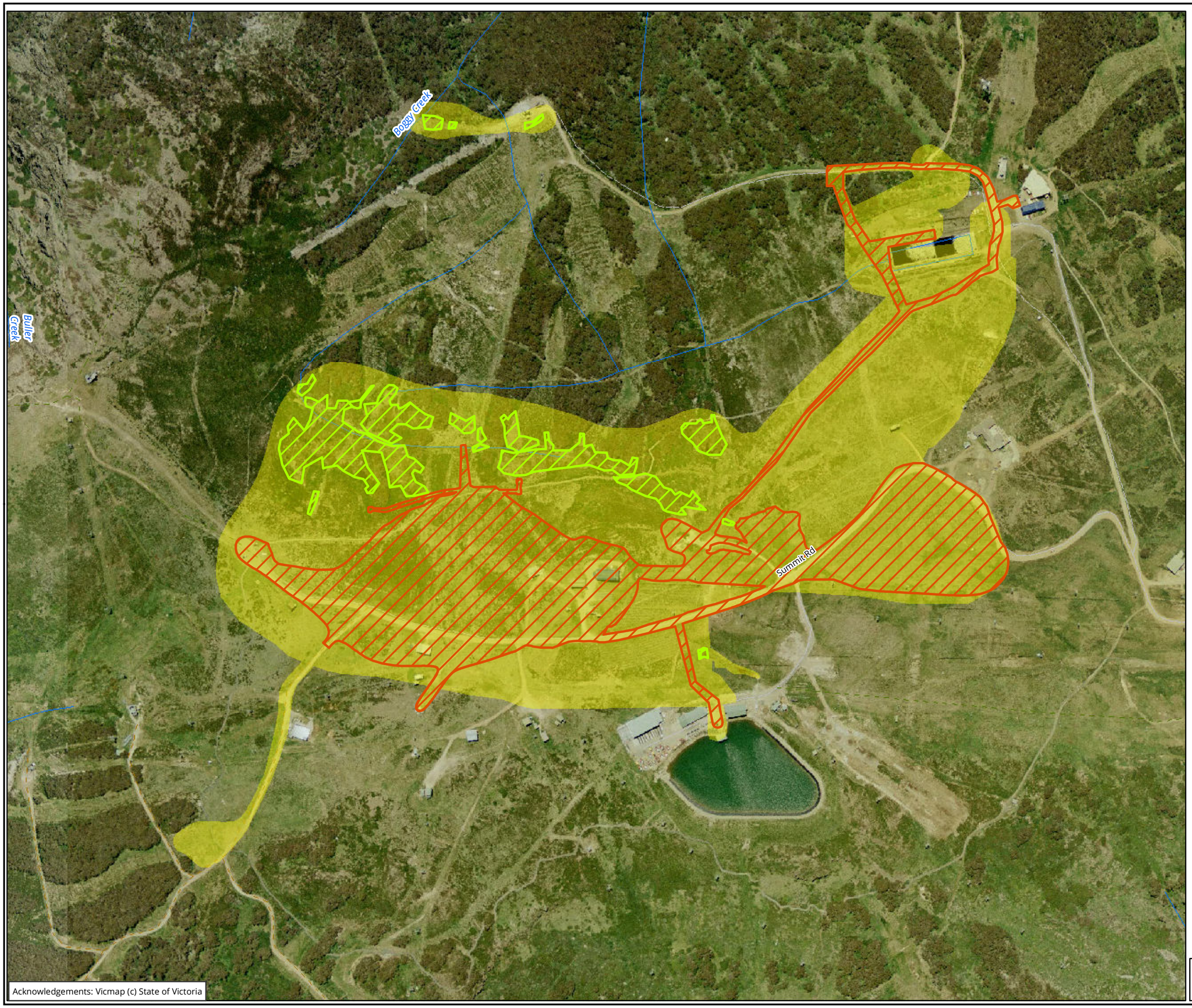
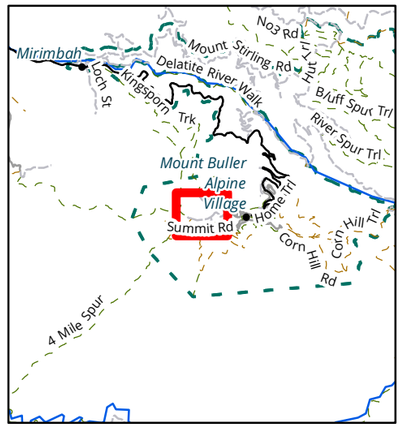
22610_FFA_F5_HabDist





Legend

- Study Area
- Project Construction Footprint (PCF)
- Alpine Bogs

Figure 6: Distribution of Alpine Bogs within the study area, Mount Buller, Victoria.

0 40 80 120 160 200

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

N

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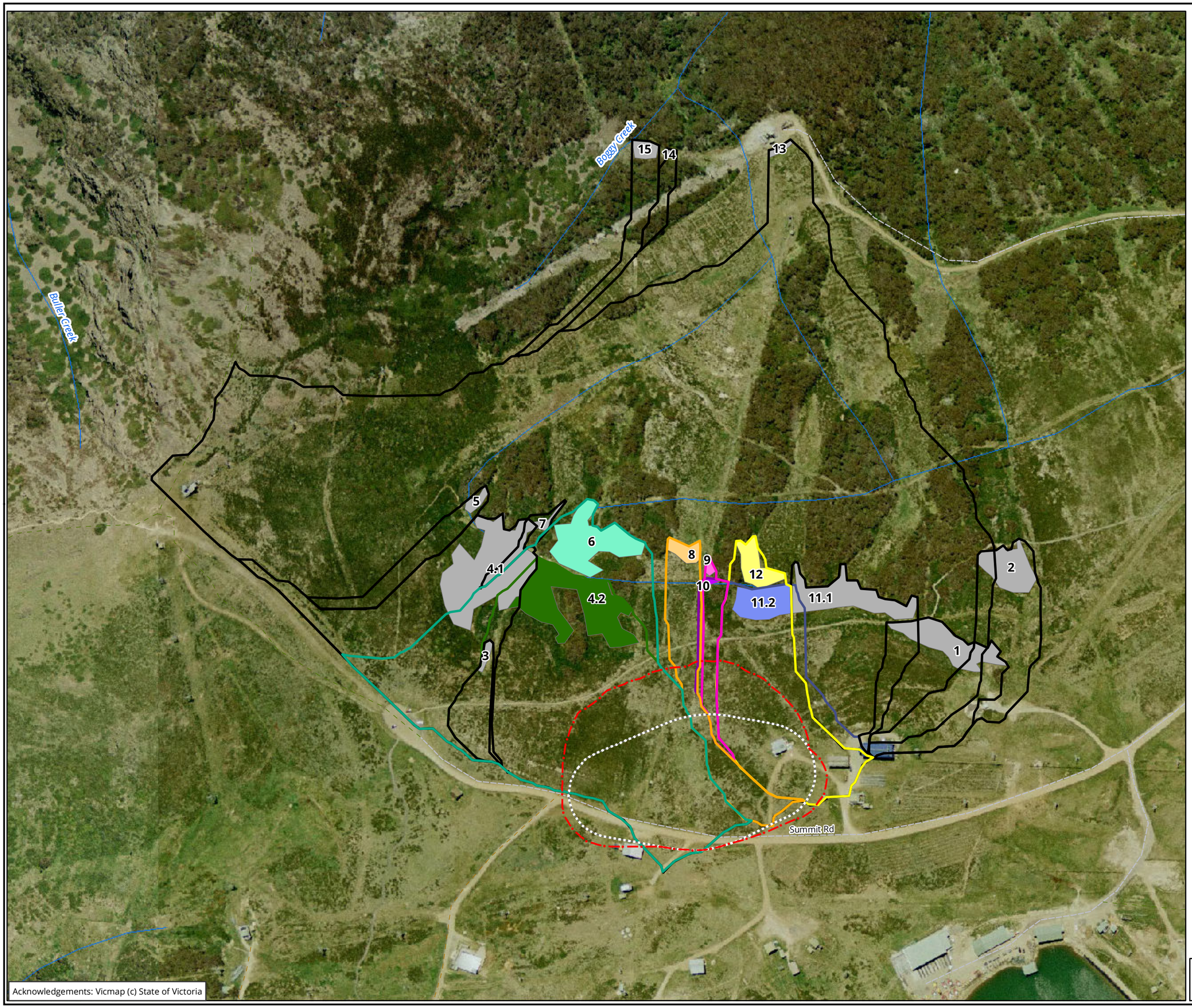
Matter: 22610,
Date: 01 August 2016,
Checked by: MG, Drawn by: LH, Last edited by: lharley
Location:P:\22600s\22610\Mapping
22610_FFA_F6_AlpineBogs



Acknowledgements: Vicmap (c) State of Victoria

Legend

Water Storage Footprint

Earth Embankment Footprint

Alpine Bogs and Alpine Bog Catchment Areas (GHD)

Indirectly Affected – Potentially Significant Impact

- 4.2
- 6
- 8
- 9
- 10
- 11.2
- 12

Indirectly Affected – Insignificant Impact

- 13

Unaffected

- 1
- 2
- 3
- 4.1
- 5
- 7
- 11.1
- 14
- 15

Figure 7: Catchment areas of Alpine Bogs in the study area, Mount Buller, Victoria.

0 30 60 90 120 150

Metres

Scale: 1:3,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

N

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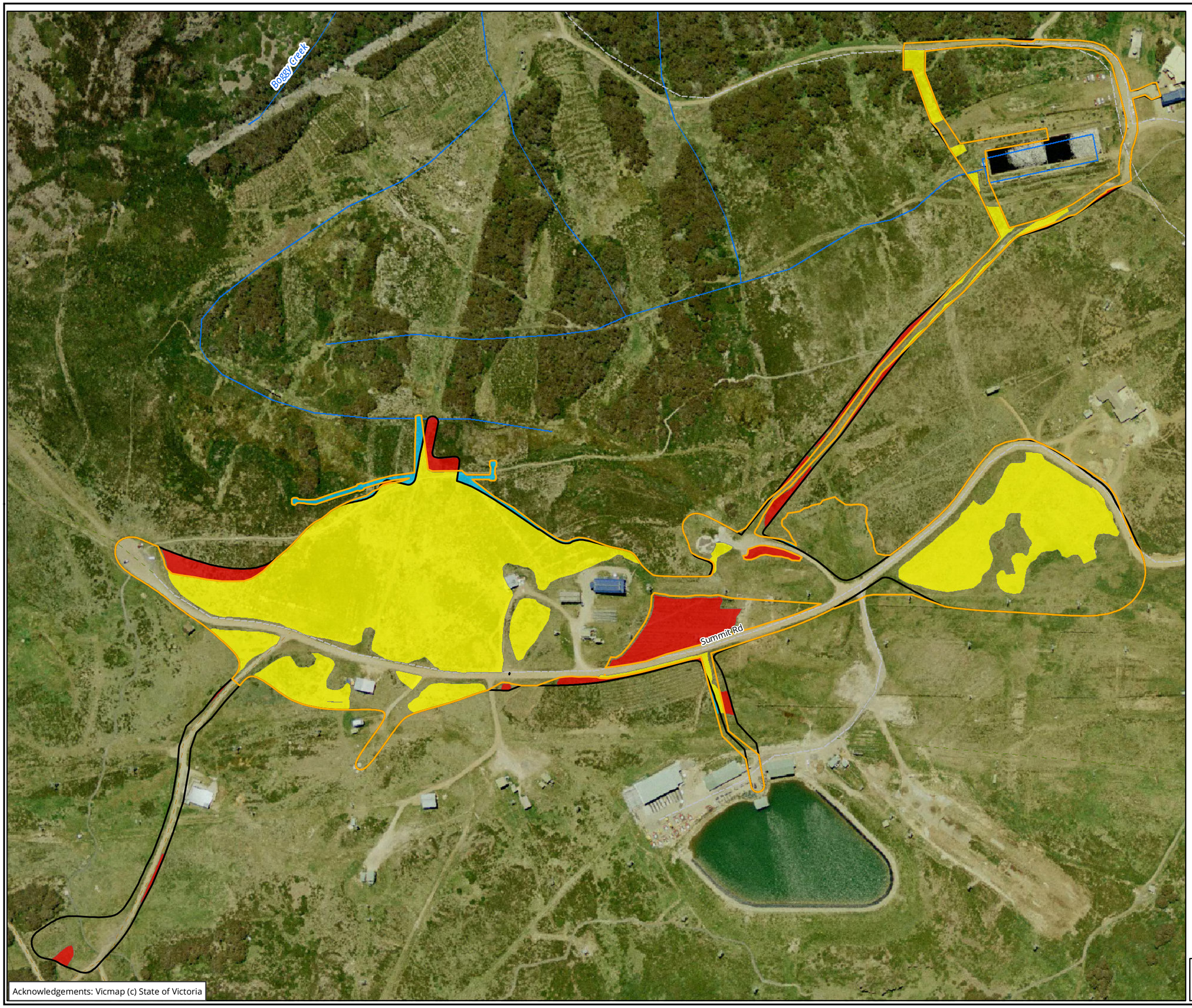
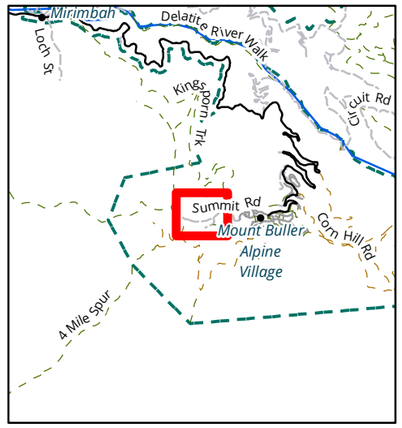
Matter: 22610,
Date: 01 August 2016,
Checked by: MG, Drawn by: LH, Last edited by: lharley
Location:P:\22600s\22610\Mapping\22610_FFA_F7_BogCatchments





Legend

- Revised Project Construction Footprint (PCF)
- Original Project Construction Footprint (PCF)

Native vegetation

- Within Original PCF, Avoided by Revised PCF
- Within Original and Revised PCFs
- New to Revised PCF

Figure 8: Comparison of proposed native vegetation removal for original and revised project construction footprints, Mount Buller, Victoria.

0 30 60 90 120 150

Metres

Scale: 1:3,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

N

Biosis Pty Ltd

Ballarat, Brisbane, Canberra, Melbourne, Newcastle, Sydney, Wangaratta & Wollongong

Matter: 22610,
Date: 08 August 2016,
Checked by: MG, Drawn by: LH, Last edited by: lharley
Location:P:\22600s\22610\Mapping
22610_FFA_F8_PropVegClearingComparison

Photos

Plate 1: Sub-alpine Woodland (EVC 43) in the northeast of the project construction footprint (looking west from north of Burnt Hut Reservoir).

Plate 2: Alpine Grassy Heathland (EVC 1004) in the southwest of the project construction footprint (looking southwest from Mount Buller Summit Road).

Plate 3: Disturbed areas including buildings, ski lift and predominantly introduced vegetation in the centre of the project construction footprint (looking west towards ABOM Express chairlift).

Plate 4: Alpine Bog Skink observed in Alpine Peaty Heathland in the south of the broader study area.

Appendices

Appendix 1 Flora

The following status codes are used in this Appendix:

Code	Meaning	Relevant legislative instrument
National significance (EPBC Act)		
CR	Critically endangered	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
EN	Endangered	
VU	Vulnerable	
PMST	Protected Matters Search Tool	
State significance (FFG Act and AL)		
L	Listed as threatened	Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act)
P	Protected species (public land only)	
x	Extinct	DELWP's Advisory List (AL) of Rare or Threatened Plants in Victoria (DEPI 2014a)
e	Endangered	
v	Vulnerable	
r	Rare	
Noxious weed status (CaLP Act)		
SP	State prohibited species	Victorian *Catchment and Land Protection Act 1994* (CaLP Act)
RP	Regionally prohibited species	
RC	Regionally controlled species	
RR	Regionally restricted species	
Habitat importance (DELWP Modelling)		
H<T	Habitat mapped within native vegetation but impact below specific offset threshold	DELWP's Habitat Important Modelling, available through the NVIM system
H>T	Habitat mapped within native vegetation and impact above specific offset threshold	
Other		
#	Native species known to occur outside its natural range	

A1.1 Flora species recorded from the study area

Table A1.1. Flora species recorded from the study area during the field assessment.

Status	Scientific Name	Common Name
Indigenous species		
v	*Cardamine lilacina s.s.*	Lilac Bitter-cress
P, r	*Aciphylla glacialis*	Snow Aciphyll
P, r	*Craspedia adenophora*	Sticky Billy-buttons
P, r	*Craspedia crocata*	Crimson Billy-buttons
P, r	*Craspedia jamesii*	Green Billy-buttons
P, r	*Craspedia* sp. 1	Mountain Forest Billy-buttons
r	*Euphrasia lasianthera*	Hairy Eyebright
r	*Gentianella muelleriana* subsp. *willisiana*	Mount Buller Snow-gentian
r	*Isolepis montivaga*	Fog Club-sedge
P, r	*Olearia phlogopappa* var. *flavescens*	Dusty Daisy-bush
r	*Pimelea ligustrina* subsp. *ciliata*	Fringed Rice-flower
r	*Ranunculus gunnianus*	Gunn's Alpine Buttercup
r	*Scleranthus singuliflorus*	Mossy Knawel
P, r	*Senecio pectinatus* var. *major*	Alpine Groundsel
P, r	*Senecio pinnatifolius* var. *alpinus*	Snowfield Groundsel
r	*Trachymene humilis* subsp. *breviscapa*	Alpine Trachymene
	Acaena echinata	Sheep's Burr
	Acaena novae-zelandiae	Bidgee-widgee
P	*Acrothamnus hookeri*	Mountain Beard-heath
	Agrostis s.l. spp.	Bent/Blown Grass
	Asperula gunnii	Mountain Woodruff
P	*Asplenium flabellifolium*	Necklace Fern
	Asterolasia trymalioides	Alpine Star-bush
P	*Baeckea gunniana*	Alpine Baeckea
P	*Baeckea utilis s.s.*	Mountain Baeckea
P	*Brachyscome rigidula*	Leafy Daisy
P	*Brachyscome* spp.	Daisy
	Bulbine glauca	Rock Lily
	Carex appressa	Tall Sedge
	Carex breviculmis	Common Grass-sedge
	Carex spp.	Sedge
P	*Celmisia pugioniformis*	Slender Snow-daisy
P	*Celmisia* spp.	Snow Daisy
	Chaerophyllum australianum	Fringed Caraway
	Chaerophyllum eriopodum	Australian Caraway
P	*Coronidium scorpioides 'rutidolepis s.s.'* variant	Pale Everlasting
P	*Cotula alpina*	Alpine Cotula
P	*Cotula australis*	Common Cotula

Status	Scientific Name	Common Name
P	*Craspedia coolaminica*	Ashen Billy-buttons
P	*Craspedia* spp.	Billy Buttons
	Empodisma minus	Spreading Rope-rush
P	*Epacris paludosa*	Swamp Heath
	Epilobium gunnianum	Gunn's Willow-herb
P	*Erigeron bellidioides*	Violet Fleabane
	Eucalyptus pauciflora	Snow Gum
	Geranium spp.	Crane's Bill
	Gonocarpus micranthus subsp. *micranthus*	Creeping Raspwort
	Goodenia hederacea subsp. *alpestris*	Ivy Goodenia
P	*Grevillea australis*	Alpine Grevillea
	Hierochloe redolens	Sweet Holy-grass
	Hovea montana	Alpine Rusty-pods
	Hydrocotyle algida	Mountain Pennywort
	Hydrocotyle hirta	Hairy Pennywort
	Isolepis aucklandica	New Zealand Club-sedge
	Juncus spp.	Rush
	Leionema phylicifolium	Alpine Leionema
	Lotus spp.	Trefoil
	Luzula modesta	Southern Woodrush
P	*Lycopodium fastigiatum*	Mountain Clubmoss
	Melicytus sp. aff. *dentatus* (snowfields variant)	Alpine Shrub-violet
	Microlaena stipoides var. *stipoides*	Weeping Grass
P	*Microseris lanceolata*	Alpine Yam-daisy
P	*Microtis* spp.	Onion Orchid
	Montia australasica	White Purslane
P	*Olearia algida*	Mountain Daisy-bush
P	*Olearia phlogopappa* var. *phlogopappa*	Dusty Daisy-bush
P	*Ozothamnus cupressoides*	Kerosene Bush
	Pimelea alpina	Alpine Rice-flower
	Plantago euryphylla	Broad Plantain
	Poa costiniana	Bog Snow-grass
	Poa fawcettiae	Horny Snow-grass
	Poa hiemata	Soft Snow-grass
	Poa hothamensis var. *hothamensis*	Ledge Grass
	Podocarpus lawrencei	Mountain Plum-pine
	Podolobium alpestre	Alpine Podolobium
P	*Polystichum proliferum*	Mother Shield-fern
P	*Prostanthera cuneata*	Alpine Mint-bush
	Ranunculus graniticola	Granite Buttercup
P	*Richea continentis*	Candle Heath
	Rubus parvifolius	Small-leaf Bramble
	Rumex spp.	Dock
	Rytidosperma nudiflorum	Alpine Wallaby-grass

Status	Scientific Name	Common Name
	Scaevola hookeri	Creeping Fan-flower
	Scleranthus biflorus s.s.	Twin-flower Knawel
P	*Senecio gunnii*	Mountain Fireweed
P	*Senecio linearifolius*	Fireweed Groundsel
P	*Sphagnum* spp.	Peat Moss
	Stellaria pungens	Prickly Starwort
P	*Stylidium armeria*	Common Triggerplant
	Tasmannia lanceolata	Mountain Pepper
	Tasmannia xerophila subsp. *xerophila*	Alpine Pepper
	Viola betonicifolia	Showy Violet
P	*Xerochrysum subundulatum*	Orange Everlasting
Introduced species		
	Acetosella vulgaris	Sheep Sorrel
	Achillea millefolium	Milfoil
	Agrostis capillaris	Brown-top Bent
	Alopecurus pratensis	Meadow Fox-tail
	Anthoxanthum odoratum	Sweet Vernal-grass
	Cerastium vulgare	Common Mouse-ear Chickweed
RR	*Cirsium vulgare*	Spear Thistle
	Dactylis glomerata	Cocksfoot
	Festuca rubra s.l.	Red Fescue
	Holcus lanatus	Yorkshire Fog
RC	*Hypericum perforatum* subsp. *veronense*	St John's Wort
	Hypochaeris radicata	Flatweed
	Juncus articulatus subsp. *articulatus*	Jointed Rush
	Juncus effusus subsp. *effusus*	Soft Rush
	Mentha spicata	Spearmint
	Mimulus guttatus	Monkey Musk
	Phleum pratense	Timothy Grass
RC	*Rubus fruticosus* spp. agg.	Blackberry
	Rumex obtusifolius subsp. *obtusifolius*	Broad-leaf Dock
	Taraxacum officinale spp. agg.	Garden Dandelion
	Trifolium repens var. *repens*	White Clover
	Trifolium spp.	Clover
	Verbascum virgatum	Twiggy Mullein
	Viola arvensis	Field Pansy

A1.2 Significant flora species

The following table includes the significant flora species that have potential to occur within the PCF. The list of species is sourced from the Victorian Flora Information System (Viridans 2014b), DELWP's Victorian Biodiversity Atlas (VBA) and DoE's Protected Matters Search Tool (PMST), all of which were accessed on 29 July 2016.

Table A1.2. Significant flora species recorded or predicted to occur within 5 km of the PCF.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in PCF
		EPBC	FFG	AL				
National significance								
Glycine latrobeana	Clover Glycine	VU	L	v	-	PMST	Grasslands and grassy woodlands, particularly those dominated by Kangaroo Grass (Walsh and Entwisle 1996).	**Unlikely** – Lack of suitable habitat within PCF. Widespread but of sporadic occurrence and rarely encountered.
Prasophyllum morganii	Mignonette Leek-orchid	VU	L	x	-	PMST	Known from only one location near Cobungra in Snow Gum open forest at about 1000 m ASL (Backhouse and Jeanes 2006). Presumed to be extinct.	**Unlikely –** Nearest known population, now presumed extinct, was approximately 85 km from PCF. While potentially suitable habitats exists within PCF, it is beyond the known distribution of the species.
Pterostylis oreophila	Blue-tongue Greenhood	CR		e	-	PMST	Damp, shady habitat along watercourses (Backhouse and Jeanes 2006).	**Unlikely –** Nearest known population is near Omeo, approximately 100 km east of PCF. While potentially suitable habitats exists within PCF, it is beyond the known distribution of the species.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in PCF
		EPBC	FFG	AL				
State significance								
Barbarea grayi	Native Wintercress			v	1980		Damp areas near high altitude streams (Walsh and Entwisle 1996).	**Unlikely** – Lack of suitable habitat.
Botrychium australe	Austral Moonwort		L	v	1770		Lowland forest and subalpine grasslands (Walsh and Entwisle 1994).	**Unlikely** – Lack of suitable habitat and recent records.
Cardamine lilacina s.s.	Lilac Bitter-cress			v	2015		Subalpine woodland and various alpine habitats (Walsh and Entwisle 1996).	**Present** – Recorded within the PCF in during the field assessment. Recent records from local area.
Schizeilema fragoseum	Alpine Pennywort			v	2007		Moist alpine herbfields, rock crevices and near streams (Walsh and Entwisle 1999).	**Likely** – Potentially suitable habitat in some areas of Alpine Grassy Heathland.

Appendix 2 Fauna

The following status codes are used in this Appendix:

Code	Meaning	Relevant legislative instrument
National significance (EPBC Act)		
CR	Critically endangered	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
EN	Endangered	
VU	Vulnerable	
PMST	Protected Matters Search Tool	
State significance (FFG Act and AL)		
L	Listed as threatened	Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act)
cr	Critically endangered	DELWP's Advisory List (AL) of Threatened Fauna in Victoria (DSE 2009; DSE 2013)
e	Endangered	
v	Vulnerable	
Noxious weed status (CaLP Act)		
PS	Listed pest species	Victorian *Catchment and Land Protection Act 1994* (CaLP Act)
Habitat importance (DELWP Modelling)		
H<T	Habitat mapped within native vegetation but impact below specific offset threshold	DELWP's Habitat Important Modelling, available through the NVIM system
H>T	Habitat mapped within native vegetation and impact above specific offset threshold	
Other		
*	Introduced species	

A2.1 Fauna species recorded from the study area

Table A2.1. Vertebrate fauna recorded from the study area during the field assessment.

Status	Scientific name	Common name
Mammals		
VU, L, en	*Mastacomys fuscus mordicus*	Broad-toothed Rat
PS, *	*Oryctolagus cuniculus*	European Rabbit
	Rattus fuscipes	Bush Rat
	Vombatus ursinus	Common Wombat
PS, *	*Vulpes vulpes*	Red Fox
Birds		
	Acanthiza pusilla	Brown Thornbill
	Anthus novaeseelandiae	Australasian Pipit
	Cacomantis flabelliformis	Fan-tailed Cuckoo
	Cacomantis variolosus	Brush Cuckoo
	Callocephalon fimbriatum	Gang-gang Cockatoo
	Corvus mellori	Little Raven
	Coturnix pectoralis	Stubble Quail
	Cracticus tibicen	Australian Magpie
	Dacelo novaeguineae	Laughing Kookaburra
	Falco cenchroides	Nankeen Kestrel
	Lichenostomus chrysops	Yellow-faced Honeyeater
	Menura novaehollandiae	Superb Lyrebird
	Pardalotus striatus	Striated Pardalote
	Petroica phoenicea	Flame Robin
	Phylidonyris pyrrhopterus	Crescent Honeyeater
	Platycercus elegans	Crimson Rosella
	Rhipidura albiscapa	Grey Fantail
	Sericornis frontalis	White-browed Scrubwren
	Strepera graculina	Pied Currawong
	Strepera versicolor	Grey Currawong
	Zosterops lateralis	Silvereye
Reptiles		
	Austrelaps ramsayi	Highland Copperhead
	Eulamprus tympanum tympanum	Southern Water Skink
L, en	*Pseudemoia cryodroma*	Alpine Bog Skink
Amphibians		
	Crinia signifera	Common Froglet

A2.2 Significant fauna species

The following table includes the significant fauna species that have potential to occur within the PCF. The list of species is sourced from the Victorian Fauna Database (Viridans 2014a), DELWP's Victorian Biodiversity Atlas (VBA) and DoE's Protected Matters Search Tool (PMST), all of which were accessed on 29 July 2016.

Table A2.2. Significant fauna species recorded or predicted to occur within 5 km of the PCF.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in PCF
		EPBC	FFG	AL				
National significance								
Burramys parvus	Mountain Pygmy-possum	EN	L	Cr H<T	2007	PMST	Alpine rock screes and boulder fields supporting heathy vegetation.	**Unlikely –** Well known to occur on Mount Buller but no records from within PCF. Generally known from alpine rock scree and Mountain Plum-pine habitat. Unlikely to disperse across low heathy vegetation as occurs in PCF.
Dasyurus maculatus maculatus (SE mainland population)	Spot-tailed Quoll	EN	L	en	-	PMST	Rainforest and wet and dry sclerophyll forests and woodlands.	**Unlikely –** No suitable habitat within the PCF.
Lathamus discolor	Swift Parrot	CR	L	en	-	PMST	A range of forests and woodlands, especially those supporting nectar-producing tree species.	**Highly unlikely** – No historical records within local area and no suitable habitat within PCF.
Liopholis guthega	Guthega Skink	EN	L	cr	-	PMST	Alpine woodlands, grasslands and heathlands with sub-surface boulders.	**Highly unlikely** – Suitable habitat within PCF, but species not known to occur on Mount Buller. Nearest known population is at Falls Creek, approximately 77 km northeast.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in PCF
		EPBC	FFG	AL				
Litoria raniformis	Growling Grass Frog	VU	L	en	-	PMST	Still or slow-flowing waterbodies and surrounding terrestrial vegetation.	**Highly unlikely** – No suitable habitat within PCF and no historical records in local area. Species generally occurs at lower elevations.
Litoria spenceri	Spotted Tree Frog	EN	L	cr	-	PMST	Rocky areas along streams within forest and woodland.	**Unlikely –** Species tends to occur in montane forest streams and typically not above the treeline.
Litoria verreauxii alpina	Alpine Tree Frog	VU	L	Cr H<T	1965	PMST	Alpine and sub-alipine woodland, heath and grassland; breeds in a variety of natural and artificial waterbodies including dams and reservoirs.	**Unlikely –** Suitable habitat present within PCF but no contemporary records from Mount Buller. Species considered to be locally extinct (Clemann 2008).
Mastacomys fuscus mordicus	Broad-toothed Rat	VU	L	En H<T	2003	PMST	Dense, wet heathlands and grasslands of high rainfall areas from the alps to the coast. Most contemporary records from alpine and sub-alpine areas.	**Present –** Well known to occur on Mount Buller. Documented within study area by Biosis Research (2009). Scats, tunnels and runs found within the PCF during GHD's field assessment are likely to have been made in part by this species.
Petauroides volans	Greater Glider	VU		vu	1988	PMST	Wet and damp sclerophyll forest with large hollow-bearing trees.	**Highly unlikely –** No suitable habitat within PCF.
Potorous longipes	Long-footed Potoroo	EN	L	vu	-	PMST	Temperate rainforest, riparian forest and wet and dry sclerophyll forest.	**Highly unlikely –** No historical records within local area and no suitable habitat within PCF.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in PCF
		EPBC	FFG	AL				
Pseudomys fumeus	Smoky Mouse	EN	L	cr	-	PMST	Coastal heath and heathy woodland, wet forest, sub-alpine heath and dry sclerophyll forest.	**Unlikely –** Marginal habitat within the PCF. Unlikely to occur above treeline. No historical records within local area despite extensive small mammal survey effort.
Pteropus poliocephalus	Grey-headed Flying-fox	VU	L	vu	-	PMST	Rainforest, wet and dry sclerophyll forest, woodland and urban areas.	**Highly unlikely –** No historical records within local area and no suitable habitat within PCF.
Rostratula australis	Australian Painted Snipe	EN	L	cr	-	PMST	Shallows of well-vegetated freshwater wetlands.	**Highly unlikely –** No historical records within local area and no suitable habitat within PCF.
State significance								
Falco subniger	Black Falcon			vu	1996		Primarily occurs in arid and semi-arid zones in the north, northwest and west of Victoria. Occurs in woodlands, open country and around terrestrial wetlands areas, including rivers and creeks.	**Unlikely –** Few historical records within local area and generally unsuitable habitat. Species tends to occur at lower elevations.
Hirundapus caudacutus	White-throated Needletail			vu	2008	PMST	An almost exclusively aerial species within Australia, occurring over most types of habitat, particularly wooded areas.	**Likely –** Likely to be present only as aerial transient. Species unlikely to show association with terrestrial habitats.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in PCF
		EPBC	FFG	AL				
Ninox strenua	Powerful Owl		L	vu	2003		Eucalypt forests and woodlands. Well-treed urban areas.	**Unlikely –** Few historical records within local area and generally unsuitable habitat. Species tends to occur at lower elevations and in forests with taller trees and more abundant prey.
Pseudemoia cryodroma	Alpine Bog Skink		L	en H>T	2009		Alpine and sub-apline grassland, heathland and woodland.	**Present –** Species detected during field assessment, suitable habitat present within the PCF and numerous recent historical records.
Pseudemoia pagenstecheri	Tussock Skink			vu	2008		On the ground in a range of grasslands or sparse grassy woodlands from alps to coast.	**Likely –** Potentially suitable habitat within PCF. Numerous recent historical records within local area.
Pseudophryne bibronii	Brown Toadlet		L	en	1960		A wide variety of woodland, forest and grassland habitats.	**Unlikely –** Few historical records within local area. Species tends to occur at lower elevations.

A2.3 Migratory species (EPBC Act listed)

Table A2.3. Migratory fauna species recorded or predicted to occur within 5 km of the PCF.

Scientific name	Common name	Most recent record
Apus pacificus	Fork-tailed Swift	PMST
Gallinago hardwickii	Latham's Snipe	PMST
Hirundapus caudacutus	White-throated Needletail	2008
Monarcha melanopsis	Black-faced Monarch	PMST
Motacilla flava	Yellow Wagtail	PMST
Myiagra cyanoleuca	Satin Flycatcher	2008
Rhipidura rufifrons	Rufous Fantail	PMST

Appendix 3 Environmental mitigation, monitoring and management requirements

The following table outlines the mitigation measures, monitoring programs and management plans that will be required to address environmental issues associated with construction and operation of the proposed water storage and ancillary infrastructure. The focus is on commitments and measures to avoid, mitigate or manage direct and indirect impacts on native vegetation, threatened ecological communities (particularly Alpine Bogs) and threatened species. The following table has been based upon the project-specific Site Environmental Management Plan (SEMP), Hydrological and Ecological Monitoring and Adaptive Management Program (HEMAMP; Biosis and GHD 2016) and Offset Strategy (Biosis 2016). In addition, the RMB will commission a Construction Environment Management Plan (CEMP), Project Revegetation Plan and Offset Management Plan. Together, these documents will provide more detailed information regarding environmental mitigation, monitoring and management.

Environmental Issue and Management Objectives	Measures to Address the Environmental Issue Mitigation, Monitoring and Management Requirements and Responsibilities
Pre-Construction Phase	
1. Monitoring and management plans Inform the detailed design of the project including performance criteria associated with potential hydrology and groundwater impacts. Inform the adaptive management processes to be implemented as part of the project.	**1.1. Climate (meteorological) monitoring** The HEMAMP includes a climate monitoring component, which will record daily temperature, daily rainfall and daily snow depth data from existing gauges near the impact sites and control sites on Mount Buller.
	1.2. Surface water monitoring The HEMAMP includes a surface water monitoring component, which will monitor water quality and flow within the Boggy Creek catchment. The surface water monitoring component will require water quality and flow within the Boggy Creek catchment to be monitored for at least 12 months prior to the commencement of construction to establish baseline flow and quality targets, which will inform surface water triggers for adaptive management, such as watering of Alpine Bogs.

Environmental Issue and Management Objectives	Measures to Address the Environmental Issue Mitigation, Monitoring and Management Requirements and Responsibilities
Monitor impacts of the project on the groundwater and surface water of the PCF and adjacent areas. Monitor impacts of the project on the existing terrestrial and aquatic ecology of the site and adjacent areas. Establish offsets to compensate for biodiversity losses associated with the project. Prepare biological material for post-construction revegetation.	**1.3. Groundwater monitoring** The HEMAMP includes a groundwater monitoring component, which will monitor groundwater quality and levels at each of the bogs (impact sites and control sites) subject to the ecological monitoring component (see below). Groundwater monitoring will involve automated and manual monitoring at 17 groundwater bores. Groundwater quality and levels will be monitored for 12 months prior to the commencement of construction to establish baseline water level and quality targets, which will inform groundwater triggers for adaptive management, such as watering of Alpine Bogs. **1.4. Ecological monitoring** The HEMAMP includes an ecological monitoring component. The ecological monitoring will require ongoing monitoring of the extent, structure and composition of the local Alpine Bogs for the lifetime of the water storage and ancillary infrastructure. Encroachment of weeds and other atypical species will also be monitored. Monitoring will commence 12 months prior to construction and suitable control sites (i.e. Alpine Bogs not affected by this project) will be used for comparison. Results from the initial 12 months of the monitoring will inform ecological performance criteria, which will be used to trigger adaptive management actions, such as watering of Alpine Bogs. The HEMAMP is designed to detect negative changes in bog condition (e.g. drying of bogs) as early as possible, so that the RMB can undertake appropriate corrective management actions (e.g. watering) immediately to remedy any deterioration in Alpine Bog condition linked to construction of the water storage (as opposed to other factors). The RMB will organise collection of data for individual Alpine Bogs (Bogs 4.2, 6, 8, 9, 10, 11.2, 12, 13 and the control bogs) but performance criteria will be expressed in terms of all impact sites collectively, relative to the control sites. Performance criteria for individual impact sites would be unrealistic, especially as smaller bogs at Mount Buller are marginal and already show signs of drying (Tolsma 2014). The HEMAMP specifies the following performance criteria for management of those Alpine Bogs (Bogs 4.2, 6, 8, 9, 10, 11.2, 12) that would otherwise be indirectly lost by construction of the water storage: • The '**extent**' criterion – there will be no more than a 10% reduction in the total combined area of the impact sites, determined by on-ground or remote (aerial) monitoring and taking into account natural variation based on extent observations averaged across control sites.

Environmental Issue and Management Objectives	Measures to Address the Environmental Issue Mitigation, Monitoring and Management Requirements and Responsibilities

	• The '**composition**' criterion – there will be no more than a 10% reduction in the total 'bog-dependent' native flora species richness of the impact sites, taking into account natural variation based on species richness observations averaged across control sites.
	• The **'encroachment'** criteria:
	  – Atypical species – there will be no more than a 10% increase in the cover of 'non-bog-dependent' species within the impact sites, taking into account natural variation based on observations averaged across control sites.
	  – Weeds – the total projected foliage cover of weeds (naturalised exotic flora species) within the impact sites will not exceed 5%.
	• The '**structure**' criterion – there will be no more than a 10% reduction in the average cover of sphagnum moss (*Sphagnum* spp.) within the impact sites, taking into account natural variation based on sphagnum moss cover averaged across control sites.
	
	Annual monitoring of the Mountain Pygmy-possum population at Mount Buller will continue in accordance with the Mountain Pygmy-possum recovery plan (RMB 2013). No pre-construction surveys for threatened flora or fauna are proposed, beyond those that have already been conducted.

	1.5. Offsets The RMB has commissioned an Offset Strategy, outlining how the project will achieve State prescribed offset requirements. The RMB will: • Establish State prescribed offsets and EPBC Act offsets for Alpine Bogs. • Receive DELWP's and DoE's endorsement of an Offset Management Plan. • Commence ecological management of the offset areas in accordance with the endorsed Offset Management Plan.
	1.6. Preparation for rehabilitation The RMB will organise for the collection of plant material for use in post-construction revegetation works, as per the Project Revegetation Plan. The RMB will order tube stock as soon as possible so that seed can be collected and plants grown during the pre-construction and construction phases. The Project Revegetation Plan will follow principles and methods outlined in the Guide to Ecological Rehabilitation in the Australian Alps

Environmental Issue and Management Objectives	Measures to Address the Environmental Issue Mitigation, Monitoring and Management Requirements and Responsibilities
	(Good 2006) and Rehabilitation Guidelines for the Resort Areas of Kosciuszko National Park (DECC 2007).
2. Design Minimise risks to native vegetation, including Alpine Bogs.	**2.1. Minimisation of footprint** Detailed design has minimised impacts to native vegetation by entirely avoiding all Alpine Bogs that were within the original PCF and by reducing the extent of proposed native vegetation removal by more than 10%. Material stockpiles, vehicle access, machinery storage etc. will use existing disturbed areas of non-native vegetation in preference to existing areas of native vegetation.
	2.2. Surface water, groundwater drainage and watering system design The RMB will be responsible for ensuring that: • Drainage around the periphery of the water storage is designed to direct run-off along the natural flow paths towards downslope Alpine Bogs, with priority given to the Alpine Bogs considered most likely to experience reductions in surface or groundwater flows. • Pipeline alignments and construction depths are reviewed to avoid or minimise the potential for interception or redirection of groundwater. • The storage embankment is designed to incorporate an internal drainage system to control groundwater pressure. Groundwater seepage under the footprint of the water storage will be collected and redistributed to priority bog areas downslope through a drainage outlet pipe with a network of branches and discharge points that distribute the captured water to the bogs. • A sub-surface watering system is designed to enable 'environmental water' to be delivered from the water storage to the Alpine Bogs as required. Specific location, depth and discharge capacity will be informed by the pre-construction monitoring programs. The final design of the watering system will preference the bogs most likely to experience reductions in surface or groundwater flows.
3. Site establishment Establish site in accordance with applicable legislation, guidelines and conditions of	**3.1. Construction footprint** Prior to the commencement of works, the extent of the construction zone, including pedestrian, vehicle and machinery access will be clearly defined both on a plan included within the CEMP and physically delineated (e.g. through temporary fencing, high visibility bunting or similar) at the site.

Environmental Issue and Management Objectives	Measures to Address the Environmental Issue Mitigation, Monitoring and Management Requirements and Responsibilities
permits/approvals. Protect ecological values.	**3.2. Exclusion zones (no-go zones)** The RMB will ensure that: • No-go zones (e.g. waterways and Alpine Bogs) are clearly marked with visible signage and temporary exclusion fences. • Construction activities, including vehicle parking, do not occur outside the PCF. • Construction is monitored to check that construction impacts do not extend beyond the PCF.
	3.3. Works near waterways The RMB, through the principal construction contractor (PCC), will ensure that construction activities do not encroach on the headwaters of Boggy Creek, which will be marked as exclusion zones (see Measures 1.2 and 3.2). Temporary fencing will protect vegetation surrounding aquatic habitats, including groundcover and understorey surrounding aquatic habitats. The RMB will retain a vegetated buffer zone of at least 10 metres around aquatic ecosystems.
Construction Phase	
4. General site management Manage all construction activities in accordance with applicable legislation, guidelines, protocols and conditions of permits/approvals.	**4.1. General site management requirements** All construction personnel will undertake construction work in accordance with the CEMP, which will follow the EPA's Environmental Guidelines for Major Construction Sites (EPA 1996) except where expressly stated. All construction works will comply with legislation and conditions of permits and approvals. All personnel will undertake site induction prior to commencing work onsite. All works and project activities will be located within the defined PCF.
	4.2. Traffic management The CEMP shall include traffic management arrangements for construction traffic, to the satisfaction of local councils and VicRoads where required.

Environmental Issue and Management Objectives	Measures to Address the Environmental Issue Mitigation, Monitoring and Management Requirements and Responsibilities
5. Water quality – surface and groundwater Prevent the generation and discharge of turbid and contaminated water from construction activities into the local stormwater system and into the Boggy Creek catchment.	**5.1. Stormwater, drainage, sedimentation and erosion management plan** The CEMP will include measures to control stormwater runoff, site drainage, sedimentation and erosion in accordance with EPA's Environmental Guidelines for Major Construction Sites (EPA 1996) and EPA's Construction Techniques for Sediment Pollution Control (EPA 1991). The PCC will prepare a contingency plan for high rainfall events. Grading, excavation and construction must not proceed during periods of heavy rainfall. Appropriate control structures (such as sediment control fences) will prevent surface water run-off contaminated with suspended sediments and other contaminants from entering the headwaters of the Boggy Creek catchment and downslope Alpine Bogs. If run-off cannot be prevented (e.g. in the case of a high rainfall event), the PCC will be responsible for diverting water away from Boggy Creek catchment for storage and subsequent treatment.
	5.2. Wastewater discharge No wastewaters will be discharged to waterways or the stormwater system, unless approved by EPA.
6. Groundwater Avoid and minimise impacts on groundwater level and disruption of flow paths.	**6.1. Excavation for pipelines and underground linear infrastructure** The PCC will: • Minimise excavation depth. • Install trench breakers/blockers to prevent development of preferential groundwater flow pathways.
	6.2. Dewatering If groundwater is pumped for construction water supplies or for construction dewatering, the PCC will maintain records of bore use (including metering of extraction/dewatering bores).
7. Disturbance to terrestrial flora and fauna and spread of	**7.1. Weed and pathogen management** The HEMAMP includes requirements for management of weeds. These requirements are consistent with those protocols currently

Environmental Issue and Management Objectives	Measures to Address the Environmental Issue Mitigation, Monitoring and Management Requirements and Responsibilities
noxious weeds species Minimise impacts on terrestrial biodiversity values.	applied under the existing integrated pest animal and plant program at Mount Buller. In particular, the RMB will be responsible for controlling any high threat environmental and/or noxious weeds, such as Orange Hawkweed *Hieracium aurantiacum* subsp. *carpathicola*. The PCC will be responsible for ensuring that personnel thoroughly clean construction vehicles before work on the mountain to minimise spread and/or introduction of weeds and pathogens, such as Amphibian Chytrid Fungus.
	7.2. Rock salvage A suitably qualified ecologist will assist with: • The removal of surface rocks and logs, so that the impacts on fauna are minimised. • The use of salvage rock (including sub-surface rock disturbed during construction) in the habitat creation program for Mountain Pygmy-possum, Broad-toothed Rat and other fauna on Mount Buller.
	7.3. Construction timing Construction will occur during daylight hours between October and May (inclusive), when fauna are active and would have more chance of escaping construction activities. If practical, habitat removal will commence centrally in the project construction footprint, then move out towards the edges, allowing fauna to move progressively away from disturbed areas into habitats that would not be removed.
	7.4. Vegetation salvage The RMB will engage a suitably qualified environmental officer to undertake vegetation salvage in accordance with the Project Revegetation Plan.
	7.5. Management of open excavations, pits and trenches The PCC will be responsible for ensuring that construction personnel: • Provide sloped walls to pits and excavations to allow trapped fauna to escape open excavations or install fauna-proof fencing completely around sections of trench left open overnight to prevent fauna from falling into open excavations. • Provide overnight cover for fauna within open trenches (via pipes, blankets or rocks) in order to avoid predation of any animals

Environmental Issue and Management Objectives	Measures to Address the Environmental Issue Mitigation, Monitoring and Management Requirements and Responsibilities
	which may inadvertently enter and become caught in trenches. • Conduct morning checks for fauna that may have fallen into excavations that are left open overnight prior to construction recommencing in that excavation.
	7.6. Introduced animals No animals (including dogs) will be permitted on site.
	7.7. Offset requirements The RMB will provide appropriate permanent legal protection of offset areas within one year of project commencement.
8. Management of spoil Manage spoil to prevent environmental impacts. Manage the discovery of contaminated material during works in accordance with environmental legislation and subordinate instruments.	**8.1. Soil stockpiles** The PCC will adopt the following protocol with regard to soil stockpiles: • Prior to creation of stockpiles or laydowns, slash vegetation and cover with geofabric. • Topsoil (the top 150-400 mm of soil) will be stripped and stored in separate stockpile zones from subsoil. • All stockpiles (subsoil and topsoil) should be covered with protective mesh to minimise erosion. • Install a filter fence at the base of stockpiles to intercept sediment. • Minimise the length of time soil is stored in stockpiles.
	8.2. Soil sampling and classification Test and classify (prior to excavation), stockpile and dispose of any contaminated material in accordance with the Victorian *Environment Protection Act 1970*, subordinate legislation and associated guidance and technical notes, including EPA's Acid Sulfate Soil and Rock Information Bulletin (EPA 2009). Prior to commencing works, the RMB will engage a qualified soil scientist to investigate the potential occurrence of Acid Sulphate Soils and contaminants in the PCF. A qualified soil scientist will develop an Acid Sulphate Soil Management Program (ASSMP) if the presence of ASS is confirmed.

Environmental Issue and Management Objectives	Measures to Address the Environmental Issue Mitigation, Monitoring and Management Requirements and Responsibilities
	8.3. Interception of suspected contaminated materials If unexpected contaminated or foreign material is identified during construction, disturbance of this material will cease and the site superintendent and RMB contacted immediately.
	8.4. Importing material to site Construction of the proposed water storage is likely to produce an excess of material, meaning that the PCC will need to import very little (if any) fill material. The PCC must confirm that any material imported to the site is free of contaminants, including weed propagules.
9. Noise, light and vibration Minimise impacts to local amenity and native fauna from noise, light and vibration.	**9.1. Restricting working hours and noise criteria** The PCC must manage noise in accordance with EPA's Noise Control Guidelines (EPA 2008). These guidelines require that: • Construction noise not exceed background by more than 10 dB outside normal working hours (7 am to 6 pm Monday to Friday; 7 am to 1 pm Saturday) • Construction noise be inaudible inside a habitable room of any residential premises between 11 pm and 7 am. The requirements will also ensure that disturbance of native fauna (particularly Mountain Pygmy-possum) by artificial light, noise and vibrations is minimised.
10. Air pollution – dust Minimise impacts to local amenity from air and dust pollution arising from construction activities.	**10.1. Dust management procedures** The CEMP will include methods to prevent and monitor dust generation.
	10.2. Controlling emissions of vehicles, plant and equipment The CEMP will include procedures to control air emissions from vehicles, plant and equipment. All vehicles will be fitted with emission control devices and comply at all times with relevant Australian Design Rules for the type and age of vehicle.

Environmental Issue and Management Objectives	Measures to Address the Environmental Issue Mitigation, Monitoring and Management Requirements and Responsibilities
11. Cultural heritage Protect cultural heritage places and areas of sensitivity.	**11.1. Aboriginal cultural heritage** All construction personnel must carry out construction works in accordance with the CHMP. The CHMP provides detailed information on procedures to be followed in the event of discovering archaeological remains or artefacts. A cultural heritage compliance induction must be held with the primary contractors, managers and/or supervisors prior to the commencement of development works. The induction must be undertaken by a RAP Representative and the Sponsor and cover the aspects detailed in the CHMP. A copy of the CHMP must be available on-site during construction works. If human skeletal material is identified, the remains must be left undisturbed in the location of discovery. The RMB must immediately notify Victoria Police and State Coroner's Office. If there are reasonable grounds to believe the remains are Aboriginal, the RMB should also contact DELWP's Emergency Coordination Centre on 1300 888 544.
12. Waste generation, handling and disposal Maximise the use of recycled products in the project design and works. Avoid, minimise and reduce waste in accordance with the waste management hierarchy.	**12.1. Waste management** The PCC will contain all equipment, waste and building materials within the PCF. Works will adopt the waste hierarchy of avoid, reduce, reuse, recycle, recover, treat and dispose. The PCC will maintain the work site free of litter at all times and provide waste and recycling bins with lids and designated waste storage and stockpile areas. The PCC will mark locations of bins on site plans and will require written approval from the RMB to locate bins outside the PCF. The PCC must organise for bins to be emptied before the bins reach capacity. The PCC will ensure that the contents of the bins are transported to an appropriate off-site transfer station, recycling centre or landfill. No waste will be disposed of on site. Select appropriate methods of waste disposal based on the classification of the waste material in accordance with the EPA Industrial Waste Resource Guidelines.

Environmental Issue and Management Objectives	Measures to Address the Environmental Issue Mitigation, Monitoring and Management Requirements and Responsibilities
13. Storage and handling of fuels and chemicals Prevent any contamination from chemicals and fuels	**13.1. Procedures for chemical and fuel storage, handling and spill response** The CEMP will include procedures for storage and handling of oils and fuels and spill response. The PCC will train all personnel in spill response procedures and the use of spill kits. The PCC will store chemicals and fuels away from sensitive areas and in an area where spills cannot result in any environmental damage. Storage areas for chemicals and fuel and refuelling areas will be no closer than 50 metres from an Alpine Bog or watercourse, such as Boggy Creek. Storage of chemicals and fuels must at all times comply with the requirements of the Victorian *Environment Protection Act 1970* and *Dangerous Goods Act 1985*. All chemicals and fuels stored on site must be kept to a minimum and bunded in accordance with EPA's Bunding Guidelines (EPA 1992).
14. Bushfire control Prevent fires associated with construction activities.	**14.1. Procedures for minimising bushfire risk** The PCC will be responsible for ensuring that: • Fire-fighting equipment is provided and maintained on site. • No work is undertaken on days declared as Total Fire Ban or with a Code Red Fire Danger Rating. • No fire is lit on site without RMB approval. • The requirements of the Victorian *Country Fire Act 1958* and Regulations are met. • The construction plant is fitted with fully working and efficient spark control devices in accordance with the applicable standard.
Operation/Post-Construction Phase	
15. Maintenance of the Alpine Bog ecological community Avoid and minimise impacts on the Alpine Bog ecological community downslope of the PCF	**15.1. Implementation of monitoring and management plan** The RMB will be responsible for ensuring that monitoring continues post-construction as per the requirements of the Hydrological and Ecological Monitoring and Adaptive Management Program (HEMAMP; see Measures 1.1 to 1. 4). Post-construction monitoring will continue for the life of the water storage, outside of winter months (snow will prevent monitoring during winter months). The RMB will be responsible for providing DELWP and DoE with an annual report outlining results of the monitoring

Environmental Issue and Management Objectives	Measures to Address the Environmental Issue Mitigation, Monitoring and Management Requirements and Responsibilities
as a result of potential changes in hydrology.	program and recommendations for future monitoring and adaptive management. Recommended changes to the monitoring program will require prior approval from DELWP and DoE before taking effect. The RMB will provide the necessary amount of 'environmental water' to the affected Alpine Bogs (Bogs 4.2, 6, 8, 9, 10, 11.2, 12 and 13) as a permanent mitigation measure. The provision of environmental water to the bogs will be a critical feature of the plan to mitigate impacts. The RMB will adopt an adaptive and proactive approach to sub-surface bog watering based on the baseline data collected during pre-construction monitoring and whether or not post-construction monitoring detects that certain thresholds (trigger points) for surface water, groundwater and the condition of Alpine Bogs have been met. Thresholds for the condition of Alpine Bogs will be set according to defined performance criteria (as outlined in Measure 1.4). Thus, if monitoring detects adverse trends or changes (e.g. drying of bogs in excess of natural seasonal fluctuations), the RMB will immediately implement appropriate proactive corrective management actions (e.g. increased watering using the sub-surface watering system installed during the construction phase). Sub-surface watering of bogs will be achieved through distribution of water from the water storage itself and through redistribution of groundwater seepage captured by the underdrainage blanket that will be installed as part of the construction phase. In addition, overflow and perimeter drains will divert water towards the bogs (incorporating appropriate sediment protection) and the RMB will make an allowance for watering of bog during stress periods (e.g. during late summer) from the total storage volume, based on post-construction monitoring.
16. Disturbance to flora and fauna and aquatic ecology and the spread of noxious weed species. Minimise the impact of the project on the existing terrestrial and aquatic ecology of the site and	**16.1. Site rehabilitation and reinstatement** In accordance with the Project Revegetation Plan, reinstate all temporarily disturbed areas using salvaged sods, salvaged plants and/or locally indigenous tube stock appropriate to the pre-disturbance Ecological Vegetation Class (having regard to position in the landscape and the aim of creating suitable habitat for Mountain Pygmy-possum, Broad-toothed Rat and Alpine Bog Skink). Revegetation will take place at the appropriate plant densities (four shrubs, 6-12 graminoids and 6-12 forbs per square metre) to re-establish dense native vegetative cover, minimise the potential for weed colonisation and to create suitable habitat for Mountain Pygmy-possum (pockets of shrubby heathland, particularly around salvaged rock) and for Broad-toothed Rat and Alpine Bog Skink (dense

Environmental Issue and Management Objectives	Measures to Address the Environmental Issue Mitigation, Monitoring and Management Requirements and Responsibilities
adjacent areas.	heathy vegetation around drainage lines). Revegetation will take place at the appropriate time of year (i.e. spring and early summer) to maximise the chance of successful establishment.
	16.2. Monitoring of site rehabilitation and reinstatement The RMB will be responsible for monitoring the progress of revegetation. Monitoring will occur annually for ten years following construction, with non-compliance (i.e. mortality of plants) addressed on an annual basis by infill planting. The RMB will monitor reinstated habitats (i.e. those subjected to temporary disturbance) for: • Rabbits and deer because they may cause damage/erosion or jeopardise the habitat recovery process. • Cats and foxes until habitats are established enough to provide native fauna with shelter from predation.
	16.3. Weed management The RMB will be responsible for applying weed control measures as part of the post-construction revegetation monitoring. The focus will be on high threat environmental and/or noxious weed species.
	16.4. Procedures to prevent introduction of fish and invasive species During operation of the water storage, the RMB will be responsible for preventing the introduction of: • Invasive fish, especially Brown Trout and Rainbow Trout, into the water storage. • Potentially invasive aquatic species to the surrounding environment via routine overflow or release from the water storage.
	16.5. Visual amenity The PCC will remove temporary hoardings, barriers, traffic management and signage when no longer required. Upon completion of construction, all remaining spoil, large rocks and construction materials will be re-used on site or removed to a more suitable location.

Appendix 4 Biodiversity impact and offset requirement report

Biodiversity impact and offset requirements report

This report **does not represent an assessment by DELWP** of the proposed native vegetation removal. It provides additional biodiversity information to support moderate and high risk-based pathway applications for permits to remove native vegetation under clause 52.16 or 52.17 of planning schemes in Victoria.

Date of issue: **03/08/2016** **DELWP ref: BIO_0288**
Time of issue: **9:23 am**

Project ID	22610_Mt Buller

Summary of marked native vegetation

Risk-based pathway	**High**
Total extent	5.278 ha
Remnant patches	5.278 ha
Scattered trees	0 trees
Location risk	C

Strategic biodiversity score of all marked native vegetation	0.968

Biodiversity impact and offset requirements report

Offset requirements if a permit is granted

If a permit is granted to remove the marked native vegetation, a requirement to obtain a native vegetation offset will be included in the permit conditions. The offset must meet the following requirements:

Offset type	**General offset**
General offset amount (general biodiversity equivalence units)	1.102 general units
General offset attributes	
Vicinity	Goulburn Broken Catchment Management Authority (CMA) **or** Mount Buller Alpine Resort (Unincorporated) Council
Minimum strategic biodiversity score	0.774[1]
Offset type	**Specific offset(s)**
Specific offset amount (specific biodiversity equivalence units) and attributes	6.065 specific units of habitat for Alpine Bog Skink 5.840 specific units of habitat for Snow Aciphyll 6.984 specific units of habitat for Mountain Daisy 7.048 specific units of habitat for Carpet Sedge 5.322 specific units of habitat for Broad-leaf Flower-rush 5.285 specific units of habitat for Sticky Fleabane 6.844 specific units of habitat for Fog Club-sedge 7.046 specific units of habitat for Tussock Woodrush 5.520 specific units of habitat for Veined Plantain 7.112 specific units of habitat for Gunn's Alpine Buttercup 1.274 specific units of habitat for Felted Buttercup 5.566 specific units of habitat for Mossy Knawel 1.218 specific units of habitat for Alpine Stackhousia 6.690 specific units of habitat for Green Billy-buttons 5.609 specific units of habitat for Mountain Wallaby-grass 0.796 specific units of habitat for Planarian

See Appendices 1 and 2 for details in how offset requirements were determined.

NB: values presented in tables throughout this document may not add to totals due to rounding

[1] Minimum strategic biodiversity score is 80 per cent of the weighted average score across habitat zones where a general offset is required

Next steps

Any proposal to remove native vegetation must meet the application requirements of the high risk-based pathway and it will be assessed under the high risk-based pathway.

If you wish to remove the marked native vegetation you are required to apply for a permit from your local council. Council will then refer your application to DELWP for assessment, as required. **This report is not a referral assessment by DELWP.**

The biodiversity assessment report from NVIM and this biodiversity impact and offset report should be submitted with your application for a permit to remove native vegetation you plan to remove, lop or destroy.

The Biodiversity assessment report generated by the tool within NVIM provides the following information:

- The location of the site where native vegetation is to be removed.
- The area of the patch of native vegetation and/or the number of any scattered trees to be removed.
- Maps or plans containing information set out in the *Permitted clearing of native vegetation – Biodiversity assessment guidelines*
- The risk-based pathway of the application for a permit to remove native vegetation

This report provides the following information to meet application requirements for a permit to remove native vegetation:

- Confirmation of the risk-based pathway of the application for a permit to remove native vegetation
- The strategic biodiversity score of the native vegetation to be removed
- Information to inform the assessment of whether the proposed removal of native vegetation will have a significant impact on Victoria's biodiversity, with specific regard to the proportional impact on habitat for any rare or threatened species.
- The offset requirements should a permit be granted to remove native vegetation.

Additional application requirements must be provided with an application for a permit to remove native vegetation in the moderate or high risk-based pathways. These include:

- A habitat hectare assessment report of the native vegetation that is to be removed
- A statement outlining what steps have been taken to ensure that impacts on biodiversity from the removal of native vegetation have been minimised
- An offset strategy that details how a compliant offset will be secured to offset the biodiversity impacts of the removal of native vegetation.

Refer to the *Permitted clearing of native vegetation – Biodiversity assessment guidelines* and for a full list and details of application requirements.

Authorised by the Victorian Government, 8 Nicholson Street, East Melbourne.

For more information contact the DELWP Customer Service Centre 136 186

Biodiversity impact and offset requirements report

Appendix 1 – Biodiversity impact of removal of native vegetation

Habitat hectares

Habitat hectares are calculated for each habitat zone within your proposal using the extent and condition scores in the GIS data you provided.

Habitat zone	Site assessed condition score	Extent (ha)	Habitat hectares
1-16-A	0.800	0.101	0.081
2-14-A	0.800	0.021	0.017
3-15-A	0.880	0.231	0.203
4-13-B	0.880	0.004	0.004
5-13-A	0.790	0.093	0.074
6-12-A	0.800	0.122	0.098
7-18-A	0.880	0.000	0.000
8-8-A	0.800	0.005	0.004
9-7-D	0.800	0.734	0.587
10-9-A	0.880	0.003	0.003
11-1-C	0.880	0.010	0.009
12-5-A	0.880	0.066	0.058
13-7-C	0.880	0.161	0.141
14-7-B	0.880	0.091	0.080
15-7-A	0.600	0.087	0.052
16-11-A	0.880	0.060	0.053
17-19-A	0.800	0.000	0.000
18-2-A	0.530	0.011	0.006
19-1-B	0.530	0.005	0.002
20-1-A	0.720	0.064	0.046
21-17-B	0.720	0.005	0.004
22-17-C	0.880	0.001	0.001
23-3-A	0.880	0.009	0.008
24-4-A	0.880	0.032	0.028
25-6-A	0.880	0.007	0.006
26-10-A	0.880	0.020	0.018
27-17-A	0.880	3.333	2.933
TOTAL			**4.517**

Biodiversity impact and offset requirements report

Impacts on rare or threatened species habitat above specific offset threshold

The specific-general offset test was applied to your proposal. The test determines if the proposed removal of native vegetation has a proportional impact on any rare or threatened species habitats above the specific offset threshold. The threshold is set at 0.005 per cent of the total habitat for a species. When the proportional impact is above the specific offset threshold a specific offset for that species' habitat is required.

The specific-general offset test found your proposal has a proportional impact above the specific offset threshold for the following rare or threatened species' habitats

Species number	Species common name	Species scientific name	Species type	Area of mapped habitat (ha)	Proportional impact (%)
12992	Alpine Bog Skink	Pseudemoia cryodroma	Dispersed	3.638	0.014 %
500113	Snow Aciphyll	Aciphylla glacialis	Dispersed	3.482	0.011 %
500479	Mountain Daisy	Brachyscome sp. 3	Dispersed	4.267	0.020 %
500644	Carpet Sedge	Carex jackiana	Dispersed	4.319	0.007 %
500653	Broad-leaf Flower-rush	Carpha nivicola	Dispersed	3.171	0.014 %
501215	Sticky Fleabane	Erigeron nitidus	Dispersed	3.208	0.033 %
501781	Fog Club-sedge	Isolepis montivaga	Dispersed	4.145	0.025 %
502065	Tussock Woodrush	Luzula alpestris	Dispersed	4.319	0.005 %
502548	Veined Plantain	Plantago alpestris	Dispersed	3.326	0.009 %
502892	Gunn's Alpine Buttercup	Ranunculus gunnianus	Dispersed	4.319	0.011 %
502896	Felted Buttercup	Ranunculus muelleri	Dispersed	0.826	0.005 %
503064	Mossy Knawel	Scleranthus singuliflorus	Dispersed	3.319	0.017 %
503245	Alpine Stackhousia	Stackhousia pulvinaris	Dispersed	0.785	0.009 %
504647	Green Billy-buttons	Craspedia jamesii	Dispersed	4.145	0.009 %
504913	Mountain Wallaby-grass	Rytidosperma oreophilum	Dispersed	3.585	0.031 %
15052	Planarian	Spathula tryssa	Highly Localised - points only	0.458	5.925 %

Clearing site biodiversity equivalence score(s)

Where a habitat zone requires specific offset(s), the specific biodiversity equivalence score(s) for each species in that habitat zone is calculated by multiplying the habitat hectares of the habitat zone by the habitat importance score for each species impacted in the habitat zone.

Habitat zone	Habitat hectares	Habitat for rare or threatened species					Specific biodiversity equivalence score (SBES)
		Proportion of habitat zone with specific offset	Species number	Species common name	Species scientific name	Habitat importance score	
1-16-A	0.081	100.000 %	12992	Alpine Bog Skink	Pseudemoia cryodroma	0.970	0.079
1-16-A	0.081	100.000 %	500113	Snow Aciphyll	Aciphylla glacialis	0.970	0.079
1-16-A	0.081	100.000 %	500479	Mountain Daisy	Brachyscome sp. 3	0.960	0.078
1-16-A	0.081	100.000 %	500644	Carpet Sedge	Carex jackiana	0.960	0.078
1-16-A	0.081	100.000 %	500653	Broad-leaf Flower-rush	Carpha nivicola	0.970	0.079
1-16-A	0.081	100.000 %	501781	Fog Club-sedge	Isolepis montivaga	0.970	0.079
1-16-A	0.081	100.000 %	502065	Tussock Woodrush	Luzula alpestris	0.960	0.078
1-16-A	0.081	100.000 %	502548	Veined Plantain	Plantago alpestris	0.960	0.078
1-16-A	0.081	100.000 %	502892	Gunn's Alpine Buttercup	Ranunculus gunnianus	0.970	0.079
1-16-A	0.081	100.000 %	503064	Mossy Knawel	Scleranthus singuliflorus	0.960	0.078
1-16-A	0.081	100.000 %	504647	Green Billy-buttons	Craspedia jamesii	0.950	0.077
2-14-A	0.017	100.000 %	12992	Alpine Bog Skink	Pseudemoia cryodroma	0.960	0.016
2-14-A	0.017	100.000 %	500113	Snow Aciphyll	Aciphylla glacialis	0.960	0.016
2-14-A	0.017	100.000 %	500479	Mountain Daisy	Brachyscome sp. 3	0.950	0.016
2-14-A	0.017	100.000 %	500644	Carpet Sedge	Carex jackiana	0.950	0.016
2-14-A	0.017	100.000 %	500653	Broad-leaf Flower-rush	Carpha nivicola	0.960	0.016
2-14-A	0.017	100.000 %	501215	Sticky Fleabane	Erigeron nitidus	0.960	0.016
2-14-A	0.017	100.000 %	501781	Fog Club-sedge	Isolepis montivaga	0.960	0.016
2-14-A	0.017	100.000 %	502065	Tussock Woodrush	Luzula alpestris	0.950	0.016
2-14-A	0.017	100.000 %	502548	Veined Plantain	Plantago alpestris	0.950	0.016
2-14-A	0.017	100.000 %	502892	Gunn's Alpine Buttercup	Ranunculus gunnianus	0.960	0.016

Habitat zone	Habitat hectares	Habitat for rare or threatened species					Specific biodiversity equivalence score (SBES)
		Proportion of habitat zone with specific offset	Species number	Species common name	Species scientific name	Habitat importance score	
2-14-A	0.017	100.000 %	503064	Mossy Knawel	Scleranthus singuliflorus	0.960	0.016
2-14-A	0.017	100.000 %	504647	Green Billy-buttons	Craspedia jamesii	0.940	0.016
2-14-A	0.017	100.000 %	504913	Mountain Wallaby-grass	Rytidosperma oreophilum	0.910	0.015
2-14-A	0.017	86.048 %	15052	Planarian	Spathula tryssa	1.000	0.015
3-15-A	0.203	85.022 %	12992	Alpine Bog Skink	Pseudemoia cryodroma	0.967	0.167
3-15-A	0.203	85.022 %	500113	Snow Aciphyll	Aciphylla glacialis	0.967	0.167
3-15-A	0.203	85.022 %	500479	Mountain Daisy	Brachyscome sp. 3	0.957	0.166
3-15-A	0.203	85.022 %	500644	Carpet Sedge	Carex jackiana	0.957	0.166
3-15-A	0.203	85.022 %	500653	Broad-leaf Flower-rush	Carpha nivicola	0.966	0.167
3-15-A	0.203	27.285 %	501215	Sticky Fleabane	Erigeron nitidus	0.960	0.053
3-15-A	0.203	85.022 %	501781	Fog Club-sedge	Isolepis montivaga	0.966	0.167
3-15-A	0.203	85.022 %	502065	Tussock Woodrush	Luzula alpestris	0.957	0.166
3-15-A	0.203	85.022 %	502548	Veined Plantain	Plantago alpestris	0.957	0.166
3-15-A	0.203	85.022 %	502892	Gunn's Alpine Buttercup	Ranunculus gunnianus	0.967	0.167
3-15-A	0.203	85.022 %	503064	Mossy Knawel	Scleranthus singuliflorus	0.960	0.166
3-15-A	0.203	85.022 %	504647	Green Billy-buttons	Craspedia jamesii	0.947	0.164
3-15-A	0.203	33.067 %	504913	Mountain Wallaby-grass	Rytidosperma oreophilum	0.910	0.061
4-13-B	0.004	100.000 %	12992	Alpine Bog Skink	Pseudemoia cryodroma	0.960	0.003
4-13-B	0.004	100.000 %	500644	Carpet Sedge	Carex jackiana	0.950	0.003
4-13-B	0.004	100.000 %	502065	Tussock Woodrush	Luzula alpestris	0.940	0.003
4-13-B	0.004	100.000 %	502892	Gunn's Alpine Buttercup	Ranunculus gunnianus	0.950	0.003
4-13-B	0.004	100.000 %	504913	Mountain Wallaby-grass	Rytidosperma oreophilum	0.920	0.003
5-13-A	0.074	100.000 %	12992	Alpine Bog Skink	Pseudemoia cryodroma	0.960	0.071

Habitat zone	Habitat hectares	Habitat for rare or threatened species					Specific biodiversity equivalence score (SBES)
		Proportion of habitat zone with specific offset	Species number	Species common name	Species scientific name	Habitat importance score	
5-13-A	0.074	48.066 %	500113	Snow Aciphyll	Aciphylla glacialis	0.960	0.034
5-13-A	0.074	48.066 %	500479	Mountain Daisy	Brachyscome sp. 3	0.950	0.034
5-13-A	0.074	100.000 %	500644	Carpet Sedge	Carex jackiana	0.950	0.070
5-13-A	0.074	48.066 %	500653	Broad-leaf Flower-rush	Carpha nivicola	0.960	0.034
5-13-A	0.074	48.066 %	501215	Sticky Fleabane	Erigeron nitidus	0.960	0.034
5-13-A	0.074	48.066 %	501781	Fog Club-sedge	Isolepis montivaga	0.960	0.034
5-13-A	0.074	100.000 %	502065	Tussock Woodrush	Luzula alpestris	0.945	0.070
5-13-A	0.074	48.066 %	502548	Veined Plantain	Plantago alpestris	0.950	0.034
5-13-A	0.074	100.000 %	502892	Gunn's Alpine Buttercup	Ranunculus gunnianus	0.955	0.070
5-13-A	0.074	48.066 %	503064	Mossy Knawel	Scleranthus singuliflorus	0.960	0.034
5-13-A	0.074	48.066 %	504647	Green Billy-buttons	Craspedia jamesii	0.940	0.033
5-13-A	0.074	100.000 %	504913	Mountain Wallaby-grass	Rytidosperma oreophilum	0.915	0.068
5-13-A	0.074	48.066 %	15052	Planarian	Spathula tryssa	1.000	0.035
7-18-A	0.000	100.000 %	12992	Alpine Bog Skink	Pseudemoia cryodroma	0.960	0.000
7-18-A	0.000	100.000 %	500113	Snow Aciphyll	Aciphylla glacialis	0.960	0.000
7-18-A	0.000	100.000 %	500479	Mountain Daisy	Brachyscome sp. 3	0.950	0.000
7-18-A	0.000	100.000 %	500644	Carpet Sedge	Carex jackiana	0.940	0.000
7-18-A	0.000	100.000 %	501781	Fog Club-sedge	Isolepis montivaga	0.960	0.000
7-18-A	0.000	100.000 %	502065	Tussock Woodrush	Luzula alpestris	0.940	0.000
7-18-A	0.000	100.000 %	502892	Gunn's Alpine Buttercup	Ranunculus gunnianus	0.950	0.000
7-18-A	0.000	100.000 %	503064	Mossy Knawel	Scleranthus singuliflorus	0.960	0.000
7-18-A	0.000	100.000 %	504647	Green Billy-buttons	Craspedia jamesii	0.940	0.000
7-18-A	0.000	100.000 %	504913	Mountain Wallaby-grass	Rytidosperma oreophilum	0.930	0.000

Habitat zone	Habitat hectares	Habitat for rare or threatened species					Specific biodiversity equivalence score (SBES)
		Proportion of habitat zone with specific offset	Species number	Species common name	Species scientific name	Habitat importance score	
8-8-A	0.004	100.000 %	12992	Alpine Bog Skink	Pseudemoia cryodroma	0.950	0.004
8-8-A	0.004	100.000 %	500113	Snow Aciphyll	Aciphylla glacialis	0.960	0.004
8-8-A	0.004	100.000 %	500479	Mountain Daisy	Brachyscome sp. 3	0.950	0.004
8-8-A	0.004	100.000 %	500644	Carpet Sedge	Carex jackiana	0.940	0.004
8-8-A	0.004	100.000 %	501781	Fog Club-sedge	Isolepis montivaga	0.950	0.004
8-8-A	0.004	100.000 %	502065	Tussock Woodrush	Luzula alpestris	0.940	0.004
8-8-A	0.004	100.000 %	502892	Gunn's Alpine Buttercup	Ranunculus gunnianus	0.950	0.004
8-8-A	0.004	100.000 %	503064	Mossy Knawel	Scleranthus singuliflorus	0.950	0.004
8-8-A	0.004	100.000 %	504647	Green Billy-buttons	Craspedia jamesii	0.930	0.004
8-8-A	0.004	100.000 %	504913	Mountain Wallaby-grass	Rytidosperma oreophilum	0.920	0.004
9-7-D	0.587	7.506 %	12992	Alpine Bog Skink	Pseudemoia cryodroma	0.956	0.042
9-7-D	0.587	3.217 %	500113	Snow Aciphyll	Aciphylla glacialis	0.960	0.018
9-7-D	0.587	96.714 %	500479	Mountain Daisy	Brachyscome sp. 3	0.950	0.540
9-7-D	0.587	96.714 %	500644	Carpet Sedge	Carex jackiana	0.940	0.534
9-7-D	0.587	93.498 %	501215	Sticky Fleabane	Erigeron nitidus	0.950	0.522
9-7-D	0.587	96.714 %	501781	Fog Club-sedge	Isolepis montivaga	0.960	0.545
9-7-D	0.587	96.714 %	502065	Tussock Woodrush	Luzula alpestris	0.940	0.534
9-7-D	0.587	3.217 %	502548	Veined Plantain	Plantago alpestris	0.950	0.018
9-7-D	0.587	96.714 %	502892	Gunn's Alpine Buttercup	Ranunculus gunnianus	0.950	0.540
9-7-D	0.587	96.714 %	502896	Felted Buttercup	Ranunculus muelleri	0.960	0.545
9-7-D	0.587	93.498 %	503245	Alpine Stackhousia	Stackhousia pulvinaris	0.960	0.527
9-7-D	0.587	96.714 %	504647	Green Billy-buttons	Craspedia jamesii	0.930	0.528
9-7-D	0.587	96.714 %	504913	Mountain Wallaby-grass	Rytidosperma oreophilum	0.910	0.517

Habitat zone	Habitat hectares	Habitat for rare or threatened species					Specific biodiversity equivalence score (SBES)
		Proportion of habitat zone with specific offset	Species number	Species common name	Species scientific name	Habitat importance score	
10-9-A	0.003	100.000 %	12992	Alpine Bog Skink	Pseudemoia cryodroma	0.950	0.002
10-9-A	0.003	100.000 %	500113	Snow Aciphyll	Aciphylla glacialis	0.960	0.002
10-9-A	0.003	100.000 %	500479	Mountain Daisy	Brachyscome sp. 3	0.950	0.002
10-9-A	0.003	100.000 %	500644	Carpet Sedge	Carex jackiana	0.940	0.002
10-9-A	0.003	100.000 %	501781	Fog Club-sedge	Isolepis montivaga	0.950	0.002
10-9-A	0.003	100.000 %	502065	Tussock Woodrush	Luzula alpestris	0.940	0.002
10-9-A	0.003	100.000 %	502892	Gunn's Alpine Buttercup	Ranunculus gunnianus	0.950	0.002
10-9-A	0.003	100.000 %	503064	Mossy Knawel	Scleranthus singuliflorus	0.950	0.002
10-9-A	0.003	100.000 %	504647	Green Billy-buttons	Craspedia jamesii	0.930	0.002
10-9-A	0.003	100.000 %	504913	Mountain Wallaby-grass	Rytidosperma oreophilum	0.920	0.002
11-1-C	0.009	100.000 %	12992	Alpine Bog Skink	Pseudemoia cryodroma	0.890	0.008
12-5-A	0.058	100.000 %	12992	Alpine Bog Skink	Pseudemoia cryodroma	0.946	0.055
12-5-A	0.058	100.000 %	500113	Snow Aciphyll	Aciphylla glacialis	0.951	0.055
12-5-A	0.058	100.000 %	500479	Mountain Daisy	Brachyscome sp. 3	0.940	0.054
12-5-A	0.058	100.000 %	500644	Carpet Sedge	Carex jackiana	0.940	0.054
12-5-A	0.058	100.000 %	502065	Tussock Woodrush	Luzula alpestris	0.940	0.054
12-5-A	0.058	100.000 %	502548	Veined Plantain	Plantago alpestris	0.941	0.055
12-5-A	0.058	100.000 %	502892	Gunn's Alpine Buttercup	Ranunculus gunnianus	0.941	0.055
12-5-A	0.058	100.000 %	504913	Mountain Wallaby-grass	Rytidosperma oreophilum	0.900	0.052
13-7-C	0.141	0.102 %	12992	Alpine Bog Skink	Pseudemoia cryodroma	0.950	0.000
13-7-C	0.141	0.102 %	500113	Snow Aciphyll	Aciphylla glacialis	0.960	0.000
13-7-C	0.141	48.671 %	500479	Mountain Daisy	Brachyscome sp. 3	0.950	0.065
13-7-C	0.141	48.671 %	500644	Carpet Sedge	Carex jackiana	0.940	0.065

Habitat zone	Habitat hectares	Habitat for rare or threatened species					Specific biodiversity equivalence score (SBES)
		Proportion of habitat zone with specific offset	Species number	Species common name	Species scientific name	Habitat importance score	
13-7-C	0.141	48.569 %	501215	Sticky Fleabane	Erigeron nitidus	0.950	0.065
13-7-C	0.141	48.671 %	501781	Fog Club-sedge	Isolepis montivaga	0.960	0.066
13-7-C	0.141	48.671 %	502065	Tussock Woodrush	Luzula alpestris	0.940	0.065
13-7-C	0.141	0.102 %	502548	Veined Plantain	Plantago alpestris	0.950	0.000
13-7-C	0.141	48.671 %	502892	Gunn's Alpine Buttercup	Ranunculus gunnianus	0.950	0.065
13-7-C	0.141	48.671 %	502896	Felted Buttercup	Ranunculus muelleri	0.960	0.066
13-7-C	0.141	48.569 %	503245	Alpine Stackhousia	Stackhousia pulvinaris	0.960	0.066
13-7-C	0.141	48.671 %	504647	Green Billy-buttons	Craspedia jamesii	0.930	0.064
13-7-C	0.141	48.671 %	504913	Mountain Wallaby-grass	Rytidosperma oreophilum	0.910	0.063
14-7-B	0.080	16.540 %	12992	Alpine Bog Skink	Pseudemoia cryodroma	0.960	0.013
14-7-B	0.080	16.616 %	500479	Mountain Daisy	Brachyscome sp. 3	0.950	0.013
14-7-B	0.080	16.616 %	500644	Carpet Sedge	Carex jackiana	0.940	0.013
14-7-B	0.080	16.616 %	501215	Sticky Fleabane	Erigeron nitidus	0.950	0.013
14-7-B	0.080	16.616 %	501781	Fog Club-sedge	Isolepis montivaga	0.960	0.013
14-7-B	0.080	16.616 %	502065	Tussock Woodrush	Luzula alpestris	0.940	0.013
14-7-B	0.080	16.616 %	502892	Gunn's Alpine Buttercup	Ranunculus gunnianus	0.950	0.013
14-7-B	0.080	16.616 %	502896	Felted Buttercup	Ranunculus muelleri	0.960	0.013
14-7-B	0.080	16.616 %	503245	Alpine Stackhousia	Stackhousia pulvinaris	0.960	0.013
14-7-B	0.080	16.616 %	504647	Green Billy-buttons	Craspedia jamesii	0.930	0.012
14-7-B	0.080	16.616 %	504913	Mountain Wallaby-grass	Rytidosperma oreophilum	0.910	0.012
15-7-A	0.052	19.227 %	12992	Alpine Bog Skink	Pseudemoia cryodroma	0.950	0.010
15-7-A	0.052	19.227 %	500113	Snow Aciphyll	Aciphylla glacialis	0.960	0.010
15-7-A	0.052	25.521 %	500479	Mountain Daisy	Brachyscome sp. 3	0.950	0.013

Habitat zone	Habitat hectares	Habitat for rare or threatened species					Specific biodiversity equivalence score (SBES)
		Proportion of habitat zone with specific offset	Species number	Species common name	Species scientific name	Habitat importance score	
15-7-A	0.052	25.521 %	500644	Carpet Sedge	Carex jackiana	0.948	0.013
15-7-A	0.052	6.295 %	501215	Sticky Fleabane	Erigeron nitidus	0.950	0.003
15-7-A	0.052	25.521 %	501781	Fog Club-sedge	Isolepis montivaga	0.952	0.013
15-7-A	0.052	25.521 %	502065	Tussock Woodrush	Luzula alpestris	0.948	0.013
15-7-A	0.052	19.227 %	502548	Veined Plantain	Plantago alpestris	0.950	0.010
15-7-A	0.052	25.521 %	502892	Gunn's Alpine Buttercup	Ranunculus gunnianus	0.958	0.013
15-7-A	0.052	25.521 %	502896	Felted Buttercup	Ranunculus muelleri	0.960	0.013
15-7-A	0.052	6.295 %	503245	Alpine Stackhousia	Stackhousia pulvinaris	0.960	0.003
15-7-A	0.052	25.521 %	504647	Green Billy-buttons	Craspedia jamesii	0.938	0.012
15-7-A	0.052	25.521 %	504913	Mountain Wallaby-grass	Rytidosperma oreophilum	0.918	0.012
16-11-A	0.053	71.461 %	12992	Alpine Bog Skink	Pseudemoia cryodroma	0.960	0.036
16-11-A	0.053	71.461 %	500113	Snow Aciphyll	Aciphylla glacialis	0.960	0.036
16-11-A	0.053	71.461 %	500479	Mountain Daisy	Brachyscome sp. 3	0.950	0.036
16-11-A	0.053	71.461 %	500644	Carpet Sedge	Carex jackiana	0.940	0.035
16-11-A	0.053	71.461 %	501781	Fog Club-sedge	Isolepis montivaga	0.960	0.036
16-11-A	0.053	71.461 %	502065	Tussock Woodrush	Luzula alpestris	0.940	0.035
16-11-A	0.053	71.461 %	502892	Gunn's Alpine Buttercup	Ranunculus gunnianus	0.950	0.036
16-11-A	0.053	71.461 %	503064	Mossy Knawel	Scleranthus singuliflorus	0.960	0.036
16-11-A	0.053	71.461 %	504647	Green Billy-buttons	Craspedia jamesii	0.940	0.035
16-11-A	0.053	71.461 %	504913	Mountain Wallaby-grass	Rytidosperma oreophilum	0.930	0.035
17-19-A	0.000	100.000 %	12992	Alpine Bog Skink	Pseudemoia cryodroma	0.960	0.000
17-19-A	0.000	100.000 %	500113	Snow Aciphyll	Aciphylla glacialis	0.960	0.000

Habitat zone	Habitat hectares	Habitat for rare or threatened species					Specific biodiversity equivalence score (SBES)
		Proportion of habitat zone with specific offset	Species number	Species common name	Species scientific name	Habitat importance score	
17-19-A	0.000	100.000 %	500479	Mountain Daisy	Brachyscome sp. 3	0.950	0.000
17-19-A	0.000	100.000 %	500644	Carpet Sedge	Carex jackiana	0.940	0.000
17-19-A	0.000	100.000 %	501781	Fog Club-sedge	Isolepis montivaga	0.960	0.000
17-19-A	0.000	100.000 %	502065	Tussock Woodrush	Luzula alpestris	0.940	0.000
17-19-A	0.000	100.000 %	502892	Gunn's Alpine Buttercup	Ranunculus gunnianus	0.950	0.000
17-19-A	0.000	100.000 %	503064	Mossy Knawel	Scleranthus singuliflorus	0.960	0.000
17-19-A	0.000	100.000 %	504647	Green Billy-buttons	Craspedia jamesii	0.940	0.000
17-19-A	0.000	100.000 %	504913	Mountain Wallaby-grass	Rytidosperma oreophilum	0.930	0.000
18-2-A	0.006	100.000 %	12992	Alpine Bog Skink	Pseudemoia cryodroma	0.890	0.005
19-1-B	0.002	100.000 %	12992	Alpine Bog Skink	Pseudemoia cryodroma	0.890	0.002
20-1-A	0.046	47.921 %	12992	Alpine Bog Skink	Pseudemoia cryodroma	0.890	0.020
21-17-B	0.004	100.000 %	12992	Alpine Bog Skink	Pseudemoia cryodroma	0.923	0.003
21-17-B	0.004	100.000 %	500113	Snow Aciphyll	Aciphylla glacialis	0.922	0.003
21-17-B	0.004	100.000 %	500479	Mountain Daisy	Brachyscome sp. 3	0.912	0.003
21-17-B	0.004	100.000 %	500644	Carpet Sedge	Carex jackiana	0.912	0.003
21-17-B	0.004	100.000 %	500653	Broad-leaf Flower-rush	Carpha nivicola	0.913	0.003
21-17-B	0.004	6.742 %	501215	Sticky Fleabane	Erigeron nitidus	0.950	0.000
21-17-B	0.004	100.000 %	501781	Fog Club-sedge	Isolepis montivaga	0.913	0.003
21-17-B	0.004	100.000 %	502065	Tussock Woodrush	Luzula alpestris	0.912	0.003
21-17-B	0.004	100.000 %	502548	Veined Plantain	Plantago alpestris	0.912	0.003
21-17-B	0.004	100.000 %	502892	Gunn's Alpine Buttercup	Ranunculus gunnianus	0.913	0.003

Habitat zone	Habitat hectares	Habitat for rare or threatened species					Specific biodiversity equivalence score (SBES)
		Proportion of habitat zone with specific offset	Species number	Species common name	Species scientific name	Habitat importance score	
21-17-B	0.004	100.000 %	503064	Mossy Knawel	Scleranthus singuliflorus	0.913	0.003
21-17-B	0.004	100.000 %	504647	Green Billy-buttons	Craspedia jamesii	0.893	0.003
21-17-B	0.004	6.742 %	504913	Mountain Wallaby-grass	Rytidosperma oreophilum	0.900	0.000
22-17-C	0.001	100.000 %	12992	Alpine Bog Skink	Pseudemoia cryodroma	0.920	0.001
22-17-C	0.001	100.000 %	500113	Snow Aciphyll	Aciphylla glacialis	0.920	0.001
22-17-C	0.001	100.000 %	500479	Mountain Daisy	Brachyscome sp. 3	0.910	0.001
22-17-C	0.001	100.000 %	500644	Carpet Sedge	Carex jackiana	0.910	0.001
22-17-C	0.001	100.000 %	500653	Broad-leaf Flower-rush	Carpha nivicola	0.910	0.001
22-17-C	0.001	100.000 %	501781	Fog Club-sedge	Isolepis montivaga	0.910	0.001
22-17-C	0.001	100.000 %	502065	Tussock Woodrush	Luzula alpestris	0.910	0.001
22-17-C	0.001	100.000 %	502548	Veined Plantain	Plantago alpestris	0.910	0.001
22-17-C	0.001	100.000 %	502892	Gunn's Alpine Buttercup	Ranunculus gunnianus	0.910	0.001
22-17-C	0.001	100.000 %	503064	Mossy Knawel	Scleranthus singuliflorus	0.910	0.001
22-17-C	0.001	100.000 %	504647	Green Billy-buttons	Craspedia jamesii	0.890	0.001
23-3-A	0.008	100.000 %	12992	Alpine Bog Skink	Pseudemoia cryodroma	0.940	0.007
23-3-A	0.008	100.000 %	500113	Snow Aciphyll	Aciphylla glacialis	0.950	0.008
23-3-A	0.008	100.000 %	500479	Mountain Daisy	Brachyscome sp. 3	0.930	0.007
23-3-A	0.008	100.000 %	500644	Carpet Sedge	Carex jackiana	0.930	0.007
23-3-A	0.008	100.000 %	502065	Tussock Woodrush	Luzula alpestris	0.930	0.007
23-3-A	0.008	100.000 %	502548	Veined Plantain	Plantago alpestris	0.940	0.007
23-3-A	0.008	100.000 %	502892	Gunn's Alpine Buttercup	Ranunculus gunnianus	0.940	0.007
23-3-A	0.008	100.000 %	504913	Mountain Wallaby-grass	Rytidosperma oreophilum	0.890	0.007

Habitat zone	Habitat hectares	Habitat for rare or threatened species					Specific biodiversity equivalence score (SBES)
		Proportion of habitat zone with specific offset	Species number	Species common name	Species scientific name	Habitat importance score	
24-4-A	0.028	100.000 %	12992	Alpine Bog Skink	Pseudemoia cryodroma	0.940	0.027
24-4-A	0.028	100.000 %	500113	Snow Aciphyll	Aciphylla glacialis	0.950	0.027
24-4-A	0.028	100.000 %	500479	Mountain Daisy	Brachyscome sp. 3	0.932	0.026
24-4-A	0.028	100.000 %	500644	Carpet Sedge	Carex jackiana	0.932	0.026
24-4-A	0.028	100.000 %	502065	Tussock Woodrush	Luzula alpestris	0.932	0.026
24-4-A	0.028	100.000 %	502548	Veined Plantain	Plantago alpestris	0.940	0.027
24-4-A	0.028	100.000 %	502892	Gunn's Alpine Buttercup	Ranunculus gunnianus	0.940	0.027
24-4-A	0.028	100.000 %	504913	Mountain Wallaby-grass	Rytidosperma oreophilum	0.892	0.025
25-6-A	0.006	100.000 %	12992	Alpine Bog Skink	Pseudemoia cryodroma	0.950	0.006
25-6-A	0.006	100.000 %	500113	Snow Aciphyll	Aciphylla glacialis	0.950	0.006
25-6-A	0.006	100.000 %	500479	Mountain Daisy	Brachyscome sp. 3	0.940	0.006
25-6-A	0.006	100.000 %	500644	Carpet Sedge	Carex jackiana	0.940	0.006
25-6-A	0.006	100.000 %	502065	Tussock Woodrush	Luzula alpestris	0.940	0.006
25-6-A	0.006	100.000 %	502548	Veined Plantain	Plantago alpestris	0.940	0.006
25-6-A	0.006	100.000 %	502892	Gunn's Alpine Buttercup	Ranunculus gunnianus	0.940	0.006
25-6-A	0.006	100.000 %	504913	Mountain Wallaby-grass	Rytidosperma oreophilum	0.900	0.006
26-10-A	0.018	100.000 %	12992	Alpine Bog Skink	Pseudemoia cryodroma	0.950	0.017
26-10-A	0.018	100.000 %	500113	Snow Aciphyll	Aciphylla glacialis	0.960	0.017
26-10-A	0.018	100.000 %	500479	Mountain Daisy	Brachyscome sp. 3	0.950	0.017
26-10-A	0.018	100.000 %	500644	Carpet Sedge	Carex jackiana	0.940	0.017
26-10-A	0.018	100.000 %	501781	Fog Club-sedge	Isolepis montivaga	0.950	0.017
26-10-A	0.018	100.000 %	502065	Tussock Woodrush	Luzula alpestris	0.940	0.017

Habitat zone	Habitat hectares	Habitat for rare or threatened species					Specific biodiversity equivalence score (SBES)
		Proportion of habitat zone with specific offset	Species number	Species common name	Species scientific name	Habitat importance score	
26-10-A	0.018	100.000 %	502892	Gunn's Alpine Buttercup	Ranunculus gunnianus	0.950	0.017
26-10-A	0.018	100.000 %	503064	Mossy Knawel	Scleranthus singuliflorus	0.950	0.017
26-10-A	0.018	100.000 %	504647	Green Billy-buttons	Craspedia jamesii	0.930	0.017
26-10-A	0.018	100.000 %	504913	Mountain Wallaby-grass	Rytidosperma oreophilum	0.920	0.016
27-17-A	2.933	86.581 %	12992	Alpine Bog Skink	Pseudemoia cryodroma	0.960	2.438
27-17-A	2.933	86.581 %	500113	Snow Aciphyll	Aciphylla glacialis	0.959	2.436
27-17-A	2.933	86.581 %	500479	Mountain Daisy	Brachyscome sp. 3	0.949	2.411
27-17-A	2.933	86.581 %	500644	Carpet Sedge	Carex jackiana	0.949	2.410
27-17-A	2.933	84.036 %	500653	Broad-leaf Flower-rush	Carpha nivicola	0.958	2.361
27-17-A	2.933	68.824 %	501215	Sticky Fleabane	Erigeron nitidus	0.959	1.936
27-17-A	2.933	86.343 %	501781	Fog Club-sedge	Isolepis montivaga	0.958	2.426
27-17-A	2.933	86.581 %	502065	Tussock Woodrush	Luzula alpestris	0.949	2.410
27-17-A	2.933	84.036 %	502548	Veined Plantain	Plantago alpestris	0.949	2.340
27-17-A	2.933	86.581 %	502892	Gunn's Alpine Buttercup	Ranunculus gunnianus	0.958	2.432
27-17-A	2.933	86.343 %	503064	Mossy Knawel	Scleranthus singuliflorus	0.958	2.425
27-17-A	2.933	86.343 %	504647	Green Billy-buttons	Craspedia jamesii	0.938	2.375
27-17-A	2.933	71.369 %	504913	Mountain Wallaby-grass	Rytidosperma oreophilum	0.910	1.905
27-17-A	2.933	11.862 %	15052	Planarian	Spathula tryssa	1.000	0.348

There are habitat zones in your proposal which are not habitat for the species above. A general offset is required for the(se) habitat zone(s).

The general biodiversity equivalence score for the habitat zone(s) is calculated by multiplying the habitat hectares by the strategic biodiversity score.

Habitat zone	Habitat hectares	Proportion of habitat zone with general offset	Strategic biodiversity score	General biodiversity equivalence score (GBES)
3-15-A	0.203	14.978 %	0.965	0.029
6-12-A	0.098	100.000 %	0.969	0.095
9-7-D	0.587	3.286 %	0.967	0.019
13-7-C	0.141	51.329 %	0.967	0.070
14-7-B	0.080	83.384 %	0.967	0.065
15-7-A	0.052	74.479 %	0.967	0.038
16-11-A	0.053	28.539 %	0.973	0.015
20-1-A	0.046	52.079 %	0.946	0.023
27-17-A	2.933	13.419 %	0.969	0.382

Mapped rare or threatened species' habitats on site

This table sets out the list of rare or threatened species' habitats mapped at the site beyond those species for which the impact is above the specific offset threshold. These species habitats do not require a specific offset according to the specific-general offset test.

Species number	Species common name	Species scientific name
11156	Mountain Pygmy-possum	Burramys parvus
11438	Broad-toothed Rat	Mastacomys fuscus mordicus
500114	Mountain Aciphyll	Aciphylla simplicifolia
500157	Mueller's Bent	Agrostis muelleriana
500601	Alpine Marsh-marigold	Psychrophila introloba
500626	Alpine Sedge	Carex blakei
500820	Snow Coprosma	Coprosma nivalis
501014	Thick Bent-grass	Deyeuxia crassiuscula
501101	Alpine Sundew	Drosera arcturi
501181	Mountain Willow-herb	Epilobium sarmentaceum
501309	Spinning Gum	Eucalyptus perriniana
501474	Mat Cudweed	Euchiton traversii
501475	Cliff Cudweed	Euchiton umbricola
502888	Eichler's Buttercup	Ranunculus eichlerianus
503463	Lilac Berry	Trochocarpa clarkei
503508	Milfoil Speedwell	Derwentia nivea
504780	Dusty Daisy-bush	Olearia phlogopappa var. flavescens
63907	Alpine Tree Frog	Litoria verreauxii alpina

Appendix 2 – Offset requirements detail

If a permit is granted to remove the marked native vegetation the permit condition will include the requirement to obtain a native vegetation offset.

To calculate the required offset amount required the biodiversity equivalence scores are aggregated to the proposal level and multiplied by the relevant risk multiplier.

Offsets also have required attributes:

- General offsets must be located in the same Catchment Management Authority (CMA) boundary or Local Municipal District (local council) as the clearing and must have a minimum strategic biodiversity score of 80 per cent of the clearing.[2]
- Specific offsets must be located in the same species habitat as that being removed, as determined by the habitat importance map for that species.

The offset requirements for your proposal are as follows:

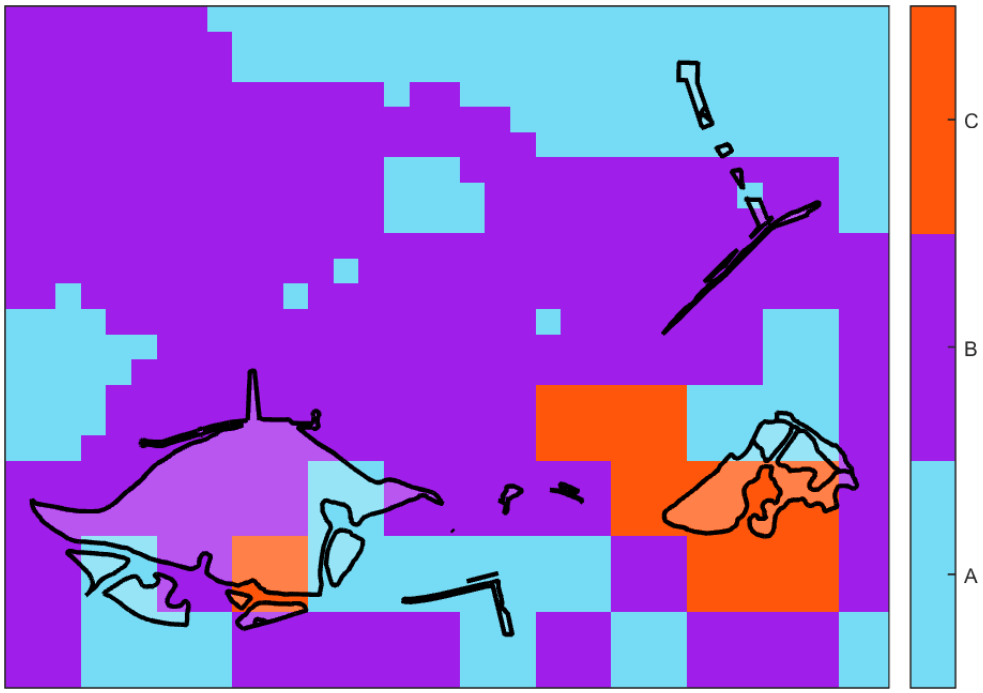
Offset type	Clearing site biodiversity equivalence score	Risk multiplier	Offset requirements	
			Offset amount (biodiversity equivalence units)	Offset attributes
Specific	3.032 SBES	2	6.065 specific units	Offset must provide habitat for 12992, Alpine Bog Skink, Pseudemoia cryodroma
Specific	2.920 SBES	2	5.840 specific units	Offset must provide habitat for 500113, Snow Aciphyll, Aciphylla glacialis
Specific	3.492 SBES	2	6.984 specific units	Offset must provide habitat for 500479, Mountain Daisy, Brachyscome sp. 3
Specific	3.524 SBES	2	7.048 specific units	Offset must provide habitat for 500644, Carpet Sedge, Carex jackiana
Specific	2.661 SBES	2	5.322 specific units	Offset must provide habitat for 500653, Broad-leaf Flower-rush, Carpha nivicola
Specific	2.643 SBES	2	5.285 specific units	Offset must provide habitat for 501215, Sticky Fleabane, Erigeron nitidus
Specific	3.422 SBES	2	6.844 specific units	Offset must provide habitat for 501781, Fog Club-sedge, Isolepis montivaga
Specific	3.523 SBES	2	7.046 specific units	Offset must provide habitat for 502065, Tussock Woodrush, Luzula alpestris
Specific	2.760 SBES	2	5.520 specific units	Offset must provide habitat for 502548, Veined Plantain, Plantago alpestris
Specific	3.556 SBES	2	7.112 specific units	Offset must provide habitat for 502892, Gunn's Alpine Buttercup, Ranunculus gunnianus
Specific	0.637 SBES	2	1.274 specific units	Offset must provide habitat for 502896, Felted Buttercup, Ranunculus muelleri
Specific	2.783 SBES	2	5.566 specific units	Offset must provide habitat for 503064, Mossy Knawel, Scleranthus singuliflorus
Specific	0.609 SBES	2	1.218 specific units	Offset must provide habitat for 503245, Alpine Stackhousia, Stackhousia pulvinaris
Specific	3.345 SBES	2	6.690 specific units	Offset must provide habitat for 504647, Green Billy-buttons, Craspedia jamesii
Specific	2.804 SBES	2	5.609 specific units	Offset must provide habitat for 504913, Mountain Wallaby-grass, Rytidosperma oreophilum

[2] Strategic biodiversity score is a weighted average across habitat zones where a general offset is required

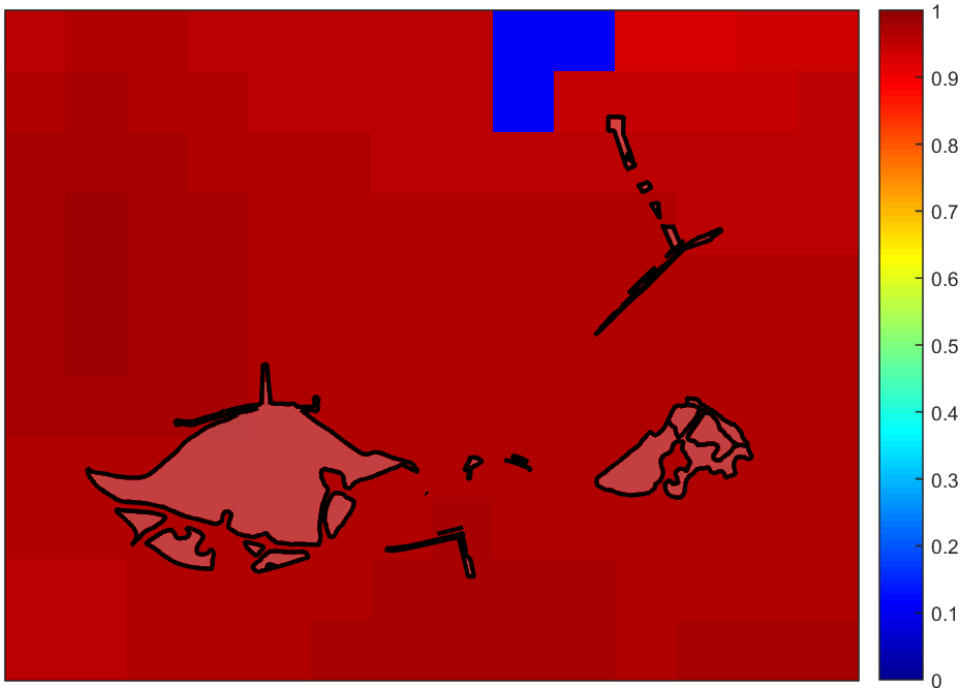
Offset type	Clearing site biodiversity equivalence score	Risk multiplier	Offset requirements	
			Offset amount (biodiversity equivalence units)	Offset attributes
Specific	0.398 SBES	2	0.796 specific units	Offset must provide habitat for 15052, Planarian, Spathula tryssa
General	0.735 GBES	1.5	1.102 general units	Offset must be within Goulburn Broken CMA or Mount Buller Alpine Resort (Unincorporated) Council Offset must have a minimum strategic biodiversity score of 0.774

Appendix 3 – Images of marked native vegetation

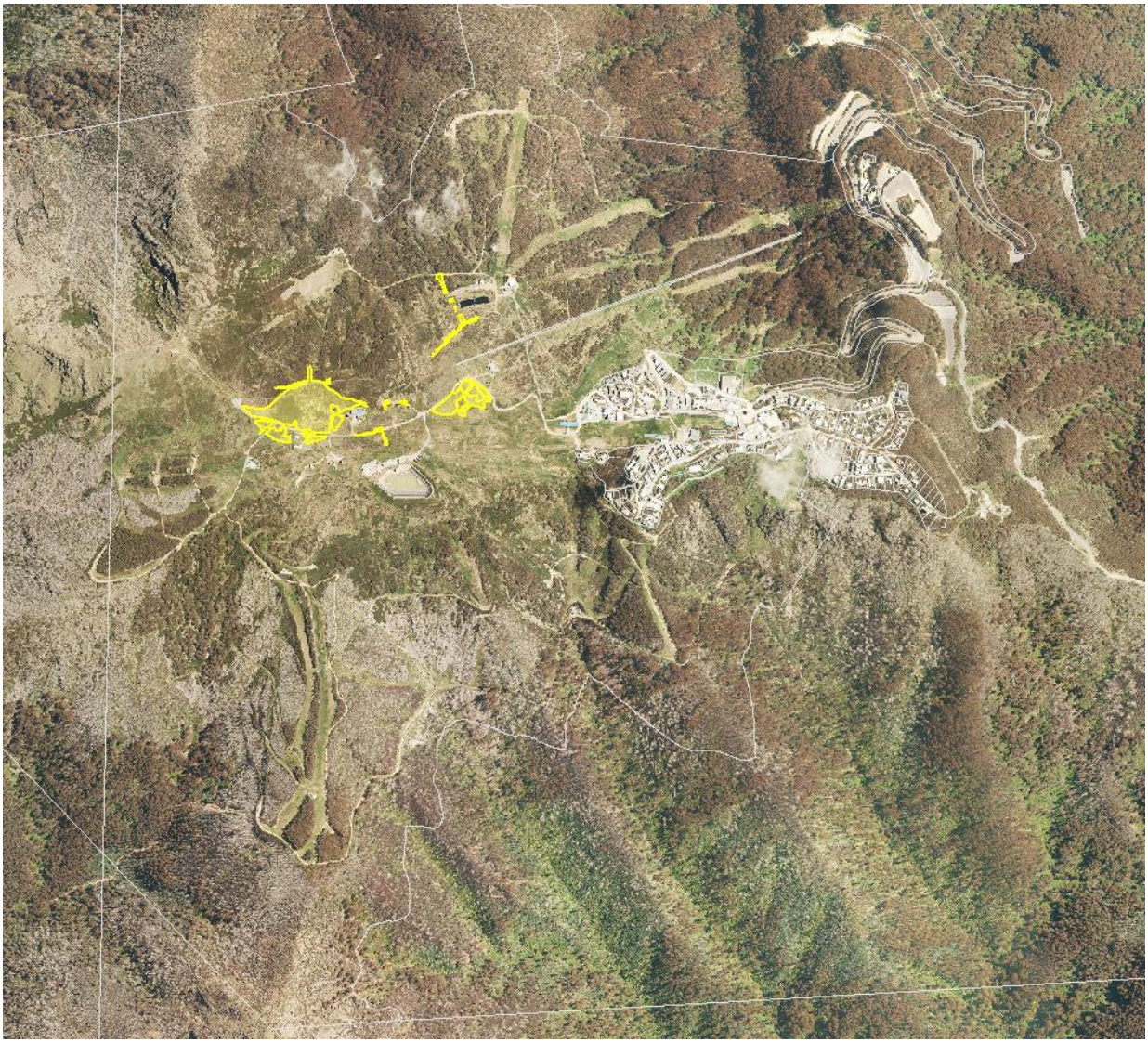
1. Native vegetation location risk map

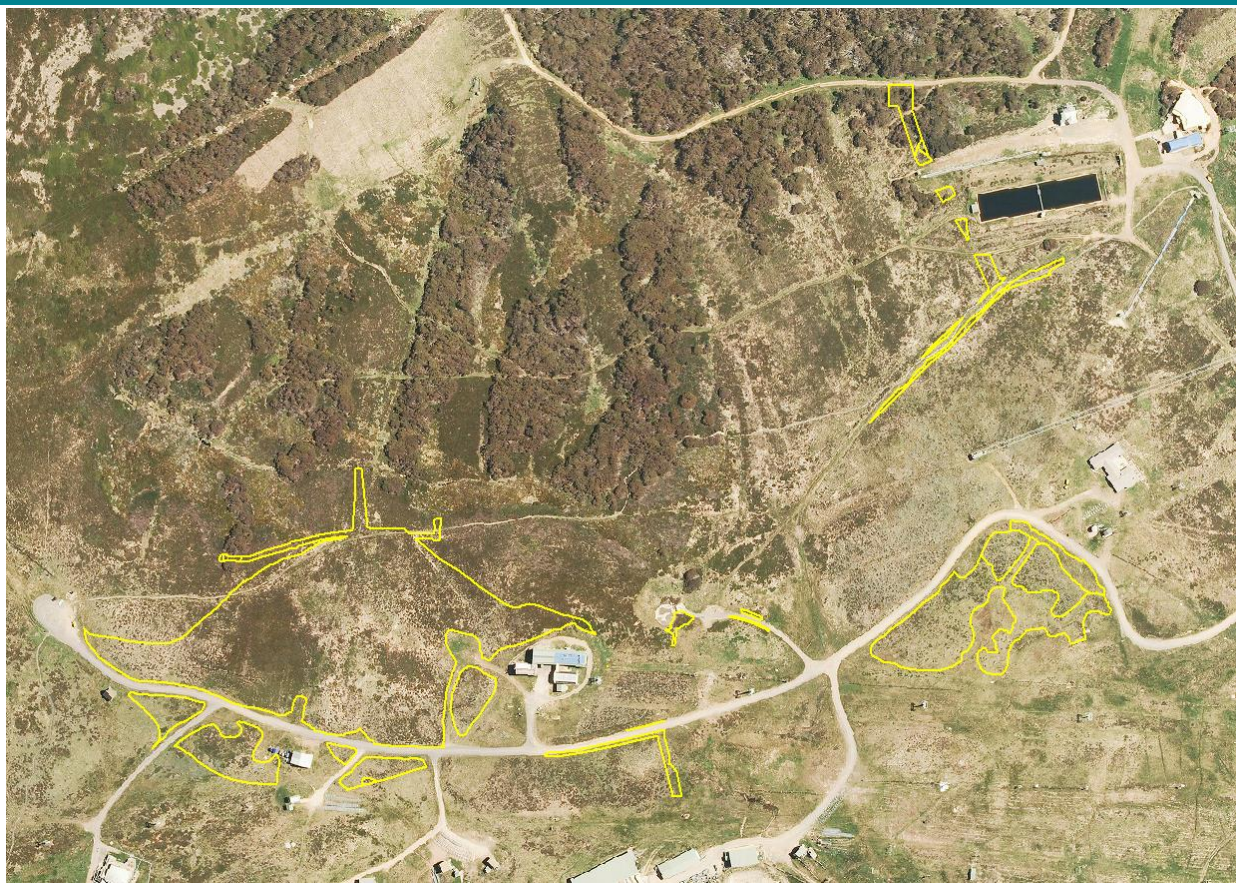


2. Strategic biodiversity score map



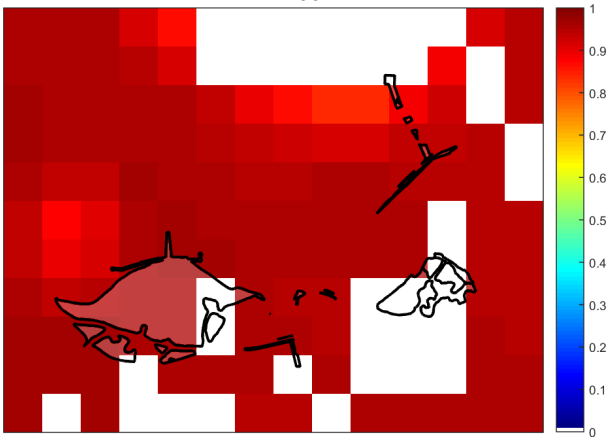
3. Aerial photograph showing marked native vegetation



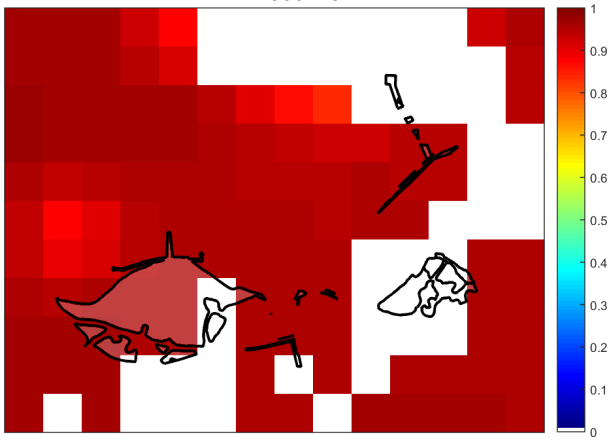


4. Habitat importance maps

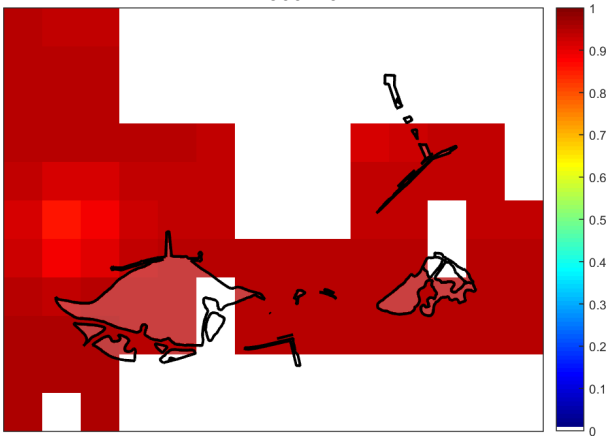
Alpine Bog Skink
Pseudemoia cryodroma
12992



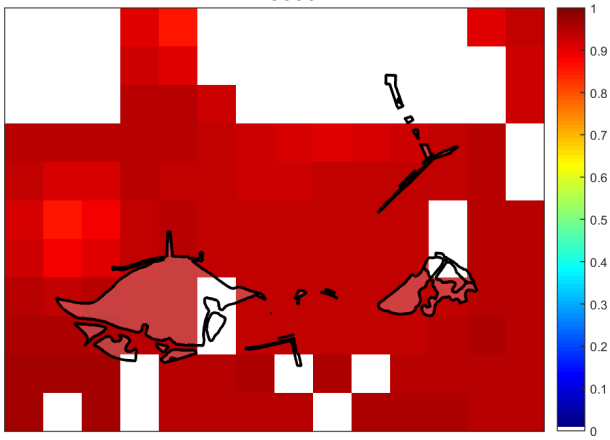
Snow Aciphyll
Aciphylla glacialis
500113



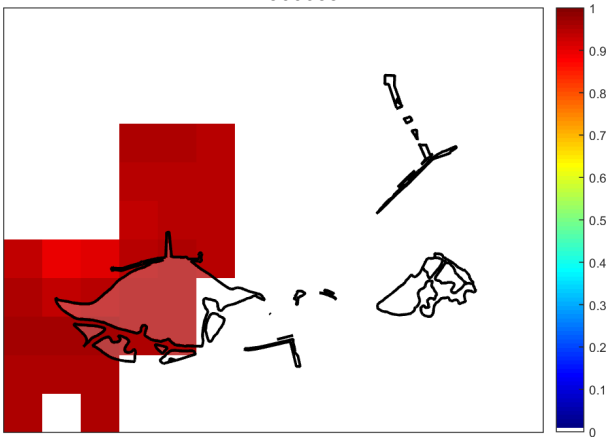
Mountain Daisy
Brachyscome sp. 3
500479



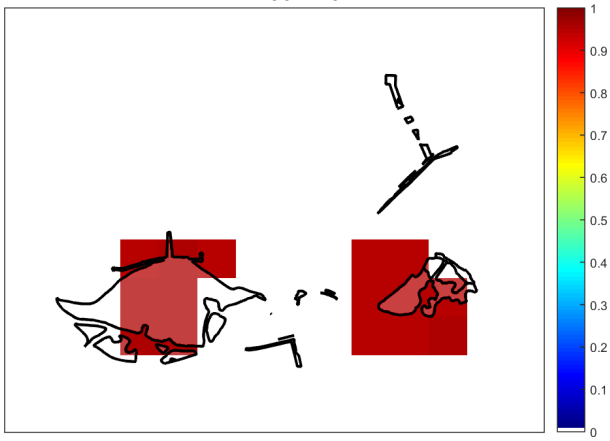
Carpet Sedge
Carex jackiana
500644



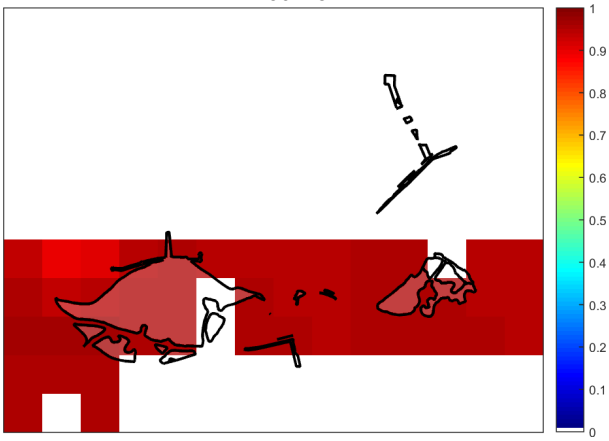
Broad-leaf Flower-rush
Carpha nivicola
500653



Sticky Fleabane
Erigeron nitidus
501215



Fog Club-sedge
Isolepis montivaga
501781



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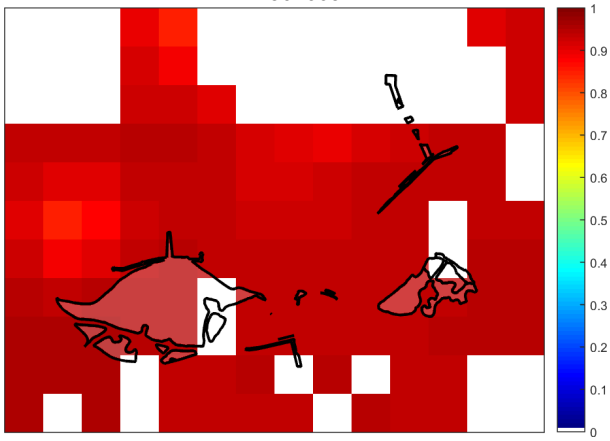

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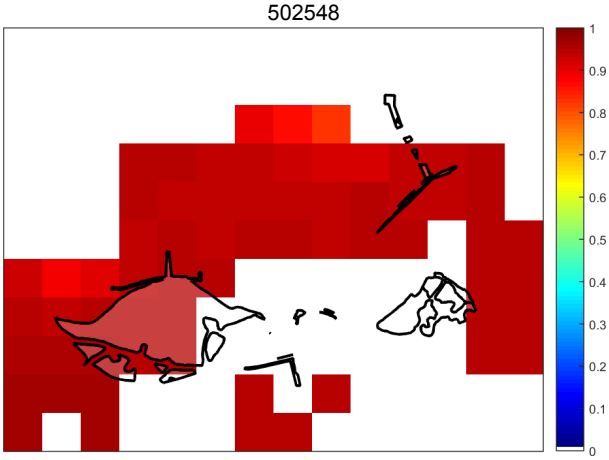

Gunn's Alpine Buttercup
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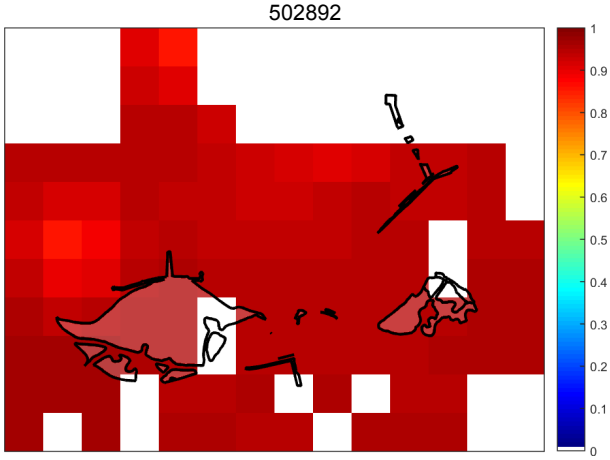
502892



Felted Buttercup
Ranunculus muelleri
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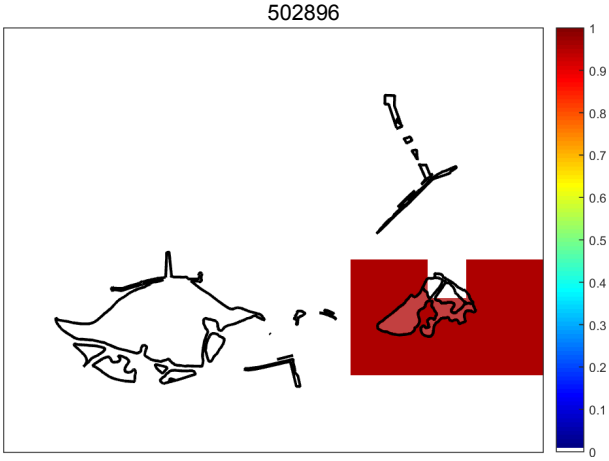

Mossy Knawel
Scleranthus singuliflorus
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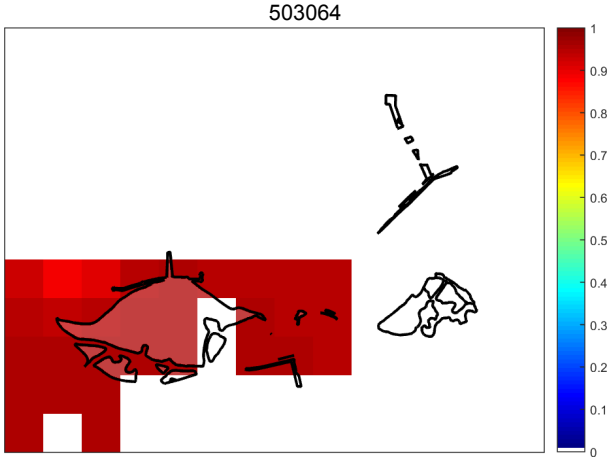
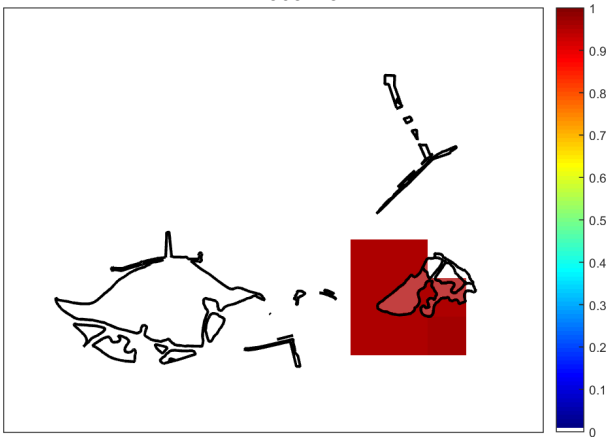
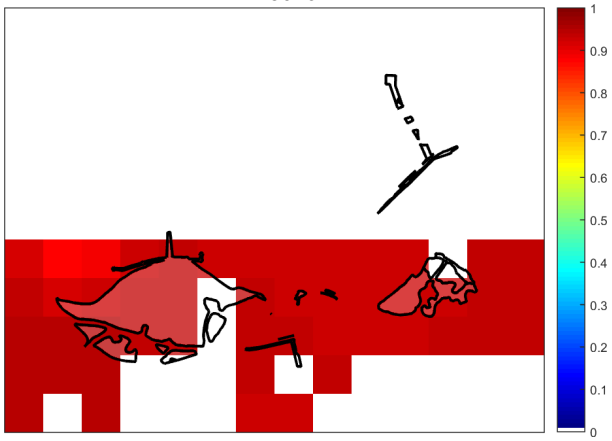


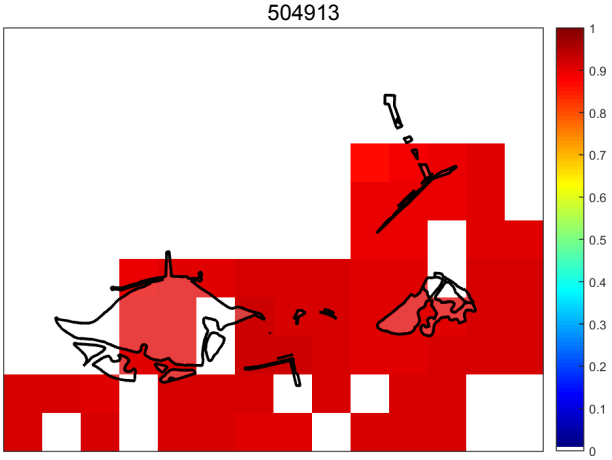
Alpine Stackhousia
Stackhousia pulvinaris
503245



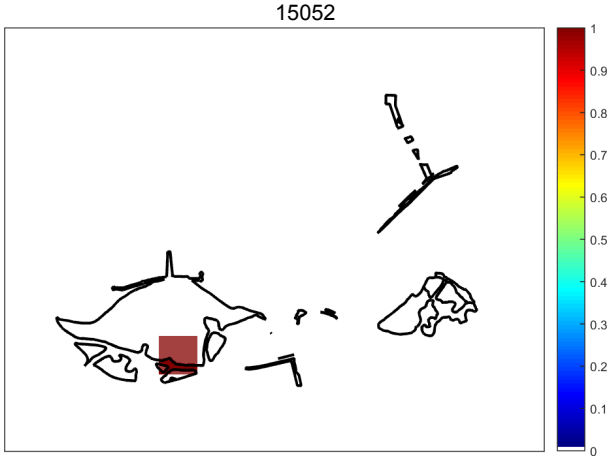
Green Billy-buttons
Craspedia jamesii
504647



Mountain Wallaby-grass
Rytidosperma oreophilum
504913



Planarian
Spathula tryssa
15052



Glossary

Condition score

This is the site-assessed condition score for the native vegetation. Each habitat zone in the clearing proposal is assigned a condition score according to the habitat hectare assessment method. This information has been provided by or on behalf of the applicant in the GIS file.

Dispersed habitat

A dispersed species habitat is a habitat for a rare or threatened species whose habitat is spread over a relatively broad geographic area greater than 2,000 hectares.

General biodiversity equivalence score

The general biodiversity equivalence score quantifies the relative overall contribution that the native vegetation to be removed makes to Victoria's biodiversity. The general biodiversity equivalence score is calculated as follows:

$$\boldsymbol{General\ biodiversity\ equivalence\ score} = \boldsymbol{habitat\ hectares} \times \boldsymbol{strategic\ biodiversity\ score}$$

General offset amount

This is calculated by multiplying the general biodiversity equivalence score of the native vegetation to be removed by the risk factor for general offsets. This number is expressed in general biodiversity equivalence units and is the amount of offset that is required to be provided should the application be approved. This offset requirement will be a condition to the permit for the removal of native vegetation.

$$\boldsymbol{Risk\ adjusted\ general\ biodiversity\ equivalence\ score} = \boldsymbol{general\ biodiversity\ equivalence\ score\ clearing} \times \mathbf{1.5}$$

General offset attributes

General offset must be located in the same Catchment Management Authority boundary or Municipal District (local council) as the clearing site. They must also have a strategic biodiversity score that is at least 80 per cent of the score of the clearing site.

Habitat hectares

Habitat hectares is a site-based measure that combines extent and condition of native vegetation. The habitat hectares of native vegetation is equal to the current condition of the vegetation (condition score) multiplied by the extent of native vegetation. Habitat hectares can be calculated for a remnant patch or for scattered trees or a combination of these two vegetation types. This value is calculated for each habitat zone using the following formula:

$$\boldsymbol{Habitat\ hectares} = \boldsymbol{total\ extent\ (hectares)} \times \boldsymbol{condition\ score}$$

Habitat importance score

The habitat importance score is a measure of the importance of the habitat located on a site for a particular rare or threatened species. The habitat importance score for a species is a weighted average value calculated from the habitat importance map for that species. The habitat importance score is calculated for each habitat zone where the habitat importace map indicates that species habitat occurs.

Habitat zone

Habitat zone is a discrete contiguous area of native vegetation that:

- is of a single Ecological Vegetation Class
- has the same measured condition.

Highly localised habitat

A highly localised habitat is habitat for a rare or threatened species that is spread across a very restricted area (less than 2,000 hectares). This can also be applied to a similarly limited sub-habitat that is disproportionately important for a wide-ranging rare or threatened species. Highly localised habitats have the highest habitat importance score (1) for all locations where they are present.

Minimum strategic biodiversity score

The minimum strategic biodiversity score is an attribute for a general offset.

The strategic biodiversity score of the offset site must be at least 80 per cent of the strategic biodiversity score of the native vegetation to be removed. This is to ensure offsets are located in areas with a strategic value that is comparable to, or better than, the native vegetation to be removed. Where a specific and general offset is required, the minimum strategic biodiversity score relates only to the habitat zones that require the general offset.

Offset risk factor

There is a risk that the gain from undertaking the offset will not adequately compensate for the loss from the removal of native vegetation. If this were to occur, despite obtaining an offset, the overall impact from removing native vegetation would result in a loss in the contribution that native vegetation makes to Victoria's biodiversity.

To address the risk of offsets failing, an offset risk factor is applied to the calculated loss to biodiversity value from removing native vegetation.

$$\boldsymbol{Risk\ factor\ for\ general\ offsets} = \mathbf{1.5}$$

$$\boldsymbol{Risk\ factor\ for\ specific\ offset} = \mathbf{2}$$

Offset type

The specific-general offset test determines the offset type required.

When the specific-general offset test determines that the native vegetation removal will have an impact on one or more rare or threatened species habitat above the set threshold of 0.005 per cent, a specific offset is required. This test is done at the permit application level.

A general offset is required when a proposal to remove native vegetation is not deemed, by application of the specific-general offset test, to have an impact on any habitat for any rare or threatened species above the set threshold of 0.005 per cent. All habitat zones that do not require a specific offset will require a general offset.

Proportional impact on species

This is the outcome of the specific-general offset test. The specific-general offset test is calculated across the entire proposal for each species on the native vegetation permitted clearing species list. If the proportional impact on a species is above the set threshold of 0.005 per cent then a specific offset is required for that species.

Specific offset amount

The specific offset amount is calculated by multiplying the specific biodiversity equivalence score of the native vegetation to be removed by the risk factor for specific offsets. This number is expressed in specific biodiversity equivalence units and is the amount of offset that is required to be provided should the application be approved. This offset requirement will be a condition to the permit for the removal of native vegetation.

$$\boldsymbol{Risk\ adjusted\ specific\ biodiversity\ equivalence\ score} = \boldsymbol{specific\ biodiversity\ equivalence\ score\ clearing} \times \mathbf{2}$$

Specific offset attributes

Specific offsets must be located in the modelled habitat for the species that has triggered the specific offset requirement.

Specific biodiversity equivalence score

The specific biodiversity equivalence score quantifies the relative overall contribution that the native vegetation to be removed makes to the habitat of the relevant rare or threatened species. It is calculated for each habitat zone where one or more species habitats require a specific offset as a result of the specific-general offset test as follows:

$$\boldsymbol{Specific\ biodiversity\ equivalence\ score} = \boldsymbol{habitat\ hectares} \times \boldsymbol{habitat\ importance\ score}$$

Strategic biodiversity score

This is the weighted average strategic biodiversity score of the marked native vegetation. The strategic biodiversity score has been calculated from the *Strategic biodiversity map* for each habitat zone.

The strategic biodiversity score of native vegetation is a measure of the native vegetation's importance for Victoria's biodiversity, relative to other locations across the landscape. The *Strategic biodiversity map* is a modelled layer that prioritises locations on the basis of rarity and level of depletion of the types of vegetation, species habitats, and condition and connectivity of native vegetation.

Total extent (hectares) for calculating habitat hectares

This is the total area of the marked native vegetation in hectares.

The total extent of native vegetation is an input to calculating the habitat hectares of a site and in calculating the general biodiversity equivalence score. Where the marked native vegetation includes scattered trees, each tree is converted to hectares using a standard area calculation of 0.071 hectares per tree. This information has been provided by or on behalf of the applicant in the GIS file.

Vicinity

The vicinity is an attribute for a general offset.

The offset site must be located within the same Catchment Management Authority boundary or Local Municipal District as the native vegetation to be removed.

Appendix 5 Biodiversity assessment guidelines glossary

Items marked with 'A' are cited from DEPI (2013a) ; items marked with 'B' are cited from DSE (2007b) and items marked with a 'C' are cited from DEPI (2014b).

Avoid [A]

Avoiding removing any native vegetation when undertaking a use or development. This can be either by not permitting or not going ahead with the use or development, or locating it elsewhere so that removing native vegetation is not required.

Benchmark [B]

A standard vegetation –quality reference point, dependent on vegetation type, which is applied in Habitat hectare assessments. Represents the average characteristics of a mature and apparently long undisturbed state of the same vegetation type.

Biodiversity [A]

The variety of all life forms, the different plants, animals and microorganisms, the genes they contain, and the ecosystems of which they form a part.

Biodiversity Interactive Map (BIM)

Web based interactive map available on the DSE website that provides information on the biodiversity of Victoria and displays flora and fauna data from the Victorian Biodiversity Atlas.

Bioregion [B]

Biogeographic areas that capture the patterns of ecological characteristics in the landscape or seascape, providing a natural framework for recognising and responding to biodiversity values. A landscape based approach to classifying the land surface using a range of environmental attributes such as climate, geomorphology, lithology and vegetation.

BushBroker [A]

A program coordinated by DELWP to match parties that require native vegetation offsets with third party suppliers of native vegetation offsets.

Canopy Tree [C]

Is a mature tree greater than 3 m in height and is normally found in the upper layer of a vegetation type. Immature trees that are not yet able to flower and are less than three metres in height are considered part of the understorey (see definition of understorey).

Condition score

The score assigned to a habitat zone that indicates the quality of the vegetation relative to the ecological vegetation class benchmark, usually expressed as a percentage or on a scale of 0 to 1.

Degraded treeless vegetation [B]

Vegetation that is neither a wetland, a remnant patch nor scattered tree(s).

DBH (Diameter at Breast Height) [B]

The diameter of the main trunk of a tree measured 1.3 m above ground level.

Dispersed habitat [A]

Habitat for a rare or threatened species whose habitat is spread over a relatively broad geographic area.

Ecological vegetation class (EVC) [A]

A native vegetation type classified on the basis of a combination of its floristic, life form, environmental and ecological characteristics.

EVC (see Ecological vegetation class) [B]

Extent risk [A]

The level of risk to biodiversity from the removal of native vegetation based on the area and/or number of scattered trees to be removed.

Forb

A herbaceous flowering plant that is not a graminoid (grass, sedge or rush).

Gain [A]

Predicted improvement in the contribution to Victoria's biodiversity achieved from an offset, calculated by combining site gain with the strategic biodiversity score or habitat importance score of the site. Gain is measured with biodiversity equivalence scores or units.

Gain Target [B]

The amount of gain that needs to be achieved to offset a loss measured in Habitat hectares.

General biodiversity equivalence score / units [A]

Score or units used to quantify the relative overall contribution of a site to Victoria's biodiversity.

General offset [A]

An offset that is required when a proposal to remove native vegetation is not deemed, by application of the specific-general offset test, to have a significant impact on habitat for any rare or threatened species.

General provisions [A]

Operational requirements in planning schemes which are consistent across the state, relating to matters such as administrative provisions, ancillary activities and referral of applications.

Habitat hectares [A]

Combined measure of condition and extent of native vegetation. This measure is obtained by multiplying the site's condition score (measured between 0 and 1) with the area of the site (in hectares).

Habitat hectares benchmark [A]

A reference point for each vegetation type that represents the average condition of mature stands that are likely to reflect pre-settlement circumstances.

Habitat hectares site assessment [A]

A site-based measure of the condition of native vegetation with reference to the benchmark for the same type of native vegetation. The assessment generates a condition score of between 0 and 1.

Habitat importance map [A]

A map that indicates the importance of locations as habitat for a particular rare or threatened species. This map is based on modelled data.

Habitat importance score [A]

Measure of the importance of the habitat located on a site for a particular rare or threatened species.

Habitat zone [B]

A discrete area of native vegetation consisting of a single vegetation type (EVC) within an assumed similar quality. This is the base spatial unit for conducting a Habitat hectare assessment. Separate *Vegetation Quality Assessments* (or Habitat hectare assessments) are conducted for each habitat zone within the designated assessment area.

Highly localised habitat [A]

Habitat for rare or threatened species whose habitat is spread over a very restricted area (i.e. less than 2,000

Highly localised habitat [A] **(cont.)**

ha). This can also be applied to a similarly limited sub-habitat that is disproportionately important for a wide-ranging rare or threatened species.

Improvement gain [B]

This is gain resulting from management commitments beyond existing obligations under legislation to improve the current vegetation quality. Achieving improvement gain is predicated on maintenance commitments being already in place. For example, control of any threats such as grazing that could otherwise damage the native vegetation must already be agreed. Typical actions leading to an improvement gain include reducing or eliminating environmental weeds, enhancement planting or revegetation over a 10-year management period. If the vegetation is to be used as an offset, a commitment to maintain the improvement gain (i.e. no subsequent decline in quality) will be required in perpetuity.

Incorporated document [A]

A document that is included in the list of incorporated documents in a planning scheme. These documents affect the operation of the planning scheme.

Indigenous vegetation [B]

The type of native vegetation that would have normally been expected to occur on the site prior to European settlement.

Landholder [A]

An owner, occupier, proprietor or holder of land.

Landowner [A]

Owner of land.

Landscape scale information [A]

Mapped or modelled information based on data collected across the landscape rather than just on a particular site.

Large Old Tree (LOT) [B]

A tree with a DBH equal to or greater than the large tree diameter as specified in the relevant EVC benchmark.

Listed species

A flora or fauna species listed under the Commonwealth *Environment Protection and Biodiversity Act 1999* or listed as threatened under the Victorian *Flora and Fauna Guarantee Act 1988*.

Local Planning Policy Framework [A]

Framework outlining a Municipal Strategic Statement and the Local Planning Policies that apply to the local government area.

Location risk [A]

The risk that removing native vegetation in a particular location will have an impact on the persistence of a rare or threatened species.

Loss[A]

Loss in the contribution to Victoria's biodiversity when native vegetation is fully or partially removed, as measured in biodiversity equivalence scores or units.

Maintenance Gain [B]

This is gain from commitments that contribute to the maintenance of the current vegetation quality over time (i.e. avoiding any decline). Includes foregoing certain entitled activities that could otherwise damage or remove native vegetation, such as grazing or firewood collection. Also typically requires a commitment to ensure no further spread of environmental weeds that may otherwise result in the loss of vegetation quality over time. If the vegetation is to be used as an offset, a commitment to maintain the vegetation quality will be required in perpetuity.

Minimise [A]

Locating, designing or managing a use or development to reduce the impacts on biodiversity from the removal of native vegetation.

Native (indigenous) vegetation [B]

Native vegetation is plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses (as defined in Clause 72 of the planning scheme).

Native vegetation credit [A]

Gains in the contribution that native vegetation makes to Victoria's biodiversity that are registered on the native vegetation credit register. Native vegetation credits are offered for sale to parties who are required to offset the removal of native vegetation.

Native vegetation credit register [A]

A statewide register of native vegetation credits that meet minimum standards for security and management of sites. The register is administered by the Department of Environment and Primary Industries, and records the creation, trade and allocation of credits to meet specific offset requirements.

Native vegetation extent [A]

Area of land covered by native vegetation or the number of scattered trees.

Native Vegetation Information Management (NVIM) system [A]

An online tool used to access information about Victoria's native vegetation.

Native vegetation particular provision [A]

Clause 52.17 in the Victoria Planning Provisions that relates to the removing, destroying or lopping of native vegetation.

No net loss [A]

An outcome where a particular gain in the contribution to Victoria's biodiversity is equivalent to an associated loss in the contribution to Victoria's biodiversity from permitted clearing.

Offset [A]

Protection and management (including revegetation) of native vegetation at a site to generate a gain in the contribution that native vegetation makes to Victoria's biodiversity. An offset is used to compensate for the loss to Victoria's biodiversity from the removal of native vegetation.

Offset Management Plan (OMP)

A document which sets out the requirements for establishment, protection and management of an offset site.

Offset market [A]

A system which facilitates trade of native vegetation credits between parties requiring offsets and third party suppliers of offsets.

Old tree [B]

A tree with a DBH equal to or greater than 0.75 of the large tree diameter as specified in the relevant EVC benchmark. Includes medium old trees and large old trees (see separate definitions). Some Regional Native Vegetation Plans additionally define very large old trees (1.5 times large tree diameter).

On-site offset [B]

An offset located on the same property as the clearing.

Particular Provisions [A]

Provisions in the Victoria Planning Provisions that relate to specific activities (for example, native vegetation is a Particular Provision).

Patch (see Remnant Patch)

Permit[A]

A legal document that gives permission for a use or development on a particular piece of land.

Perennial [A]

A plant that lives for more than two years. Perennials include species that are always visible e.g. shrubs and trees, but also include species that are not always visible above ground.

Permitted clearing [A]

Removal of native vegetation for which a planning permit has been granted to remove native vegetation.

Permitted clearing regulations [A]

The rules in the planning system that regulate permits for the removal of native vegetation.

Planning provisions – See Victoria Planning Provisions.

Prior management gain

This gain acknowledges actions to manage vegetation since State-wide planning permit controls for native vegetation removal were introduced in 1989.

Planning scheme [A]

Policies and provisions for the use, development and protection of land in a local government area.

Planning system [A]

Victoria's land-use planning system that includes the Victoria Planning Provisions and each local government's planning scheme.

Property Vegetation Plan [B]

A plan which relates to the management of native vegetation within a property, and which is contained within an agreement made pursuant to section 69 of the Conservation, Forests and Lands Act 1987.

Protected species

A flora species protected under the *Victorian Flora and Fauna Guarantee Act 1988.*

Protection (of a tree) [B]

An area with twice the canopy diameter of the tree(s) fenced and protected from adverse impacts: grazing, burning and soil disturbance not permitted, fallen timber retained, weeds controlled, and other intervention and/or management if necessary to ensure adequate natural regeneration or planting can occur.

Rare or threatened species [A]

A species that is listed in:

- DELWP's Advisory List of Rare or Threatened Plants in Victoria as 'endangered', 'vulnerable', or 'rare', but does not include the 'poorly known' category
- DELWP's Advisory List of Threatened Vertebrate Fauna in Victoria as 'critically endangered', 'endangered' or 'vulnerable', but does not include 'near threatened' or 'data deficient' categories
- DELWP's Advisory List of Threatened Invertebrate Fauna in Victoria as 'critically endangered', 'endangered' or 'vulnerable', but does not include 'near threatened' or 'data deficient' categories.

Recruitment [B]

The production of new generations of plants, either by allowing natural ecological processes to occur (regeneration etc), by facilitating such processes such as regeneration to occur, or by actively revegetating (replanting, reseeding). See Revegetation.

Referral authority [A]

An authority that a permit application is referred to for decision under Section 55 of the Planning and Environment Act 1987. All referral requirements are specified in Clause 66 of planning schemes.

Remnant patch of native vegetation [A]

Either:

- an area of native vegetation , with or without trees, where at least 25 per cent of the total perennial understorey plant cover is native plants.
- an area with three or more indigenous canopy trees where the tree canopy cover is at least 20 per cent.

Remnant vegetation [B]

Native vegetation that is established or has regenerated on a largely natural landform. The species present are those normally expected in that vegetation community. Largely natural landforms may have been subject to some past surface disturbance such as some clearing or cultivation (or even the activities of the nineteenth century gold rushes) but do not include man-made structures such as dam walls and quarry floors.

Responsible authority [A]

The authority charged with the responsibility for administering and enforcing particular aspects of a planning scheme.

Revegetation [B]

Establishment of native vegetation to a minimum standard in formerly cleared areas, outside of a remnant patch.

Scattered tree [C]

An indigenous canopy tree that does not form part of a remnant patch of native vegetation (see definition of remnant patch of native vegetation).

Section 173 agreements [B]

A management agreement primarily between a landowner and the responsible authority according to section 173 of the Planning and Environment Act 1987.

Security Gain

This is gain from actions to enhance security of the on-going management and protection of native vegetation at the offset site, either by entering into an on-title agreement (for example under Section 173 of the *Planning and Environment Act 1987*), or by locating the offset on land that has greater security than the clearing site, or by transferring private land to a secure public conservation reserve.

Site [A]

An area of land that contains contiguous patches of native vegetation or scattered trees, within the same ownership.

Site-based information [A]

Information that is collected at a site.

Site gain [A]

Predicted improvement in the condition, or the condition and extent, of native vegetation at a site (measured in Habitat hectares) generated by the landowner committing to active management and increased security.

Site loss [A]

Loss in the condition, or condition and extent, of native vegetation when native vegetation is fully or partially removed, measured in Habitat hectares.

sp.

Species (one species).

spp.

Species (more than one species).

Species persistence [A]

The continued existence of a species into the future.

Specific biodiversity equivalence score / units [A]

With reference to a specific species, a score or units used to quantify the relative contribution of a site to Victoria's biodiversity.

Specific-general offset test [A]

A test used to determine whether a general or specific offset is required based on the impact of native vegetation removal on the habitat for rare or threatened species.

Specific offset [A]

An offset that is targeted to a particular species (or multiple species) impacted by the removal of native vegetation.

State Planning Policy Framework [A]

A collection of clauses in the Victoria Planning Provisions that inform planning authorities and responsible authorities of those aspects of state planning policy which they are to take into account and give effect to in planning and administering their respective areas.

Strategic biodiversity map [A]

A map that shows the relative value of a location in the landscape with regard to its condition, extent, connectivity and the support function it plays for species. The map is based on modelled data.

Strategic biodiversity score [A]

A score that quantifies the relative value of a location in the landscape with regard to its condition, extent, connectivity and the support function it plays for species.

Strategic planning [A]

A coordinated approach to planning where areas for conservation and areas which can be cleared are strategically identified.

Supplementary planting

Establishment of overstorey and/or understorey plants within a remnant patch. Typically includes the planting or direct-seeding of understorey life forms.

Taxon (plural taxa)

A term used to describe any taxonomic unit. This term is typically used when referring broadly to any scientifically recognised species, subspecies or variety.

Third-party offset [B]

An offset located on a property owned by a person other than the landowner who incurs the native vegetation loss being offset.

Understorey

Understorey is all vegetation other than mature canopy trees – includes immature trees, shrubs, grasses, herbs, mosses, lichens and soil crust. It does not include dead plant material that is not attached to a living plant. More information on understorey life forms is set out in the Vegetation Quality Assessment Manual (DSE 2004).

Vegetation Quality Assessment

The standard DELWP method for assessing remnant patches of vegetation. Details of the method are outlined in the Vegetation Quality Assessment Method (DSE 2004). The results of the assessment are expressed in Habitat hectares. Also referred to as a 'Habitat hectare assessment'

Victoria Planning Provisions [A]

A list of planning provisions that provides a standard template for individual planning schemes.

Zone [A]

A zone in the Victoria Planning Provisions is a set of permitted uses of land which are defined spatially