Recovery Plan for the Mountain Pygmy-possum *Burramys parvus* on Mount Buller, Victoria

2011 to 2016

Version date: December 2013

CONTENTS

Abbreviations

ARMB	Mount Buller and Mount Stirling Alpine Resort Management Board
BSL	Buller Ski Lifts
DoE	Department of the Environment (Commonwealth, formerly DSEWPaC)
DEH	Department of the Environment and Heritage (Commonwealth former)
DEPI	Department of Environment and Primary Industries (Vic, formerly DSE)
DSE	Department of Sustainability and Environment (Vic, now DEPI)
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities (Commonwealth, formerly DEH)
EPBC	*Environment Protection and Biodiversity Conservation Act* 1999
FFG	*Flora and Fauna Guarantee Act* 1988
NRE	Department of Natural Resources & Environment (Vic, now DEPI)
VMP	Vegetation Management Plan

1.0 PURPOSES OF THIS RECOVERY PLAN

This second Recovery Plan for Mountain Pygmy-possum *Burramys parvus* has been prepared to guide management actions to be undertaken on Mount Buller for the next five years. It briefly reviews achievements of the first Mount Buller Recovery Plan (ARMB 2005a) for the species and identifies limiting constraints that have become apparent during implementation of the first Recovery Plan. This second Recovery Plan aims to use existing knowledge to identify achievable actions for the next five years and nominates the parties responsible for each action, with a view to ensuring the long term persistence of the Mountain Pygmy-possum at Mount Buller.

Several management strategies and plans have been developed previously for the species and these have been reviewed to assist with the preparation of the actions presented in this Recovery Plan.

This Plan is primarily focused on management actions on and for the Mount Buller Alpine Resort. A captive management program, begun in 2006 – 2007 at Healesville Sanctuary, and a translocation strategy which commenced in 2010 – 2011, are not discussed here in detail. While these projects are integral to ensuring the long term conservation and to reducing extinction risk for the Mount Buller Mountain Pygmy-possum population, they are being managed and undertaken separately to management of the Resort and are generally outside the scope of this Plan.

1.1 Recovery Plan Process

There is a wealth of knowledge and understanding relevant to the recovery of the Mountain Pygmy-possum on Mount Buller. This has been compiled from intensive scientific research and seasonal monitoring that has been conducted on the species and its habitat at Mount Buller and other populations. Specifically for Mount Buller there a number of environmental plans that have been developed that are relevant to the conservation of this species. Relevant documentation has been reviewed, and is briefly summarised where relevant, but the focus of this Recovery Plan is on the actions that need to be carried out to ensure that the Mountain Pygmy-possum population survives on Mount Buller.

The process of developing this Recovery Plan has actively involved the individuals – researchers, managers, agency staff and consultants – with knowledge of the Mountain Pygmy-possum on Mount Buller, through an intensive program of workshops and discussions (see Acknowledgments).

1.2 Plan Implementation

The primary responsibility for the implementation of this Recovery Plan lies with the ARMB, but it will also require considerable inputs and support from BSL and DEPI. To facilitate this cooperative approach, the Mount Buller Mountain Pygmy-possum Taskforce was established in 2006 and will continue into the future, to set annual goals, incorporate new knowledge into adaptive management and to report on progress to the ARMB Board annually.

The Taskforce will include at least:

- A representative of the ARMB
- A representative of BSL
- A representative of DEPI.

The ARMB representative will Chair the Taskforce.

ACKNOWLEDGEMENTS

The preparation of this Recovery Plan has been coordinated by Ian Smales of Biosis Pty Ltd, on behalf of the ARMB.

The following individuals made significant inputs to the planning process through their involvement in the workshop and subsequent plan development (in alphabetical order):

Jerry Alexander (DEPI)
Rod Armistead (Biosis Pty Ltd)
Laurie Blampied (BSL)
Aaron Harvey (Biosis Pty Ltd)
Dean Heinze (Consultant)
Matt Janney (BSL)
Louise Perrin (ARMB)
Nick Reeves (BSL)
Rebecca Steer (Biosis Pty Ltd)

The Plan's preparation was also supported by a range of ARMB staff and by the ARMB Board. BSL was also highly supportive of the planning process.

Mapping was prepared Steve Flack, James Shepherd and Matt Looby (Biosis Pty Ltd) and digital base data was supplied by Ed Mahon (BSL) and the ARMB.

Cover photo: Vincent Antony, ARMB.

2.0 INTRODUCTION

Biosis Pty Ltd was commissioned by the Mount Buller and Mount Stirling Alpine Resort Management Board (ARMB) to prepare the second Mount Buller Recovery Plan for the Mountain Pygmy-possum.

This document is the second Mount Buller Recovery Plan for the Mountain Pygmy-possum. This Recovery Plan provides a brief overview of the species, its conservation status and threats across its current range, and then focuses on the Mount Buller population. This document discusses the successful actions, outcomes and identifies limiting constraints made apparent while undertaking the actions set out in the first Recovery Plan. However, the main focus of the Recovery Plan is to use and build on the existing knowledge of the conservation requirements of the Mountain Pygmy-possum, to identify achievable actions, and the parties responsible for each action. The overall aim of the Recovery Plan is to develop and implement strategies to increase the size of the population while protecting, enhancing and maintaining habitat to ensure the long term persistence of the Mountain Pygmy-possum at Mount Buller.

The Plan has a five-year timeframe, 2011-2016, after which an updated Plan will be required. The progress of the Plan will be reviewed annually, with an evaluation of progress against set goals and indicators, and an analysis of the actions undertaken and any improvements needed to adapt to new knowledge and experience.

The ARMB manages the Crown land reserve that includes the Mount Buller and Mount Stirling Alpine Resorts and provides the infrastructure services to the Resorts. There are two areas within the Victorian Alps in which the Mountain Pygmy-possum occurs, the Mount Bogong-Mount Higginbotham area, and the Mount Buller area. The entire known Mountain Pygmy-possum habitat on Mount Buller is contained within the Resort.

This Recovery Plan is the document that will guide the ARMB and other stakeholders, including the ski-field operator, Buller Ski Lifts (BSL), and the Department of Environment and Primary Industries (DEPI), towards the long term survival of the Mountain Pygmy-possum on Mount Buller.

The Mountain Pygmy-possum *Burramys parvus* is the largest of the five pygmy-possums (Family Burramyidae) and is the only extant member of its genus. It is entirely restricted to alpine and sub-alpine environments, dependant on winter snow and is Australia's only marsupial that undergoes hibernation (Heinze *et al*. 2004; Mansergh and Broome 1994). It is an iconic species of the Australia Alps and fulfils several specialised and unique ecological functions. The Mountain Pygmy-possum is listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* and Threatened under the Victorian *Flora and Fauna Guarantee Act 1989*.

The most significant threats to the Mountain Pygmy-possum include habitat loss and fragmentation, predation and climate change. Since the mid-1990s population declines have been documented at Mount Buller and Mount Kosciusko. The Mount Buller decline has been particularly dramatic and consequently there is grave concern for the conservation and persistence of this population (Menkhorst *et al*. 2010).

3.0 LEGISLATIVE AND POLICY CONTEXT

3.1 State Legislation and Policy

3.1.1 Alpine Resorts Planning Scheme

The Alpine Planning Team, within the Department of Transport, Planning and Local Infrastructure (DTPLI), administers the Alpine Resorts Planning Scheme on behalf of the Minister for Planning. The relevant legislation is the *Planning and Environment Act* 1987. The Alpine Planning Team considers proposals to use or develop land and ensures that land is not used or developed in conflict with the requirements of the Act or the Alpine Resorts Planning Scheme.

The ARMB acts as the Crown's representative for leasing and other land management functions and also provides services such as water, sewerage and other municipal services. The ARMB is notified of all applications for planning permits and is given the opportunity to formally comment as the Land Manager. It is the Referral Authority for permit applications that involve the utility services they provide.

3.1.2 Alpine Resorts Strategic Plan 2012

The *Alpine Resorts (Management) Act* 1997 requires the preparation five-yearly review of an Alpine Resorts Strategic Plan. The Alpine Resorts Strategic Plan 2012 was endorsed by the Victorian Government and released in December 2012 (ARCC 2012). The 2012 Plan replaces the Alpine Resorts 2020 Strategy.

The vision of the 2012 Plan is *Victoria's alpine resorts will be vibrant, growing and sustainable places, delivering alpine recreational and tourism experiences that are available to all.*

The 2012 Plan sets out six strategic objectives for Victoria's Alpine Resorts, these include:

- Enhancing the visitor experience and developing resorts
- Delivering resort services and infrastructure efficiently and accountably
- Building partnerships
- Respecting the alpine environment
- Broadening access opportunities
- Regulatory reform.

These objectives are supported by a financial and governance implementation framework and a set of actions.

3.1.3 Flora and Fauna Guarantee Act 1988

The primary State legislation dealing with biodiversity conservation and sustainable use of native flora and fauna is the *Flora and Fauna Guarantee Act* 1988 (FFG Act). The Act is administered by DEPI. The Mountain Pygmy-possum is listed under the FFG Act. Critical Habitat can be declared under the Act for a species, but there have been no areas of Critical Habitat declared for the Mountain Pygmy-possum in Victoria.

A permit under the FFG Act is required to 'take' (kill, injure, disturb or collect) listed flora species, flora species that are members of listed communities or protected flora from public land. A permit is not required to 'take' listed fauna or members of a listed fauna community under the FFG Act. Controls in relation to protection of fauna are provided under the *Wildlife Act* 1975 and the *Wildlife Regulations* 2002.

A FFG Act Action Statement for the Mountain Pygmy-possum has been prepared (DSE 1991). The Action Statement was written prior to the discovery of the Mountain Pygmy-possum on Mount Buller and thus provided no measures related to its protection there. An updated Action Statement for the Mountain Pygmy-possum has been drafted but is not yet released. Action Statements are not legally binding documents but are statements of DEPI policy.

3.1.4 Advisory List of Threatened Vertebrate Fauna in Victoria

The Advisory List is prepared and revised at intervals by the DEPI. The List provides the conservation status of threatened vertebrate fauna in Victoria. The most recent List was published in March 2013.

The Mountain Pygmy-possum is listed on the Advisory List as "critically endangered" in Victoria (DSE 2013).

3.1.5 Native Vegetation Management Framework

Victoria's Native Vegetation Management – A Framework for Action (NRE 2002) sets out State Government policy for the protection, enhancement and revegetation of native vegetation across Victoria. The policy is implemented through the *Planning and Environment Act* 1987, under Amendment VC 19 to the Victoria Planning Provisions. In association with Regional Native Vegetation Plans which have been prepared by each Catchment Management Authority, the Framework provides decision-making tools for native vegetation management. The policy has adopted the principle that there should be a net gain in the extent/quality of native vegetation throughout the state, whereby, there is:

> *a reversal, across the whole landscape, of the long-term decline in the extent and quality of native vegetation, leading to a Net Gain* (NRE 2002).

Actions that impact on native vegetation will need to consider the Net Gain policy as part of the permit process.

Reforms to the Framework are currently underway and the Victorian Government plans to replace the current policy with a new policy: *Permitted clearing of native vegetation – Biodiversity assessment guidelines 2013* (the 'Guidelines'). These Guidelines had not been introduced at the time of releasing this version of the Recovery Plan but their implications for native vegetation management at the Mount Buller will need to be considered in future Plans.

3.2 Commonwealth Legislation

3.2.1 Environment Protection and Biodiversity Conservation Act

Under the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act), actions, unless exempt, require approval from the Australian Government Minister for the Environment if they are likely to significantly impact on a 'matter of national environmental significance'. There are currently nine matters of national environmental significance defined for the purposes of the Act. The relevant matter in relation to the Mountain Pygmy-possum is "nationally listed threatened species and ecological communities". The Mountain Pygmy-possum is listed under the Act as "endangered".

Any person proposing to take an action that may, or will, have a significant impact on a matter of national environmental significance must refer the action to the Australian Government Minister for Environment for determination as to whether the action is a 'controlled action'. If this is the case, the Minister will determine the type of environmental assessment and reporting that is required and make a decision on whether or not to approve the taking of the action.

Under the Commonwealth's assessment guidelines:

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

- *lead to a long-term decrease in the size of a population*
- *reduce the area of occupancy of the species*
- *fragment an existing population into two or more populations*
- *adversely affect habitat critical to the survival of a species*
- *disrupt the breeding cycle of a population*
- *modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*
- *result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*
- *introduce disease that may cause the species to decline, or*
- *interfere with the recovery of the species.*

Under these guidelines, almost any action that has the potential to negatively impact directly or indirectly on Mountain Pygmy-possum habitat at Mount Buller, will be referrable to the Minister under the Act.

The EPBC Act contains several compliance and enforcement mechanisms, including court injunctions, required environmental audits, strict civil and criminal penalties (which include fines up to $550,000 for an individual or $5.5 million for a body corporate, and jail terms of up to seven years), remediation of environmental damage, liability of executive officers and publicising of contraventions. Under certain circumstances, an executive officer of a body corporate can be liable for civil penalties and criminal offences (including up to two years imprisonment) for a contravention of the EPBC Act committed by the body corporate.

4.0 THE MOUNTAIN PYGMY-POSSUM

4.1 Conservation Status

The Mountain Pygmy-possum is listed as endangered under the *Commonwealth Environment Protection and Biodiversity Conservation Act* 1999, endangered under the New South Wales *Threatened Species Act* 1995, and threatened under the Victorian *Flora and Fauna Guarantee Act* 1988.

4.2 Distribution

The Mountain Pygmy-possum occurs as three geographically distinct populations (Figure 1). The three populations are located in alpine areas above the winter snow line (>1300 m) that are separated by valleys in south-eastern Australia. The three populations are at:

- Mount Kosciuszko in New South Wales
- Mount Bogong-Mount Higginbotham in Victoria
- Mount Buller in Victoria (Mansergh and Broome 1994).

Each population is further limited and fragmented by the patchiness of their preferred boulderfield and alpine heathland habitat (Heinze *et al.* 2004). It is estimated that there is less than seven km^2 of habitat in total across the three populations. This includes less than four km^2 in Kosciusko National Park, less than two km^2 in the Mount Bogong-Mount Higginbotham area, and less than one km^2 of Type I habitat at Mount Buller (Heinze *et al.* 2004).

Each population has been shown to be genetically unique from the others at a level sufficient for the three populations to be identified as unique Evolutionarily Significant Units (ESU) (Moritz 1994). It is intended that even with a genetic augmentation program (see Section 7.1), all geographically separated populations will remain substantially genetically distinct from each other.

4.3 Abundance

Because of the cryptic nature of the species, it is extremely difficult to determine how many Mountain Pygmy-possums are present in each population. However, monitoring has occurred at survey sites within known and potential habitat located within the three geographically isolated regions. Detailed long-term surveys have occurred at selected surveys sites to monitor fluctuations within the three populations. Additional detailed ecological and biological studies have also been undertaken within many of the larger sub-populations.

These assessments have provided a good understanding of the current distribution, relative abundance, biology and ecology of the Mountain Pygmy-possum. In 2007, the total population of Mountain Pygmy–possums across the three regions was estimated at approximately 2030 (1505 females and 525 males) adult individuals. This included 355 individuals in the Mount Kosciuszko region, 1645 in the Mount Bogong-Mount Higginbotham region and 30 in the Mount Buller

population (Menkhorst *et al*. 2010). An additional 38 animals are presently held at Healesville Sanctuary for captive breeding purposes (Menkhorst *et al*. 2010).

However, revised population estimates and actual declines at Mount Buller and Mount Kosciusko suggest that the overall Mountain Pygmy-possum population may be considerably less than the 2007 estimate of 2030 individual adults. The most dramatic decline has occurred at Mount Buller where a 90% reduction in population size has been recorded. The most critical goal of this Recovery Plan is to undertake actions aimed at reversing this decline and actively increasing the Mount Buller Mountain Pygmy-possum population size. In contrast, the most populated and stable region includes the Mount Loch-Mount Higginbotham areas. More than half the World's Mountain Pygmy-possum population occurs in these areas.

The surveys have also provided an understanding of home range, winter/summer nesting behaviour, diet and habitat use.

4.4 Habitat

Mountain Pygmy-possums are limited in distribution by their preference for deep boulderfields at high elevations above the winter snow line (>1300 m ASL). These boulderfield habitats have been formed by a cycle of freezing and thawing which, over time, has broken up the underlying rock into boulders. The spaces between the boulders provide protection from extremes of temperature. These spaces also provide summer habitat for the migratory Bogong Moth *Agrotis infusa*, which often occur in large numbers and are a major component of the Mountain Pygmy-possum dietary requirements. The vegetation is also an important component of the habitat requirements of the Mountain Pygmy-possum. Alpine heathland, typically dominated by Mountain Plum-pine *Podocarpus lawrencei* and other shrubs, provides cover, nesting material, seeds and fruit which are key components of the Mountain Pygmy-possum diet.

Heinze (2002) classified the Mountain Pygmy-possum preferred habitat into two distinct groups, Type I and Type II habitat. The characteristics of these are explained below and mapped in Figure 3.

Habitat Type I is the habitat type where Mountain Pygmy-possums occur at the highest densities and generally breed (Heinze and Harvey 2006). It is composed of boulderfields and rocky outcrops that are dominated by Mountain Plum-pine and other alpine Heathland Communities (Heinze and Harvey 2006). This habitat type occurs at higher elevations with high densities of the Mountain Plum-pine and deeper boulderfields. These areas support greater numbers of Bogong Moths. On Mount Buller the total area of Type I habitat comprises of 32.39 ha (Heinze and Harvey 2006).

Habitat Type II is habitat where Mountain Pygmy-possums occur at relatively lower densities and is less preferred as breeding sites (Heinze and Harvey 2006). It is more varied than Habitat Type I and is composed of boulderfields, rocky outcrops, and isolated patches of Mountain Plum-pine Heathland, buried boulderfields, dense Snow Gum canopy cover and a range of heathland communities. Type II habitat occurs on more exposed aspects, lower altitudes and has poor snow holding capacity. Although less optimal than Type I habitat, this habitat type is extremely important for breeding, migrating and providing cover for dispersing individuals. On Mount Buller, the total area of Type II habitat comprises of 192.13 ha (Heinze and Harvey 2006).

4.5 Life History and Social Organisation

The Mountain Pygmy-possum has a unique life history. It is one of the longest-lived small terrestrial mammals in Australia, with some females known to live up to 12 years of age. Males generally live to 5 years of age. It is Australia's only small mammal known to hibernate beneath the winter snow. In Victoria, there is a naturally skewed and variable gender ratio, with fewer males than females (typically ranging from 1:3 to 1.6, with instances of 1:22 recorded in the Mount Buller population). In the 2010 survey period, no gender bias was record with male to female ratio equal to 1:1 (Heinze *pers. comm.* 2011).

After mating has occurred, males and females segregate and use different habitat areas. The males move to lower elevation areas that are less resource-rich, while the lactating females and young remain in resource-rich higher elevations. The ability for males and females to move between elevations and habitat patches is critical for the normal social functioning of the species. In addition, corridors linking habitat patches provide juvenile possums with increased opportunities to disperse from their maternal nest sites. The protection and/or re-connection of links between habitats at lower and higher elevations are extremely important to the persistence of the Mountain Pygmy-possum.

4.6 Mount Buller population of the Mountain Pygmy-possum

The Mountain Pygmy-possum was first discovered on Mount Buller in 1996 (Heinze and Williams 1998). But development for skiing had been occurring in the region for several decades prior to this discovery leading to significant habitat loss, modification and fragmentation of once connected habitats. The most optimal Mountain Pygmy-possum habitat lies on the southern slopes where the better ski runs, including Fanny's Finish ski run to Standard ski run are located. There is habitat on the northern slopes of the Summit which is largely outside ski run areas.

In 1996, the population of the Mountain Pygmy-possum at Mount Buller was estimated at 300 adult females. Since then surveys have shown a steady decline in population size. For example, in 2002, it was estimated that 150 adult females were present in the population, then less than 100 in 2003 and 2004 and between 50 – 100 in 2006 (Heinze 2005, Heinze 2006, 2006a; Menkhorst *et al.* 2010). However, the most recent estimates suggest the populations may be as low as 20 - 30 total individuals, including males and females (Heinze pers. comm. 2011). This sudden and dramatic decline is of great concern and suggests that this population is at risk of becoming extinct.

As previously mentioned, the major factors contributing to the current decline include habitat loss and fragmentation, bushfire, predation and climate change.

The population at Mount Buller is now at critically low levels, and urgent management action is required to redress this situation.

5.0 PREVIOUS RECOVERY ACTIONS 2005 - 2010

5.1 Research and annual monitoring

Research and annual monitoring of Mount Buller Mountain Pygmy-possums has occurred since 1996. Nine sites within Type I habitats have been surveyed annually using live capture-mark-recapture (CMR) techniques. These sites are shown numbered within Type I habitats in Figure 2. Data from these surveys has identified a dramatic population decline that has occurred during the past ten years.

5.2 Habitat mapping and rehabilitation projects

Habitat availability is the major factor limiting the distribution of Mountain Pygmy-possums. As outlined in Section 4, considerable damage and habitat alteration occurred prior to the discovery of Mountain Pygmy-possums at Mount Buller in 1996. Several successful projects have been implemented to recreate, restore and extend habitats required by Mount Buller Mountain Pygmy-possums including:

I. All Type I and Type II habitat has been mapped in detail and reported in Heinze and Harvey (2006). It is provided as Figure 3 in this Recovery Plan. Heinze and Harvey (2006) identified an additional 3.58 ha of Mountain Pygmy-possum habitat that had not been identified during earlier habitat assessments, including an additional 27% of Type I habitat and 1% less of Type II habitat.

II. The development and partial implementation of the first *Revegetation and Habitat Restoration Plan for Mountain Pygmy-possums* Burramys parvus *at Mount Buller* (MacPhee and Harvey 2007).

III. The development and partial implementation of the *Boulderfield Habitat Feasibility Study* (SMEC Australia 2007).

IV. Habitat isolation and fragmentation was reduced with the installation of six boulderfield tunnels linking previously fragmented habitat areas (Figure 4). These tunnels are similar to the "Tunnel of Love" at Mount Hotham.

V. Habitat has been recreated with the construction of two boulderfields each of approximately 0.25 ha in size and using in excess of 2000 cubic metres of rock. This includes habitat connecting Federation Bowl to Wombat Valley by creating 2000 m^2 of Type 1 and 1950 m^2 of Type II Habitat and restoration of previously cleared boulderfield habitat to connect Bull Run Bowl with the Funnel by creating 2510 m^2 of Type I and 3380 m^2 of Type II. Revegetation within these areas of habitat has occurred involving the establishment of over 50,000 plants. Revegetated areas are shown in Figure 4.

5.3 Road & track management

Development and implementation of the *Vehicular Roads and Tracks Management Strategy* (2007) has been undertaken. It aims to:

I. Reduce fragmentation of habitat by roads and tracks.

II. Create corridors underneath roads and tracks to reconnect previously isolated habitat patches.

III. Minimise the inputs of sediment (see below), weeds and litter from roads and tracks into habitat.

IV. Reduce predator access to Type I and Type II habitat.

5.4 Sediment control

Sediment, occurring primarily due to run-off from roads and tracks, has potential to reduce or degrade habitat for Mountain Pygmy-possums if it infiltrates boulder scree. The interstitial spaces between rocks are micro-habitat of great importance to the species and these spaces can become filled with sediment where boulder scree downslope of sediment sources acts as a sediment trap. BSL has undertaken trials of different designs of traps to collect sediment at roadsides and has settled on a 'best practice' design that performs well to reduce environmental impact:

I. One hundred and eighty-two 'best practice 'sediment traps have been installed.

II. Approximately 18 m^3 of sedimentary material per annum has been collected by sediment traps and removed thus preventing its potential infiltration into Mountain Pygmy-possum habitat.

5.5 Fire protection

The following actions have been undertaken during the past five year period with a view to protection of Mountain Pygmy-possums and their habitat from deleterious impacts of fire:

I. *Habitat and Fire Severity Mapping Project* (Harvey 2008) has been completed post 2006-2007 fires (Figure 5).

II. A *Bushfire Management Plan* has been produced (ARMB 2010) using the mapping information provided in Heinze and Harvey (2006). This report strongly recommends that all Type I and Type II habitats are to be protected from fire and as a result this habitat has been included in the Resort's asset listings under its Bushfire Management Plan.

III. Review of the DEPI *Regional Fire Management Plan* to ensure that it fully takes into account the identification and protection of Mountain Pygmy-possum habitat on Mount Buller.

IV. DEPI *Regional Fire Management Plan* provides that no planned burning is to be undertaken in Mountain Pygmy-possum habitat or in areas where fire may escape and threaten habitat.

5.6 Predator control

The development and implementation of the Integrated Pest Animal Control Program (ARMB 2005b) which has been successful in achieving the following:

I. Removal of more than 100 feral cats.

II. Analysis of more than 70 feral cat stomach/gut samples for dietary assessment.

III. Contribution of eleven feral cats to research being undertaken into feral cat bait preferences at the DPI Keith Turnbull Research Institute.

IV. Conduct of 400 spring, summer and autumn and 50+ winter bait station days per annum targeting foxes.

V. Conduct of more than 288 sand pad checks per annum (spring, summer and autumn).

VI. Conduct of more than 120 hours per annum of spotlight monitoring (excluding control hours).

VII. Collection of 308 scats over 104 km walked per annum.

VIII. Removal of six Sambar Deer (numbers to be removed limited by permit allowance).

IX. Removal of 12 wild dogs (in conjunction with DEPI Senior Wild Dog Controller).

5.7 Over-snow activities

The following action has been taken to assist with reduction of potential deleterious effects of use of snowmobiles and snow-grooming activities:

I. Introduction of information about appropriate use of snowmobiles by staff in *Snowmobile Manual Insert* (2006), which now includes exam questions relating to Mountain Pygmy-possum.

II. The establishment of specific snow mobile routes to avoid Mountain Pygmy-possum habitat.

III. Cessation of snow-grooming in some key areas.

5.8 Bogong Moth investigations

The following actions have been undertaken with regard to Bogong Moth:

I. An investigation into survey techniques to monitor Bogong Moths resulted in the *Trap Design and Surveys of Bogong Moths* (Agrotis infusa) *at Mount Buller* (Mitrovski 2009).

That report identified bucket traps filled with boulders (diameter >20 cm) provided an optimal method to survey moths. The report also showed that Bogong Moth abundance was considerably greater in the Mount Buller Village than in natural boulderfields.

II. Solar powered lights have been installed by Ski Lifts Mount Buller within Federation boulderfields with the aim of attracting moths to these sites.

III. An external investigation into arsenic residues in Bogong Moths has been completed by Pettina Love, of La Trobe University (Love, PhD thesis).

5.9 Public interpretation activities

The following actions have been undertaken to increase awareness of the Mountain Pygmy-possum:

I. Guided walks program featuring Mountain Pygmy-possum interpretation (every Saturday and Sunday from January to Easter inclusive).

II. Construction of two miniature habitat areas with interpretive panels in the Village Centre and at the Ski School for children.

III. Dedicated page on the Mount Buller website for Mountain Pygmy-possums including links and downloadable documents.

IV. Creation of 'Barry the Burramys' children's mascot for Mount Buller (BSL initiative).

6.0 RECOVERY OBJECTIVES

6.1 Twenty-five year Aim (2011 - 2036)

The current Plan has been prepared for the period 2011 – 2016. This timeframe is considered to be practicable for the purposes of planned management. A longer-term aim has been developed for the forthcoming twenty-five years. This provides an overarching aim toward which the current Plan will contribute. The twenty-five year aim is:

To achieve a self-sustaining population (including approximately 500 adult females) of the Mountain Pygmy-possum that exists within a sustainable ski resort at Mount Buller.

6.2 Five year Recovery Goals

This Recovery Plan has a five year life (2011-2016). Section 7 below, outlines actions to be taken during the life of this Plan. All actions are intended to contribute to recovery of Mountain Pygmy-possums on Mount Buller. The effect on Mountain Pygmy-possums of most of those actions of themselves and individually, will not be directly measurable. However, in combination they are designed to assist substantially with improvement of the species' prospects. The following section sets out goals which can be measured at the end of the life of this Plan (or at any point during the next five years). The goals outlined here are direct measures of improved status of the Mountain Pygmy-possum population on Mount Buller. Goals for particular actions are indicated in Section 7, as applicable.

6.2.1 Key goals for this Plan

Actions outlined in this Plan will be considered to have been successful if it can be demonstrated that the following goals have been achieved by 2016:

1. Monitoring of Mountain Pygmy-possums shows a population with increased reproductive fitness improved over 2010 levels and including greater than 75% of females having full pouch compliments, no second litters, and a male to female ratio of between 1:2 and 1:6.

2. Monitoring of key sub-populations (Figure 2) demonstrates that they are inhabited by at least the following numbers of Mountain Pygmy-possums:

Grimus (1 monitoring site)	>1 breeding females
Buller South (1 monitoring site)	>12 breeding females
Wombat Valley (2 monitoring sites)	>1 breeding females
Federation (4 monitoring sites)	>32 breeding females
Site 324	>3 breeding females
Site 350	>23 breeding females
Site 329	>3 breeding females
Site 334	>3 breeding females
Chamois (1 monitoring site)	>1 breeding females

3. At least one functional habitat connection exists between all areas of suitable habitat for the species that were disconnected in 2011 and that are known to have been connected prior to 1970.

4. Less than 1% of introduced predator scats sampled and analysed contain remains of Mountain Pygmy-possum.

5. All Type I and Type II habitats is protected and, where required, is enhanced.

6. Knowledge of the species' distribution and habitat use on Mount Buller has been improved over 2010 levels of understanding.

7.0 RECOVERY ACTIONS FOR THIS PLAN

This section provides an overview of actions required to be undertaken during the life of the Plan. Some entail continuation of existing actions and some are new. For each action the party or parties responsible for its implementation is identified in bold. All actions have been identified for the contribution they are expected to make to improving the status of the Mountain Pygmy-possum on Mount Buller. Some actions may not have an effect that is measurable during the life of the Plan, but all are expected to contribute to improving the species conservation status in the long-term.

7.1 Improved understanding of Mountain Pygmy-possums on Mount Buller

Although there is a good understanding of the biology and ecology of the Mountain Pygmy-possum, knowledge gaps still exist. The following actions are intended to address currently identified gaps in knowledge or understanding. If further gaps in knowledge are identified during the life of this plan that might affect achievement of its goals, an adaptive approach should be adopted with a view to filling them.

ACTIONS

I. Review existing Mountain Pygmy-possum monitoring program and modify if potential improvements are identified. **[ARMB & DEPI]**

II. Fully understand the distribution, dispersal patterns, habitat use and ecology of the Mountain Pygmy-possum on Mount Buller. This will require an increase in the geographic spread of the monitoring program. Specifically, it is important to survey all potential low altitude and sub-optimal habitats for the species. **[ARMB & DEPI]**

III. Explore the efficacy of various technologies for the purposes of survey and monitoring for Mountain Pygmy-possums and for predators (e.g. use of remotely operated movement or infra-red-sensor cameras; hair tubes and bait station visitation). Employ the most effective method(s). **[ARMB & DEPI]**

IV. Develop effective short- and long-term monitoring to assess efficacy of recreated habitat and habitat corridors in facilitation of Mountain Pygmy-possum movements. **[ARMB & DEPI]**

V. Develop and enhance techniques to improve the genetic diversity, adaptability and survival of Mountain Pygmy-possums while decreasing the likelihood of inbreeding by translocation of wild and/or captive-bred individuals into the population. These actions are covered in more detail by separate captive management and translocation plans. **[DEPI with support from ARMB]**

VI. Develop and implement techniques for monitoring and investigating the health, flowering phenology, potential pollinators, seed production and recruitment of Mountain Plum-pine and other important alpine heath species. **[DEPI]**

VII. Design and implement a program to assess the viability, longevity and survival rates of translocated Mountain Pygmy-possums. Its purpose will be to identify vulnerabilities and determine means to overcome, mitigate or compensate for these. **[DEPI with support from ARMB]**

VIII. Results of all investigations outlined above should be reviewed and provided to agencies of all jurisdictions responsible for conservation and recovery of the species and to the Mount Buller Taskforce, as they come to hand, in order to permit new knowledge to be applied as early as is practicable. Results of all investigations should be provided in written form prior to the next five-year review of this plan. **[All nominated parties]**

7.2 Natural ecological interactions

Declining food resources, disturbance and predation will directly impact on the Mountain Pygmy-possum. Actions to mitigate these are proposed below.

7.2.1 Bogong Moths

Bogong Moths are a major component of the Mountain Pygmy-possum diet. The Bogong Moth breeds in the plains of the Murray-Darling Basin and migrates to the Alps for the summer. It has been suggested that Bogong Moths bring arsenic residues, and possibly pesticide residues, from the plains into Mountain Pygmy-possum habitat (Green *et al.* 2001). This suggestion has been largely disproved by the work of Love (2010), whose findings suggested the source of arsenic in Bogong Moths is not anthropogenic and there is no evidence that the concentration of arsenic present in the moths pose a risk to Mountain Pygmy-possums.

Little is known about the status or any possible threats to the Bogong Moth in its breeding areas, and off-site management actions in these areas are not proposed.

ACTIONS

I. Use methods outlined in *Trap Design and surveys of Bogong Moths (*Agrotis infusa*) at Mount Buller* (Mitrovski 2009) to implement a Bogong Moth abundance monitoring program. **[ARMB & BSL]**

II. Develop techniques to analyse Bogong Moth abundance data with a view to assessing whether this is a limiting factor for the Mountain Pygmy-possum on Mount Buller. **[DEPI & ARMB]**

III. Analyse Bogong Moth abundance data for seasonal and long term climatic trends. **[DEPI & ARMB]**

IV. Investigate whether accumulation of toxins such as arsenic in Bogong Moths resulting from agricultural practices has indirect impacts upon Mountain Pygmy-possums. **[DEPI].**

7.2.2 Natural predators & competitors

The impact of owl predation became evident during recent radio-tracking surveys. Predation by snakes, Spot-tailed Quoll *Dasyurus maculatus*, smaller native predators and rodents may also occur. The effects of such native predators on capacity for the Mount Buller Mountain Pygmy-possum population to recover is unknown.

Declines in food resources and available habitat may increase the likelihood of inter-species competition occurring. Bush Rats *Rattus fuscipes* and Dusky Antechinus *Antechinus swainsonii* commonly occur within Mountain Pygmy-possum habitats and may compete for food and nesting resources. The effects of such native competitors on recovery of the Mount Buller Mountain Pygmy-possum population is also unknown.

ACTIONS

I. Assess the potential impact of native predators on Mountain Pygmy-possums. The aim of such investigations should be to ascertain whether effects of natural predators are having impacts that might significantly hamper recovery of the species. **[DEPI & ARMB]**.

II. Assess competition for key resources by other native species. Investigations should be aimed at identifying whether competition for key resource requirements between such species and Mountain Pygmy-possums are having impacts that might significantly hamper recovery of the species. **[DEPI & ARMB]**.

7.3 Feral predator control

Red foxes, feral cats and wild dogs are introduced pest predators that pose threats to the Mountain Pygmy-possum. Control of feral predators is considered a key management action to ensure the long-term survival of Mountain Pygmy-possums. The *Integrated Pest Animal Control Program* (ARMB 2005b) addresses the management of feral cats, foxes, wild dogs, rabbits and deer. It involves the use of various methods of control (trapping, shooting and baiting), monitoring (spotlight counts, sand pads, scat collection and stomach/gut samples) and analyses (scats and stomach/gut). The following actions should be undertaken.

ACTIONS

I. Enhance existing predator monitoring and control techniques defined in the *Integrated Pest Animal Control Program* (2005). Continue to review new technologies, bait types and effective and selective delivery systems that minimize hazards to non-target species. **[ARMB]**

II. Review methods and success of new techniques to control foxes, cats and wild dogs. New bait types, delivery systems and methods to avoid non-target species should be explored. **[ARMB]**

III. Increase use of remote cameras for monitoring activities of predatory mammals. **[ARMB]**

7.4 Habitat loss, fragmentation and degradation

Appropriate management of habitat is a key to the survival of the Mountain Pygmy-possum on Mount Buller.

Large areas of Type I and Type II habitat for the Mountain Pygmy-possum have been lost or degraded over the last 70 years, and the risk of further deterioration still exists. The prevention of any further loss, fragmentation or degradation of habitat is a critical component of this and the previous Recovery Plan. The retention and management of all existing habitat, maintaining and enhancing connections between habitat areas, and the rehabilitation of degraded habitat areas are urgent actions required for the recovery of the Mountain Pygmy-possum population on Mount Buller.

The following sections indicate actions that should be undertaken to retain and improve habitat connectivity. They are addressed under sections for development of connections between existing habitat patches; revegetation and boulderfield management.

7.4.1 Structural habitat connectivity

The habitat for the Mountain Pygmy-possum on Mount Buller occurs in discrete and often isolated patches. It is important for the normal social functions of Mountain Pygmy-possums that they have the ability to move safely throughout and between all habitat patches. This section focuses on artificially created and restored boulderfields, rock-filled tunnels and/or surface rock corridors to provide localised habitat connections. Revegetation of these areas to provide additional cover, nesting material and food resources is also critical (see below). These artificial links will provide Mountain Pygmy-possums with capacity to move across areas that are currently unsuitable as habitat for the species.

Strategies set out in the *Revegetation and Habitat Restoration Plan* (MacPhee & Harvey 2007) and *Boulderfield Habitat Feasibility Study* (SMEC Australia 2007) should be implemented by the actions outlined below to ensure that habitat connections are established to facilitate normal movement and social functioning amongst the Mountain Pygmy-possum population. Those documents encourage the identification, design, feasibility assessments and construction of habitat connections aimed at facilitating the movement of Mountain Pygmy-possums. However, the feasibility and functionality assessments have identified construction, Occupational Health and Safety, financial and ecological limitations on boulderfield and surface tunnel construction.

ACTIONS

I. Identify and map all existing artificial corridors linking Type I and Type II habitats. **[ARMB & BSL]**

II. Review all design guidelines, construction methods and standards including Occupation, Health and Safety issues for further construction of habitat connections. **[ARMB & BSL with support from DEPI]**

III. Use information provided by the monitoring program (Section 7.1) to continue enhancing design of artificial boulderfields and tunnels. **[ARMB & BSL with support from DEPI]**

IV. Create at least one functional habitat connection from each patch of Type I or Type II habitat which is disconnected in 2011 and that is known to have been connected prior to 1970, to another patch of Type I or Type II habitat. **[ARMB & BSL with support from DEPI]**

V. Determine the viability and effectiveness of constructed habitat connections by monitoring and documenting their use by Mountain Pygmy-possums. The efficacy of remotely operated movement-sensor cameras or other technologies for this purpose should be explored and the most effective method(s) should be employed. **[ARMB & DEPI]**

VI. Continue enlarging the recently constructed surface rock corridor on Outer Edge below Zwier's Zig Zag access trail for its value in support of natural regeneration of native vegetation. **[BSL]**

7.4.2 Boulderfield management

The first Mount Buller Recovery Plan (ARMB 2005a) recommended that a number of lost habitat areas should be restored. Creation of boulderfields as two pilot projects in areas where there were few constraints have been accomplished and provided practical experience for the potential establishment of boulderfields on a larger scale.

The viability of further habitat re-creation in areas of more difficult terrain on Mount Buller was fully investigated during a detailed *Boulderfield Habitat Feasibility Study* (SMEC Australia 2007). The study identified many physical, financial and Occupational, Health and Safety issues that present considerable practical difficulties, which also have cost implications. The transportation of boulders would require either expansion of existing roads or the creation of new temporary roads, which would threaten existing habitat. In addition, large numbers of boulders would be required with consequential high levels of heavy vehicular traffic. Alternative methods of transporting boulders were explored (e.g. helicopter, cable systems, etc.) but safety issues and costs were considered to be limiting factors. Other issues include the potential indirect impacts on other habitat areas from increased vehicle traffic or temporary access roads, the stability of created boulder fields and off-site impacts associated with sourcing rock. As a consequence future large habitat re-creation projects may not be feasible or safe to install, but feasibility of doing so should continue to be explored, especially if new methods come to light.

ACTIONS

I. Restore degraded boulderfields and investigate the feasibility of creating boulderfield habitat in areas where it has been lost in the past. **[DEPI & ARMB]**

II. Consider potential alternative approaches to improve boulderfield habitat including obtaining of rocks from other activities on Mount Buller and removal of recent sediment from in situ boulderfields. **[DEPI & ARMB]**

III. Require that a condition of permits for future construction or works on Mount Buller is to salvage rock from construction areas for use in Mountain Pygmy-possum habitat

management works. Use of rock from the village area might entail less concentrated disturbance, but would be expected to provide small quantities of rock by comparison with that required for more ambitious and large-scale boulderfield creation projects. **[DEPI & ARMB]**

7.4.3 Revegetation

Rehabilitation and restoration, including revegetation, in Type I and II Mountain Pygmy-possum habitat and in buffer and connecting vegetation is important to the viability and continuation of the Mount Buller population.

The revegetation and restoration of degraded habitats are complex management processes. A *Revegetation and Habitat Restoration Plan* (MacPhee & Harvey 2007) has been implemented since 2007 and sets out the key actions, logistics and resources required to enhance the quality of vegetation on and surrounding Mountain Pygmy-possum habitat, which are listed below. The following general principles apply to revegetation works. All planting will be with the suite of species that comprise the natural floristic composition of Mountain Pygmy-possum habitats and should be of local Mount Buller provenance.

Enhancement of Type I or Type II habitats are the priority, as required, through planting to restore full cover of indigenous vegetation. This will be achieved through natural regeneration combined with supplementary plantings where required. It may include infill plantings of particular species whose densities have decreased due to past management practices.

If buffer or connecting habitat is the focus, then the aim will be to encourage cover of low indigenous shrubs. This will be achieved through the promotion of natural regeneration combined with supplementary plantings. Rehabilitated and revegetated areas within ski fields must be managed to ensure habitat values are maintained whilst retaining their suitability as ski field areas.

ACTIONS

I. Develop criteria to measure the growth, development and natural functionality of revegetated habitats. This may entail a simple assessment of height, vertical densities and overall percentage cover of vegetation. **[ARMB]**

II. Implement strategies to improve understanding of the spatial and temporal use of rehabilitated habitats by the Mountain Pygmy-possum. This will be achieved through monitoring programs outlined elsewhere in this plan. **[DEPI &ARMB]**

III. Review the *Revegetation and Habitat Restoration Plan* (2007) for the Mountain Pygmy-possum *Burramys parvus* on Mount Buller, Victoria. This should include revised mapping of the previously and proposed rehabilitation areas. Suitable soil, locally indigenous plants and boulders are scarce resources – any future construction or works (including in the village areas) will be required under conditions of approval, to salvage soil, plants and/or rock from construction areas to contribute these to Mountain Pygmy-possum habitat

management works elsewhere on the mountain. The potential uses for salvageable material at each site to be determined by ARMB as the referral authority. **[ARMB]**

IV. Ensure the availability of suitable planting stock with genetic provenance specific to Mount Buller is available through a sustainable plant nursery. Collaboration from the other alpine resorts will be required to ensure the sustainability of such a nursery. **[ARMB]**

V. Undertake infill revegetation in the areas identified at III above. **[ARMB & BSL]**

VI. Ensure all rehabilitated and revegetated areas are clearly identified and, as appropriate, protected from ski field management works. Where revegetated areas may require summer slope grooming in the future, this should be subject to prior approval by ARMB, DEPI and/or DTPLI. **[BSL & ARMB]**

7.4.4 Habitat management & restoration plan

All works to improve existing habitats and to create additional habitat through development of new structural connections, new boulderfields and revegetation works should be set out in a plan that sets priorities and provides a co-ordinated approach.

ACTION

I. Set out a program of habitat management and restoration works that incorporates all of the above actions into a comprehensive plan for the duration of this Recovery Plan and broken into annual works programs. **[ARMB]**

7.5 Road & track management

The extensive network of roads and tracks on the southern slopes of Mount Buller contribute to the fragmentation of a number of Type I and Type II habitat patches and are a source of sediment, weeds and litter that potentially impact upon the quality of the habitat areas. They are also likely to facilitate the access of introduced predators and consequential impacts on Mountain Pygmy-possum populations.

ACTIONS

I. No further roads or tracks are to be developed in Type I or Type II habitat or within a 30 m buffer of those habitats, unless for the specific purpose of restoration of habitat and with the approval of DEPI. **[ARMB, BSL & DEPI]**

II. Plan vehicle use to minimise unnecessary trips (e.g. ensure all required equipment is in vehicle at commencement of trip, etc). **[ARMB & BSL]**

III. The current low mountain bike and walking use in areas of Mountain Pygmy-possum habitat or buffers will be maintained. Summer recreational use of these areas will be kept to a minimum. Promotion of these activities generally on Mount Buller must be tailored to ensure that they do not increase in these particular and identified locations. **[ARMB]**

IV. Maintenance of existing roads is permitted using low impact construction and maintenance techniques designed to ensure long-term sustainable improvements are achieved. **[ARMB & BSL]**

7.6 Drainage & sedimentation

Much of the Mountain Pygmy-possum habitat on Mount Buller occurs naturally in drainage lines. The natural flow of water through these areas may be important to the maintenance of the habitat and its vegetation. It also means that habitat areas are sensitive to altered flows or increased sedimentation caused by actions in their catchments. On some of the older ski slopes that occur within Mountain Pygmy-possum habitat (especially in the Federation Bowl), sediment from past ski area development has partially filled in the boulderfield habitat in many areas.

Management of drainage and sediment flows into Mountain Pygmy-possum habitat is an important component of this Recovery Plan. The two primary sources of sediment in the Resort are roads and tracks and poorly vegetated sections of ski field areas. Construction activities areas can create short-term and localised but significant sources of sediment. The major aim is to minimise sediment entering and impacting upon Mountain Pygmy-possum habitat.

ACTIONS

I. Continue to review and map all drainage and sediment sources in the catchments for Type I and Type II habitat areas, including roads and tracks, un-vegetated or poorly vegetated areas and cross-drains on ski areas (including outlet of Wombat underground collector drain). **[BSL]**

II. Document results of the trials undertaken by BSL of different designs of sediment traps. **[BSL]**

III. Install and monitor preferred sediment traps on all roads and tracks draining to Type I and II habitats. **[BSL]**

IV. Ensure that sediment traps are regularly cleared and maintained; all trapped sediment to be documented and removed to an appropriate designated disposal site. Sediment to be re-used/recycled as appropriate. Use of sediment in revegetation works should be considered and implemented as appropriate. **[BSL]**

V. Stabilise and revegetate eroding or poorly vegetated areas. **[ARMB & BSL]**

VI. Ensure all works are conducted to EPA best practice guidelines for Sediment Pollution Control. **[ARMB & BSL]**

VII. Investigate the use of construction techniques and materials for track repair to minimise erosion and consequent sedimentation. **[ARMB & BSL]**

7.7 Waste and litter

Waste management issues can contribute to habitat degradation (e.g. litter trapped in boulders) and to death of Mountain Pygmy-possums (e.g. animals entangled, trapped or drowned in discarded material and containers that are inappropriately designed or unsecured waste bins (NSW National Parks and Wildlife Service 2002). The aim is to minimise litter input to Mountain Pygmy-possum habitat.

ACTIONS

I. Waste management planning and facilities on Mount Buller will take into account potential for, and reduction of potential impacts on the Mountain Pygmy-possum. **[ARMB & BSL]**

II. There will be an emphasis on minimising litter in and around Mountain Pygmy-possum habitat areas through the appropriate provision of bins (including at the top and bottom of lifts). **[BSL]**

III. Educate staff and visitors as to the impacts of litter on the Mountain Pygmy-possum. **[ARMB & BSL]**

IV. Undertake annual collection days within habitat areas during the summer months. **[ARMB & BSL]**

7.8 Fire management

The vegetation within Mountain Pygmy-possum habitat is highly sensitive to fire and is very slow to regenerate after being burnt or scorched. It is critical that no Mountain Pygmy-possum habitat is burnt on Mount Buller. In the event of a bushfire, the habitat areas will be regarded as the prime environmental asset on the mountain and given the same level of fire protection that is provided to key physical assets. The main aim is to exclude and protect the mapped Type I and Type II Mountain Pygmy-possum habitat from planned burns and from bushfire.

ACTIONS

I. Exclude all Type I and Type II Mountain Pymgy-possum habitat from planned burns and bushfires. **[DEPI with support from ARMB and BSL]**

II. Any reviews of relevant fire plans prepared during the life of this plan should specifically require the exclusion of fire from Type I and Type II Mountain Pymgy-possum habitat and provide maps that clearly delineating these habitat assets. **[ARMB & DEPI]**

7.9 Ski-field management

7.9.1 Snow grooming and over-snow vehicles

The winter hibernation period is a critical phase of the annual cycle of the Mountain Pygmy-possum. The noise and activity associated with over-snow vehicles (e.g. snowmobiles and snow groomers) may disturb the animals during hibernation and the compaction of snow by these vehicles may reduce or otherwise alter the insulating properties of the snow and or the sub-snow microenvironment.

While there is some information to support these hypotheses, further research would be required to confirm them. Due to the critical importance of hibernation and the fact that changes to over-snow vehicle use can be rapidly implemented, this Recovery Plan takes a precautionary approach and recommends immediate changes to the use of over-snow vehicles in key winter habitat areas on Mount Buller.

ACTIONS

I. Snow grooming activities in Type I and Type II habitat and associated 30 m buffer will be confined to essential operations (e.g. search and rescue) only. **[BSL]**

II. Develop winter maps to clearly identity both appropriate over-snow access areas and no go areas where Mountain Pygmy-possum habitat is present. **[BSL].**

III. Type I or Type II preferred habitat may expand over time as new habitat is re-created. The snow grooming strategy/plan must be maintained current to any changes that occur. **[BSL]**

IV. Access trails identified in maps to be developed will only be groomed for essential operational procedures and only when the minimum snow depth is greater than 60 cm. **[BSL]**

V. The use of over-snow vehicles for search and rescue and medical evacuation will be allowed in all areas. **[BSL]**

VI. Where snowmobile use is deemed necessary close to Type I or Type II, habitats, use of a 4-stroke machine will be encouraged. All new or replacement snowmobiles should be 4-stroke machines. **[BSL]**

VII. Grooming on runs on the Southern Slopes that do not support Type I or Type II habitat will continue but will be undertaken in a manner that minimises damage to vegetation and soil, especially during low snow conditions. **[BSL]**

VIII. Where there are Mountain Pygmy-possum corridors constructed across runs that otherwise do not have Mountain Pygmy-possum habitat, the location of the corridors will be made clear to machine operators and grooming activities must be managed to ensure that the corridors are not damaged or unnecessarily disturbed. **[BSL]**

IX. Where revegetation is being undertaken on ski runs that otherwise do not have Mountain Pygmy-possum habitat, the location of revegetation areas will be made clear to machine operators and grooming activities must be managed to ensure that revegetation areas are not damaged, especially in low snow conditions. Signage and awareness programs are to be developed **[BSL]**

X. Snow farming activities are subject to the same restrictions as grooming activities. **[BSL]**

7.9.2 Ski lift rationalisation

It is understood that BSL have a long-term aim to rationalise the number and location of ski lifts on Mount Buller. This may provide opportunities to mitigate some existing impacts on Mountain Pygmy-possum habitat. Minimisation of impacts and, where practicable, enhancement of Mountain Pygmy-possum habitat should be key aims of lift system rationalisation.

ACTIONS

I. Ensure any review of ski lifts includes a full consideration of potential impacts on the Mountain Pygmy-possum, including the potential to reduce impacts associated with some existing lifts and associated access and infrastructure (e.g. Southside). **[BSL]**

II. Where any lift is permanently removed the site will be rehabilitated to replicate the habitat type that existed there prior to development. This will include re-establishment of boulderfield components and linkages wherever practicable **[BSL]**

7.9.3 Snow-making

Artificial snow-making may have effects on Mountain Pygmy-possums although these effects have not been fully explored. One aspect that has been identified is for the chemistry of source water to include higher than natural levels of nutrients or of other pollutants that may deleteriously affect vegetation of Mountain Pygmy-possum habitats. A separate report *Mountain Pygmy-possum and Class A recycled water* was prepared in 2009 (Feehan Consulting 2009).

I. Monitoring should be undertaken for any altered nutrient inputs to Mountain Pygmy-possum habitat from recycled water used during snow making activities. Any altered nutrients must be managed to ensure they do not have impacts on Mountain Pygmy-possums or their habitats. Detailed recommendations for such investigations, including for determination of relevant threshold levels for water chemistry are provided in Feehan Consulting (2009) and should be followed. **[ARMB & BSL]**

7.10Climate change

A warming of the environment on Mount Buller due to global warming or natural climate change has the potential to significantly alter the habitat, population dynamics and survival of Mountain Pygmy-possum. Warming is expected to affect the operation of the Resort and the Mountain Pygmy-possum population at Mount Buller by reducing the extent, annual period and, possibly depth, of snow cover. A primary means to tackle these effects on operation of the Resort is through increased artificial snow-making. It will be important to ensure that actions to manage poor snow conditions do not impact on the Mountain Pygmy-possum or its habitat.

ACTIONS

I. The extent of local climate change will be monitored by establishing 2-3 climate monitoring stations at sites representative of key Mountain Pygmy-possum habitat areas (the existing

Bureau of Meteorology winter monitoring stations may be suitable sites; there should be liaison with the Bureau on how best to implement this action). **[ARMB & BSL]**

II. Planning for any increased snow making facilities will need to take full account of potential impacts on the Mountain Pygmy-possum and its habitat; new facilities in Type I or Type II habitat or buffers will need EPBC Act referral by the proponent. **[BSL]**

III. The water reticulation system for snow making could provide a source of water to assist with establishing revegetation during un-seasonally dry periods. **[BSL]**

7.11 Environmental management & awareness

The existing lease arrangements at Mount Buller differ from those in other Victorian ski resorts. Prior to 2005, this had resulted in a lack of clarity in environmental and management responsibilities. Between 2005 and 2010, these responsibilities, particularly in relation to the management of Mountain Pygmy-possums and their habitat, have been progressively clarified, More focused arrangements for environmental management have the potential to improve the implementation of this Recovery Plan to ensure that the ARMB can fulfil its land management responsibilities and that BSL operates and manages leased sites according to lease conditions.

It will be important to ensure that the responsibility for environmental management within both the ARMB and BSL is clear, and each organisation will make sure there are clear and transparent responsibilities and lines of communication.

7.11.1 Education and environmental awareness of mountain staff

It is important that all mountain staff are aware of this Recovery Plan and its requirements, of the location of Mountain Pygmy-possum habitat and of their legal requirements, particularly under provisions of the EPBC Act.

There has been a considerable increase in environmental awareness within the ARMB and BSL in recent years, and the Mountain Pygmy-possum has been a major factor in raising this awareness. Environmental issues now form part of staff induction and key staff participate in the Alpine Ecology or Alpine Rehabilitation Courses each year. The actions set out in this plan provide an opportunity to build on this, and a program will be put in place to continue to expand the environmental awareness of mountain staff through education and training.

The range of management actions proposed in this Recovery Plan, combined with the presence of high quality educational facilities at Mount Buller, provides learning opportunities which should be built upon over the life of this plan. These must include ensuring that all staff working on the mountain are aware of the Recovery Plan, potential impacts on Mountain Pygmy-possums and their obligations, including legal requirements, in relation to the species.

ACTIONS

I. Continue to include environmental issues in staff induction. **[BSL & ARMB]**

II. Continue to send key staff to the Alpine Ecology or Alpine Rehabilitation Course. **[BSL & ARMB]**

III. Seek to conduct the Alpine Ecology and/or Alpine Rehabilitation Course or aspects of the course(s) on Mount Buller. **[ARMB]**

7.11.2 Education and environmental awareness of visitors

The recovery program for the Mountain Pygmy-possum will alter aspects of both winter and summer management, and visitor awareness and support will be important for the acceptance and success of such changes.

ACTIONS

I. To create a supportive visitor community by ensuring visitors are aware of the significance of the Mountain Pygmy-possum on Mount Buller and are informed about the recovery actions that may affect them. **[ARMB & BSL]**

II. Maintain existing interpretive displays in the village and update when appropriate. **[ARMB]**

III. Install an interpretive display at the Mount Buller Ski School on Bourke Street. **[BSL]**

IV. Provide regular Mountain Pygmy-possum recovery updates on Mount Buller web page, newsletters and interpretive videos. **[ARMB & BSL]**

V. Establish a public interpretation facility in Cow Camp or other prominent location that is easily located and viewed. **[ARMB & BSL]**

7.12 Administration of Recovery Plan

The Mount Buller Pygmy-possum Taskforce is to continue to set annual goals, incorporate new knowledge into adaptive management and report progress to relevant stakeholders annually.

7.12.1 Knowledge management and base data

There is considerable knowledge about the Mountain Pygmy-possum on Mount Buller and about on-ground management issues. While much of this is documented, much is not and could be lost with changes in personnel which may occur over time. It is important that this knowledge is captured and stored at one secure repository on Mount Buller and, for security at another location off the mountain to capture, curate and make available key knowledge about the Mountain Pygmy-possum and about on-ground management.

ACTIONS

I. Establish and maintain a library of material and references on the Mountain Pygmy-possum at the ARMB offices and at another location off the mountain. **[ARMB]**

II. All existing works undertaken for Mountain Pygmy-possum management (e.g. tunnels, revegetation) will also be accurately mapped and this will be continuously updated as new works are completed. **[ARMB & BSL]**

7.12.2 Mountain Pygmy-possum Taskforce

A Taskforce group was established in 2005 to oversee the implementation of the Recovery Plan. The Taskforce involved representatives from the ARMB, BSL and DEPI who meet at least two to three times a year to discuss progress and projects. Other specialist invitees attend as required. This collaborative group has been instrumental in ensuring actions are completed on time and to budget.

ACTIONS

I. The Taskforce will continue to oversee, develop and embrace new strategies, ideas and technologies to ensure the implementation of this Plan and specifically to ensure that actions identified in this Plan are undertaken and carried to completion. ARMB will chair the Taskforce. **[ARMB]**

II. The Taskforce will produce a short annual report listing actions undertaken and accomplishments of the previous twelve months. **[ARMB & all taskforce members]**

III. The Taskforce will meet at least twice per annum to review actions undertaken during preceding period, assign priorities for forthcoming period, and deal with any new matters relevant to Mountain Pygmy-possum conservation management on Mount Buller. **[ARMB & all taskforce members]**

7.13 Direct recovery actions

This section provides a brief overview of important direct measures for the recovery of the Mountain Pygmy-possum on Mount Buller, but that are not directly related to the key management of processes on Mount Buller. They will primarily be undertaken by DEPI and Zoos Victoria who have prepared separate plans. Specific actions contained in those plans are not repeated here, but it should be noted that management on Mount Buller may need to be tailored to accommodate them.

7.13.1 Captive management & translocation strategy

As a consequence of substantial decline experienced by the Mount Buller Mountain Pygmy-possum population over the last 10 to 15 years there has also been an extremely rapid decline in genetic variation (Mitrovski *et al.* 2008). Reductions in genetic diversity can lead to inbreeding depression, reductions in fitness, fecundity and survival rates and an increased likelihood of a population becoming extinct. To reverse this trend, measures to effectively increase the population size, increase genetic diversity and avoid extinction of the Mount Buller population are presently being implemented. These include captive management and a translocation strategy.

7.13.1.1 Captive Management Plan

Objectives and procedures for captive management of the species are set out in *Captive Management Plan for Mountain Pygmy-possum* Burramys parvus (Parrott *et al*. 2011).

This conservation program was initiated at Healesville Sanctuary in 2006-2007. The principle aim of the captive breeding program is to produce young suitable to be released into the wild Mount Buller population to achieve the following objectives:

- Gradually increase the wild population to a sustainable and viable level
- Maintain levels of genetic variation within this unique Evolutionarily Significant Unit.

The strategic objectives for the captive management program are taken from Parrott *et al*. 2011. This program aims to introduce wild and captive bred (hybrid and Mount Buller genotype) Mountain Pygmy-possums into the Mount Buller population.

The program aims to:

- Produce genetically viable Mount Buller/central Evolutionarily Significant Unit (ESU) hybrid possums for augmentation into the into Mount Buller population.
- By 2013, produce 70 young per year for release into the wild and to sustain a captive population. This will be achieved by increasing the breeding population to 35 pairs and breeding participation rate to 60% of captive-bred females.
- Increase expertise and knowledge of Burramys captive management and husbandry. This will have particular emphasis on developing appropriate methods around hibernation, reproduction and diet of the species in captivity.

7.13.1.2 Translocation Strategy

The *Translocation Strategy for the Mt Buller Population of the Mountain Pygmy-possum* (Weeks and Corrigan 2011) guides this aspect of management for the species.

The aim of this strategy is to:

- Reduce the likelihood of the population becoming extinct due to stochastic events by maintaining a minimum population of 25-50 individuals whilst working to increase the population size. This goal accords with minimum viable population modelling undertaken for the Mountain Pygmy-possum.
- Increase the genetic diversity of the population so as to reduce the impacts of genetic depression and inbreeding depression.
- Increase genetic diversity to increase the evolutionary potential and adaptability of the species.
- Undertake and further develop optimal translocation strategies to increase the genetic diversity within the wild Mount Buller population by ~20% ('genetic rescue'). In order to increase the genetic diversity, six to 20 males from the central ESU region are to be translocated to Mount Buller. The introduction of unrelated individuals into the population should be undertaken as soon as possible and over a short seasonal time frame.

- Translocated individuals should be post-weaning but otherwise as young as possible because young animals are considered likely to best adapt to a reintroduction environment. They also have longer life- and breeding life-expectancy and thus greater capacity to contribute to the population, than do older animals.
- Monitor post-release population and genetic admixture as measures of the success of the program.

Post-release surveys must continue as they have since 1996. These surveys should continue to collect information regarding short term and long term survival, gender ratios, population trends, recruitment, distribution and habitat use, recapture rates, longevity and synchrony of breeding.

Understanding these processes will provide an indication of the success of translocation and genetic augmentation program.

8.0 SUMMARY OF ACTIONS FOR THIS RECOVERY PLAN

ACTION	RESPONSIBILITY
7.1 Improving understanding of Mountain Pygmy-possums on Mount Buller	
I. Review existing Mountain Pygmy-possum monitoring program and modify if potential improvements are identified.	**ARMB & DEPI**
II. Fully understand the distribution, dispersal patterns, habitat use and ecology of the Mountain Pygmy-possum on Mount Buller. This will require an increase in the geographic spread of the monitoring program. Specifically, it is important to survey all potential low altitude and sub-optimal habitats for the species.	**ARMB & DEPI**
III. Explore the efficacy of various technologies for the purposes of survey and monitoring for Mountain Pygmy-possums and for predators (e.g. use of remotely operated movement- or infra-red-sensor cameras; hair tubes and bait station visitation). Employ the most effective method(s).	**ARMB & DEPI**
IV. Develop effective short- and long-term monitoring to assess efficacy of recreated habitat and habitat corridors in facilitation of Mountain Pygmy-possum movements.	**ARMB & DEPI**
V. Develop and implement techniques for monitoring and investigating the health, flowering phenology, potential pollinators, seed production and recruitment of Mountain Plum-pine and other important alpine heath species.	**DEPI**
VI. Develop and enhance techniques to improve the genetic diversity, adaptability and survival of Mountain Pygmy-possums while decreasing the likelihood of inbreeding by translocation wild and/or captive-bred individuals into the population. These actions are covered in more detail by separate captive management and translocation plans.	**DEPI with support from ARMB**
VII. Design and implement a program to assess the viability, longevity and survival rates of translocated Mountain Pygmy-possums. Its purpose will be to identify vulnerabilities and determine means to overcome, mitigate or compensate for these.	**DEPI with support from ARMB**
VIII. Results of all investigations outlined above should be reviewed and provided to the National Recovery Team and the Mount Buller Taskforce as they come to hand, in order to permit new knowledge to be applied as early as is practicable. Results of all investigations should be provided in written form prior to the next five-year review of this plan.	**All nominated parties**
7.2 Natural ecological interactions	
7.2.1 Bogong Moths	
I. Use methods outlined in Trap Design and surveys of Bogong Moths (*Agrotis infusa*) at Mount Buller to implement a Bogong Moth abundance monitoring program	**ARMB & BSL**
II. Develop techniques to analyse Bogong Moth abundance data with a view to assessing whether this is a limiting factor for the Mountain Pygmy-possum on Mount Buller.	**DEPI & ARMB**
III. Analyse Bogong Moth abundance data for seasonal and long term climatic trends.	**DEPI & ARMB**
IV. Investigate whether accumulation of toxins such as arsenic in Bogong Moths resulting from agricultural practices has indirect impacts upon Mountain Pygmy-possums.	**DEPI**

ACTION	RESPONSIBILITY
7.2.2 Natural predators & competitors	
I. Assess the potential impact of native predators on Mountain Pygmy-possums. The aim of such investigations should be to ascertain whether effects of natural predators are having impacts that might significantly hamper recovery of the species.	**ARMB & DEPI**
II. Assess competition for key resources by other native species. Investigations should be aimed at identifying whether competition for key resource requirements between such species and Mountain Pygmy-possums are having impacts that might significantly hamper recovery of the species.	**ARMB & DEPI**
7.3 Feral Predator Control	
I. Enhance existing predator monitoring and control techniques. Continue to review new technologies, bait types and effective and selective delivery systems that minimise hazards to non-target species.	**ARMB**
II. Continue and, where feasible, enhance all predator control programs defined in the *Predator Management Strategy* (2005).	**ARMB**
III. Review methods and success of new techniques to control foxes, cats and foxes. New bait types, delivery systems and methods to avoid non-target species should be explored.	**ARMB**
IV. Increase use of remote cameras for monitoring activities of predatory mammals	**ARMB**
7.4 Habitat loss, fragmentation and degradation	
7.4.1 Structural habitat connectivity	
I. Identify and map all existing artificial corridors linking Type I and Type II habitats.	**ARMB & BSL with support from DEPI**
II. Review all design guidelines, construction methods and standards including Occupation, Health and Safety issues for further construction of habitat connections.	**ARMB & BSL with support from DEPI**
III. Use information provided by the monitoring program (Section 7.1) to continue enhancing design of artificial boulderfields and tunnels	**ARMB & BSL with support from DEPI**
IV. Create at least one functional habitat connection from each patch of Type I or Type II habitat which is disconnected in 2011 and that is known to have been connected prior to 1970, to another patch of Type I or Type II habitat	**ARMB & BSL with support from DEPI**
V. Determine the viability and effectiveness of constructed habitat connections by monitoring and documenting their use by Mountain Pygmy-possums. The efficacy of remotely operated movement-sensor cameras or other technologies for this purpose should be explored and the most effective method(s) should be employed.	**ARMB & DEPI**
VI. Continue enlarging the recently constructed surface rock corridor on Outer Edge below Zwier's Zig Zag access trail for its value in support of natural regeneration of native vegetation	**BSL**
7.4.2 Boulderfield management	
I. Restore degraded boulderfields and investigate the feasibility of creating boulderfield habitat in areas where it has been lost in the past.	**DEPI & ARMB**

ACTION	RESPONSIBILITY
II. Undertake further detailed feasibility and planning studies for boulderfield habitat and minor tunnel re-creation works. These assessments will draw on the knowledge obtained during the implementation of the previous construction works. They will need to include safety and strategies for work in steep, potentially dangerous environments, and minimum impact construction in sensitive environments, environmental approvals and costing of works	**ARMB & BSL**
III. Consider potential alternative approaches to improve boulderfield habitat including obtaining of rocks from other activities on Mount Buller and removal of recent sediment from in situ boulderfields.	**DEPI & ARMB**
IV. Require that a condition of permits for future construction or works on Mount Buller is to salvage rock from construction areas for use in Mountain Pygmy-possum habitat management works. Use of rock from the village area might entail less concentrated disturbance, but would be expected to provide small quantities of rock by comparison with that required for more ambitious and large-scale boulderfield creation projects.	**DEPI & ARMB**
7.14. Revegetation	
I. Develop criteria to measure the growth, development and natural functionality of revegetated habitats. This may entail a simple assessment of height, vertical densities and overall percentage cover of vegetation.	**ARMB**
II. Implement strategies to improve understanding of the spatial and temporal use of rehabilitated habitats by the Mountain Pygmy-possum. This will be achieved through monitoring programs outlined elsewhere in this plan.	**DEPI & ARMB**
III. Review the 2007 *Revegetation and Habitat Restoration Plan* for the Mountain Pygmy-possum *Burramys parvus* on Mount Buller, Victoria. This should include revised mapping of the previously and proposed rehabilitation areas. Suitable soil, locally indigenous plants and boulders are scarce resources – any future construction or works (including in the village areas) will be required under conditions of approved, to salvage soil, plants and/or rock from construction areas to contribute these to Mountain Pygmy-possum habitat management works elsewhere on the mountain. The potential uses for salvageable material at each site to be determined by ARMB as the referral authority.	**ARMB**
IV. Ensure the availability of suitable planting stock with genetic provenance specific to Mount Buller is available through a sustainable plant nursery. Collaboration from the other alpine resorts will be required to ensure the sustainability of such a nursery.	**ARMB**
V. Undertake infill revegetation in the area mentioned above.	**ARMB & BSL**
7.1.5 Habitat management & restoration plan	
I. Set out a program of habitat management and restoration works that incorporates all of the above actions into a comprehensive plan for the duration of this Recovery Plan and broken into annual works programs.	**ARMB**
7.5 Road & track management	
I. No further roads or tracks are to be developed in Type I or Type II habitat or within a 30 m buffer of those habitats, unless for the specific purpose of restoration of habitat and with the approval of DEPI.	**ARMB, BSL & DEPI**
II. Plan vehicle use to minimise unnecessary trips (e.g. ensure all standard equipment is in vehicle at commencement of trip, etc).	**ARMB & BSL**

ACTION	RESPONSIBILITY
III. The current low mountain bike and walking use in areas of Mountain Pygmy-possum habitat or buffers will be maintained. Summer recreational use of these areas will be kept to a minimum. Promotion of these activities generally on Mount Buller must be tailored to ensure that they do not increase in these particular and identified locations.	**ARMB**
IV. Maintenance of existing roads is permitted using low impact construction and maintenance techniques designed to ensure long-term sustainable improvements are achieved	**ARMB**
7.6 Drainage & sedimentation	
I. Continue to review and map all drainage and sediment sources in the catchments for Type I and Type II habitat areas, including roads and tracks, un-vegetated or poorly vegetated areas and cross-drains on ski areas (including outlet of Wombat underground collector drain).	**BSL**
II. Document results of the trials undertaken by BSL of different designs of sediment traps.	**BSL**
III. Install and monitor preferred sediment traps on all roads and tracks draining to Type I and II habitats.	**BSL**
IV. Ensure that sediment traps are regularly cleared and maintained; all trapped sediment to be documented and removed to an appropriate designated disposal site. Sediment to be re-used/recycled as appropriate. Use of sediment in revegetation works should be considered and implemented as appropriate.	**BSL**
V. Stabilise and revegetate eroding or poorly vegetated areas.	**ARMB & BSL**
VI. Ensure all works are conducted to EPA best practice guidelines for Sediment Pollution Control.	**ARMB & BSL**
VII. Investigate the use of construction techniques and materials for track and road repair to minimise erosion and consequent sedimentation.	**ARMB & BSL**
7.7 Waste and Litter	
I. Waste management planning and facilities on Mount Buller will take into account potential for, and reduction of potential impacts on the Mountain Pygmy-possum.	**ARMB & BSL**
II. There will be an emphasis on minimising litter in and around Mountain Pygmy-possum habitat areas through the appropriate provision of bins (including at the top and bottom of lifts).	**BSL**
III. Educate staff and visitors as to the impacts of litter on the Mountain Pygmy-possum.	**ARMB & BSL**
IV. Undertake annual collection days within habitat areas during the summer months	**ARMB & BSL**
7.8 Fire management	
I. Any reviews of relevant fire plans prepared during the life of this plan should specifically include this objective and current mapping clearly delineating these habitat assets.	**ARMB & BSL**
7.9 Ski-field management	
7.9.1 Snow grooming and over-snow vehicles	
I. Snow grooming activities in Type I and Type II habitat and associated 30 m buffer will be confined to essential operations (e.g. search and rescue) only.	**BSL**

ACTION	RESPONSIBILITY
II. Develop winter maps to clearly identity both appropriate over-snow access areas and no go areas where Mountain Pygmy-possum habitat is present.	**BSL**
III. Type I or Type II preferred habitat may expand over time as new habitat is re-created. The snow grooming strategy/plan must be maintained current to any changes that occur.	**BSL**
IV. Access trails identified in maps to be developed will only be groomed for essential operational procedures and only when the minimum snow depth is greater than 60 cm.	**BSL**
V. The use of over-snow vehicles for search and rescue and medical evacuation will be allowed in all areas.	**BSL**
VI. Where snowmobile use is deemed necessary close to Type I or Type II, habitats, use of a 4-stroke machine will be encouraged. All new or replacement snowmobiles should be 4-stroke machines.	**BSL**
VII. Grooming on runs on the Southern Slopes that do not support Type I or Type II habitat will continue but will be undertaken in a manner that minimises damage to vegetation and soil, especially during low snow conditions.	**BSL**
VIII. Where there are Mountain Pygmy-possum corridors constructed across runs that otherwise do not have Mountain Pygmy-possum habitat, the location of the corridors will be made clear to machine operators and grooming activities must be managed to ensure that the corridors are not damaged or unnecessarily disturbed.	**BSL**
IX. Where revegetation is being undertaken on ski runs that otherwise do not have Mountain Pygmy-possum habitat, the location of revegetation areas will be made clear to machine operators and grooming activities must be managed to ensure that revegetation areas are not damaged, especially in low snow conditions. Signage and awareness programs are to be developed	**BSL**
7.9.2 Ski lift rationalisation	
I. Ensure any review of ski lifts includes a full consideration of potential impacts on the Mountain Pygmy-possum, including the potential to reduce impacts associated with some existing lifts and associated access and infrastructure (e.g. Southside).	**BSL**
II. Where any lift is permanently removed the site will be rehabilitated to replicate the habitat type that existed there prior to development. This will include re-establishment of boulderfield components and linkages wherever practicable.	**BSL**
7.9.3 Snow-making	
I. Monitoring should be undertaken for any altered nutrient inputs to Mountain Pygmy-possum habitat from recycled water used during snow making activities. Any altered nutrients must be managed to ensure they do not have impacts on Mountain Pygmy-possums or their habitats. Detailed recommendations for such investigations, including for determination of relevant threshold levels for water chemistry are provided in Feehan Consulting (2009) and should be followed.	**ARMB & BSL**
7.10 Climate change	
I. The extent of local climate change will be monitored by establishing 2-3 climate monitoring stations at sites representative of key Mountain Pygmy-possum habitat areas (the existing Bureau of Meteorology winter monitoring stations may be suitable sites; there should be liaison with the Bureau on how best to implement this action).	**ARMB & BSL**

ACTION	RESPONSIBILITY
II. Planning for any increased snow making facilities will need to take full account of potential impacts on the Mountain Pygmy-possum and its habitat; new facilities in Type I or Type II habitat or buffers will need EPBC Act referral by the proponent.	**BSL**
III. The water reticulation system for snow making could provide a source of water to assist with establishing revegetation during un-seasonally dry periods.	**BSL**
7.11 Environmental management & awareness	
7.11.1 Education and environmental awareness of mountain staff	
I. Continue to include environmental issues in staff induction.	**BSL & ARMB**
II. Continue to send key staff to the Alpine Ecology or Alpine Rehabilitation Course.	**BSL & ARMB**
III. Seek to conduct the Alpine Ecology and/or Alpine Rehabilitation Course or aspects of the course(s) on Mount Buller	**ARMB**
7.11.2 Education and environmental awareness of visitors	
I. To create a supportive visitor community by ensuring visitors are aware of the significance of the Mountain Pygmy-possum on Mount Buller and are informed about the recovery actions that may affect them.	**ARMB & BSL**
II. Maintain existing interpretive displays in the village and update when appropriate.	**ARMB**
III. Install an interpretive display at the Mount Buller Ski School on Bourke Street.	**ARMB**
IV. Provide regular Mountain Pygmy-possum recovery updates on Mount Buller web page, newsletters and interpretive videos.	**ARMB & BSL**
V. Establish a public interpretation facility in Cow Camp or other prominent location that is easily located and viewed.	**ARMB & BSL**
7.12 Administration of Recovery Plan	
7.12.1 Knowledge management and base data	
I. Establish and maintain a library of material and references on the Mountain Pygmy-possum at the ARMB offices and at another location off the mountain.	**ARMB**
II. All existing works undertaken for Mountain Pygmy-possum management (e.g. tunnels, revegetation) will also be accurately mapped and this will be continuously updated as new works are done.	**ARMB & BSL**
7.12.2 Mountain Pygmy-possum Taskforce	
I. The Taskforce will continue to oversee, continue to develop and embrace new strategies and ideas and technologies to oversee the implementation of this Plan and specifically to ensure that actions identified in this Plan are undertaken and carried to completion. ARMB will chair the Taskforce	**ARMB**
II. The Taskforce will produce a short annual report listing actions undertaken and accomplishments of the previous twelve months.	**ARMB & all taskforce members**
III. The Taskforce will meet at least twice per annum to review actions undertaken during preceding period, assign priorities for forthcoming period, and deal with any new matters relevant to Mountain Pygmy-possum conservation management on Mount Buller.	**ARMB & all taskforce members**

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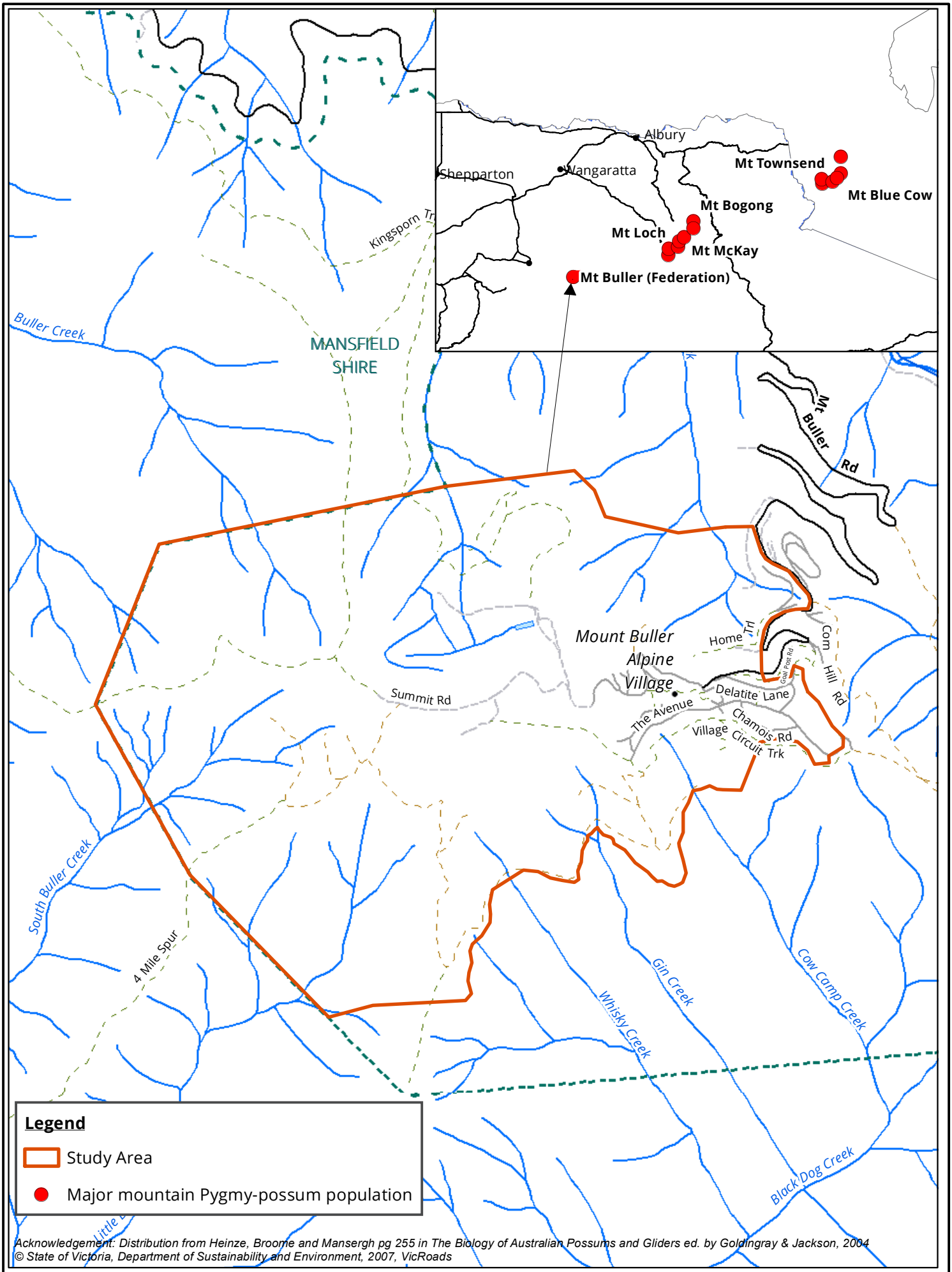
Appendix 1: Figures



Acknowledgement: Distribution from Heinze, Broome and Mansergh pg 255 in The Biology of Australian Possums and Gliders ed. by Goldingray & Jackson, 2004

Figure 1: Present distribution of Mountain Pygmy-possum (*Burramys parvus*)

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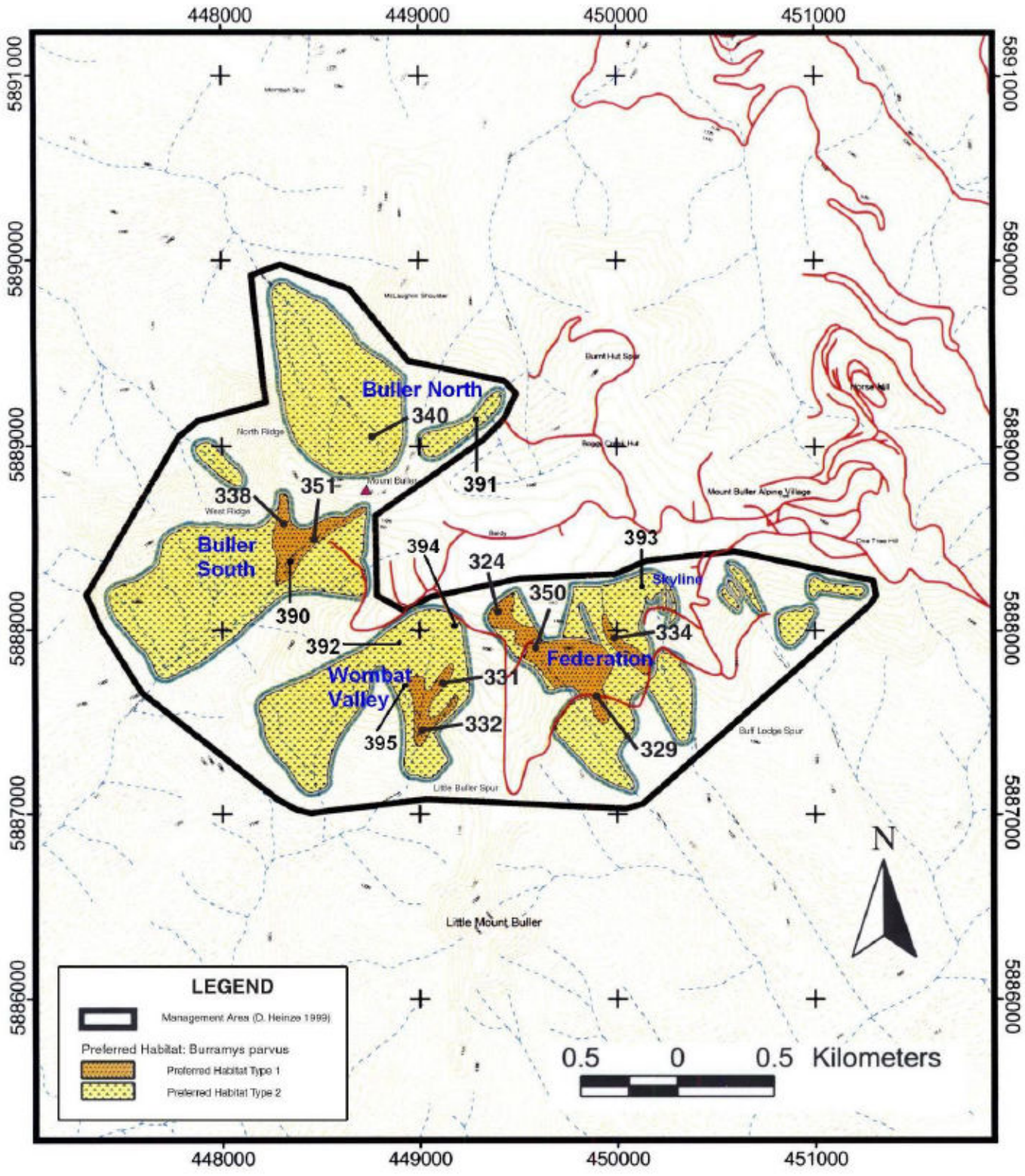

Figure 2: Trap sites and preferred habitat of the Mountain Pygmy-possum at Mount Buller, including the Wombat Valley.

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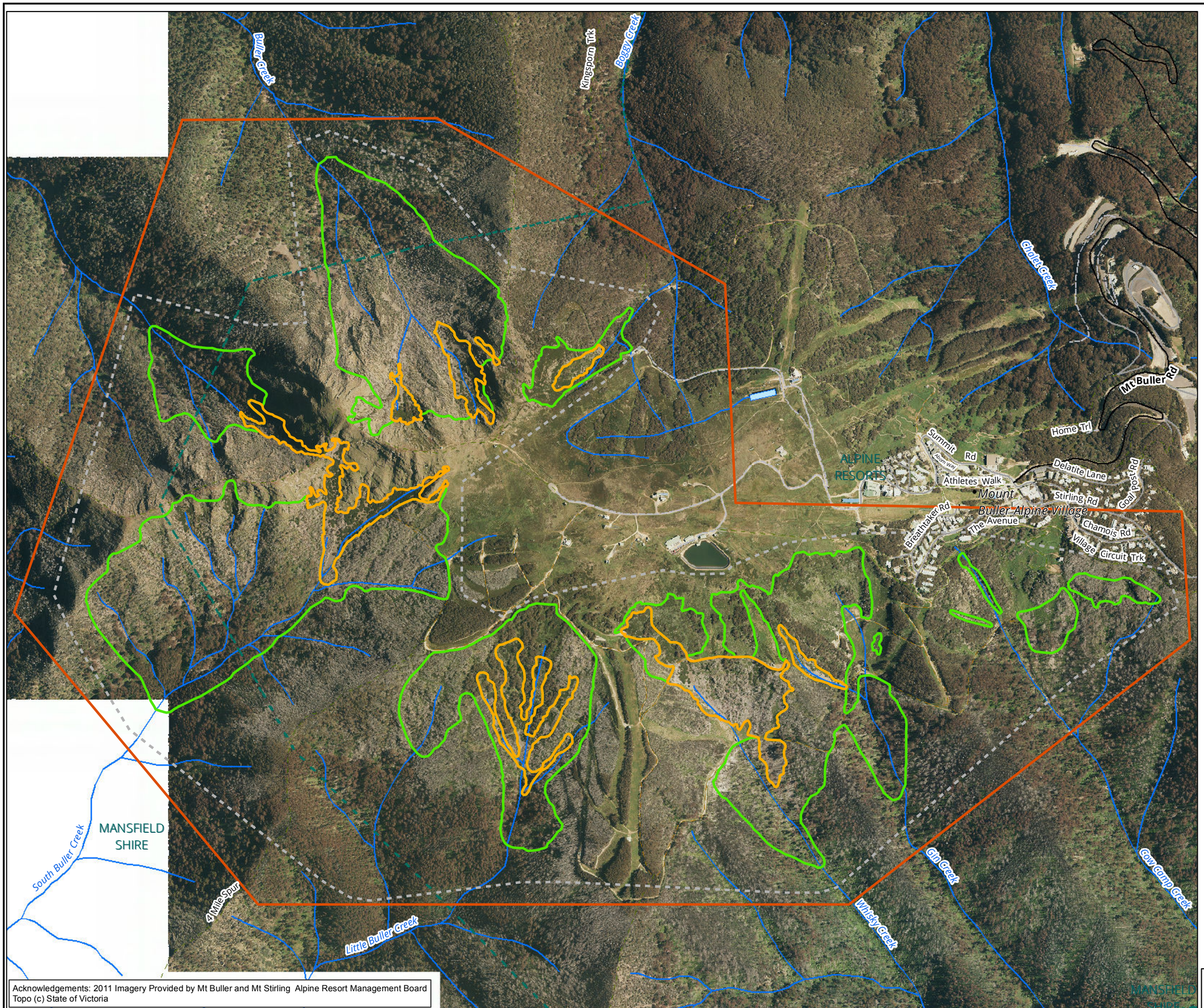

Legend

- Study Area
- Revised management area

Preferred habitat

- Type I
- Type II

Figure 3: Distribution of Type I and Type II Mountain Pygmy-possum habitat, Mount Buller (from Heinze and Harvey 2006)

0 130 260 390 520 650

Metres

Scale: 1:13,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

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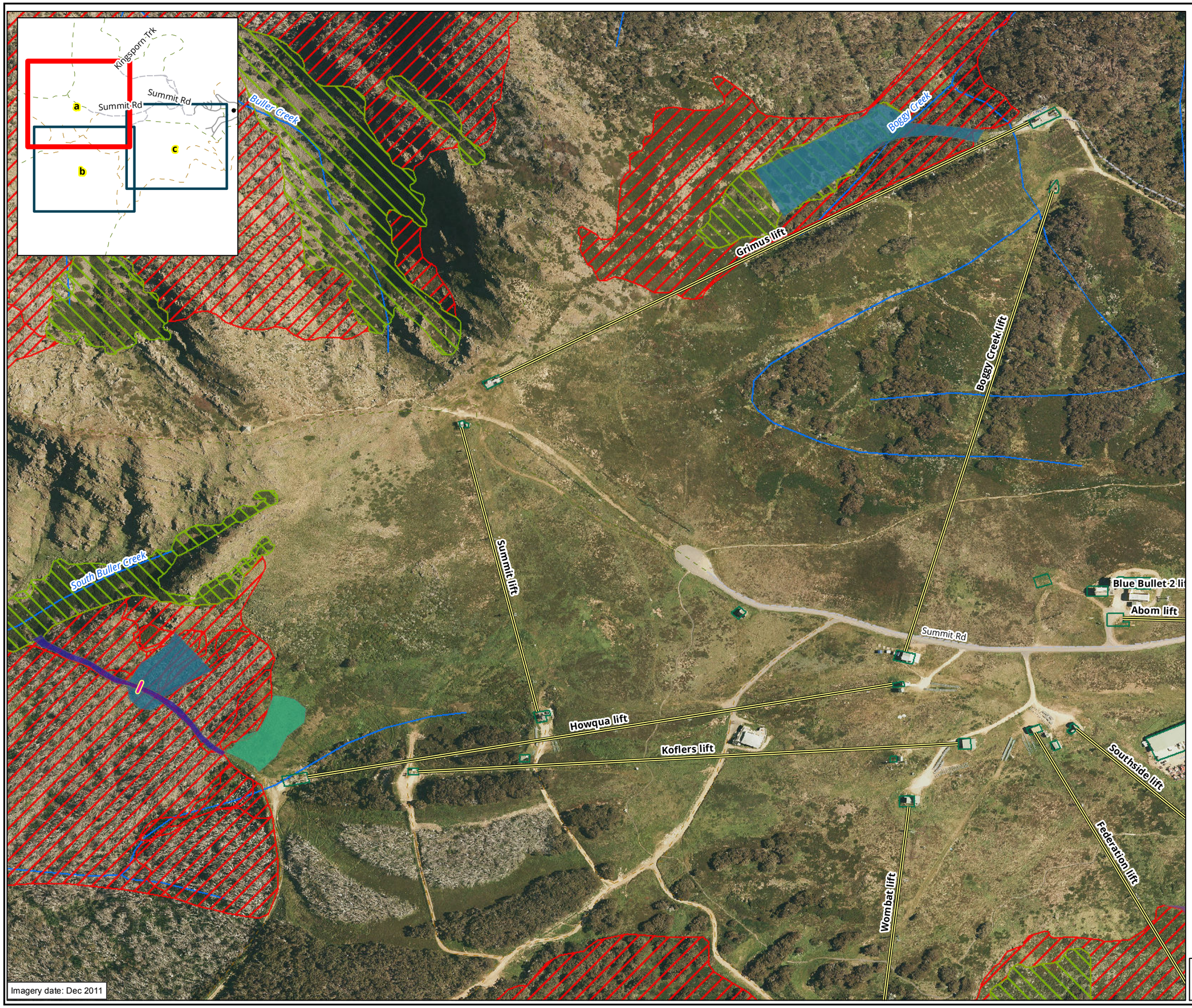

Legend

Ski Lifts

Proposed additional habitat links

Sub-surface, Medium priority

Vegetation restoration areas

(Condition and priority for follow-up)

Follow-up works: infill plant/ manage slashing, High

Follow-up works: infill plant/ manage slashing, Medium

Follow-up works required: replant, Low

Successful revegetation/ natural regeneration, Low

Mountain Pygmy-possum habitat

Habitat - Type 1

Habitat - Type 2

Figure 4: (map a) – Mount Buller Mountain Pygmy-possum habitat re-creation and restoration works (mapped in October 2013)

0 50 100 150 200

Metres

Scale: 1:4,000 @ A3

Coordinate System: GCS GDA 1994

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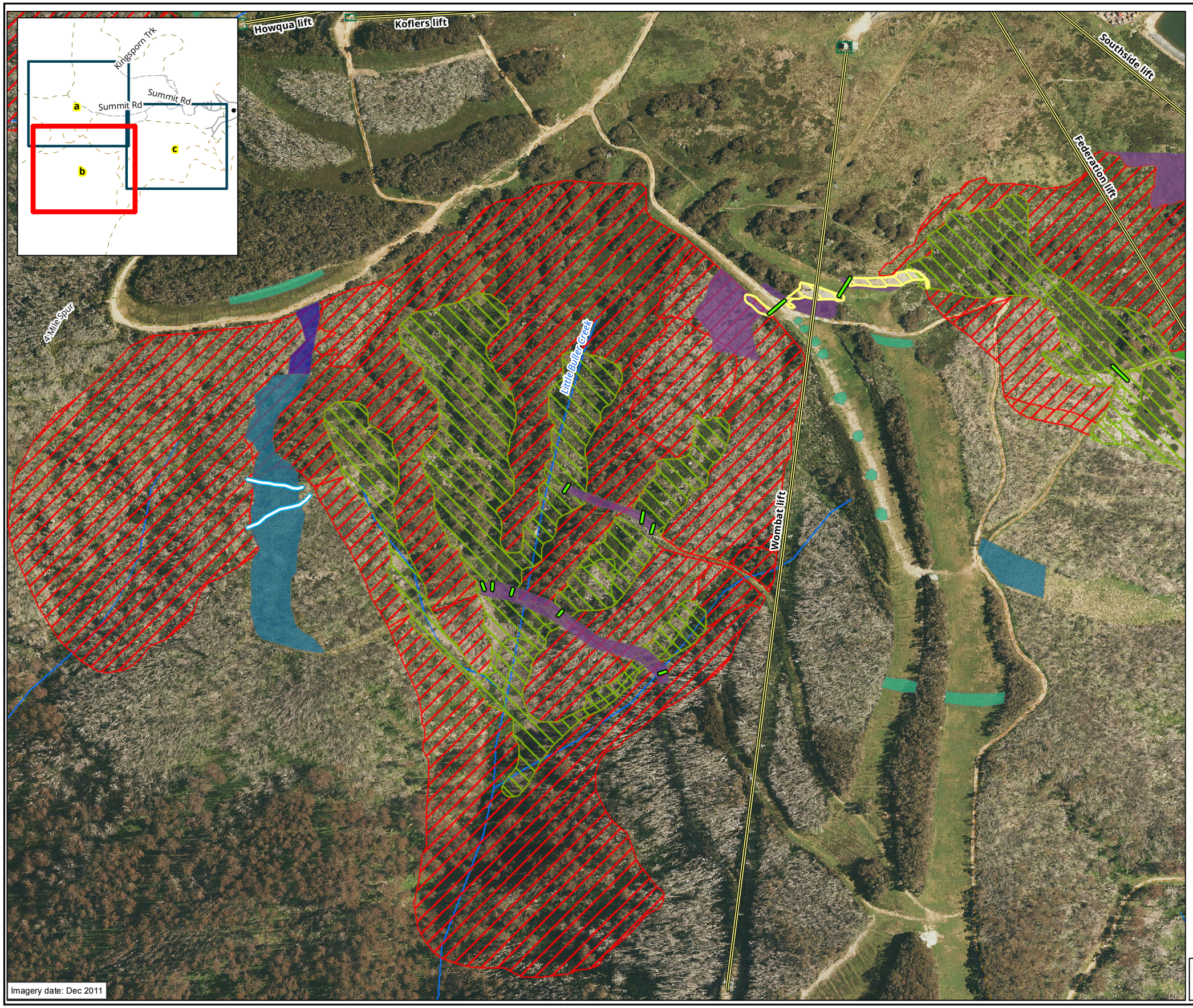

Legend

Ski Lifts

Created habitat links

Sub-surface/tunnel

Surface crossing

Created Boulder Fields

Vegetation restoration areas

(Condition and priority for follow-up)

Follow-up works: infill plant/ manage slashing, High

Follow-up works: infill plant/ manage slashing, Medium

Follow-up works required: replant , Medium

Follow-up works required: replant, Low

Successful revegetation/ natural regeneration, Low

No immediate follow-up works required, Low

Mountain Pygmy-possum habitat

Habitat - Type 1

Habitat - Type 2

Figure 4: (map b) – Mount Buller Mountain Pygmy-possum habitat re-creation and restoration works (mapped in October 2013)

0 50 100 150 200

Metres

Scale: 1:4,000 @ A3

Coordinate System: GCS GDA 1994

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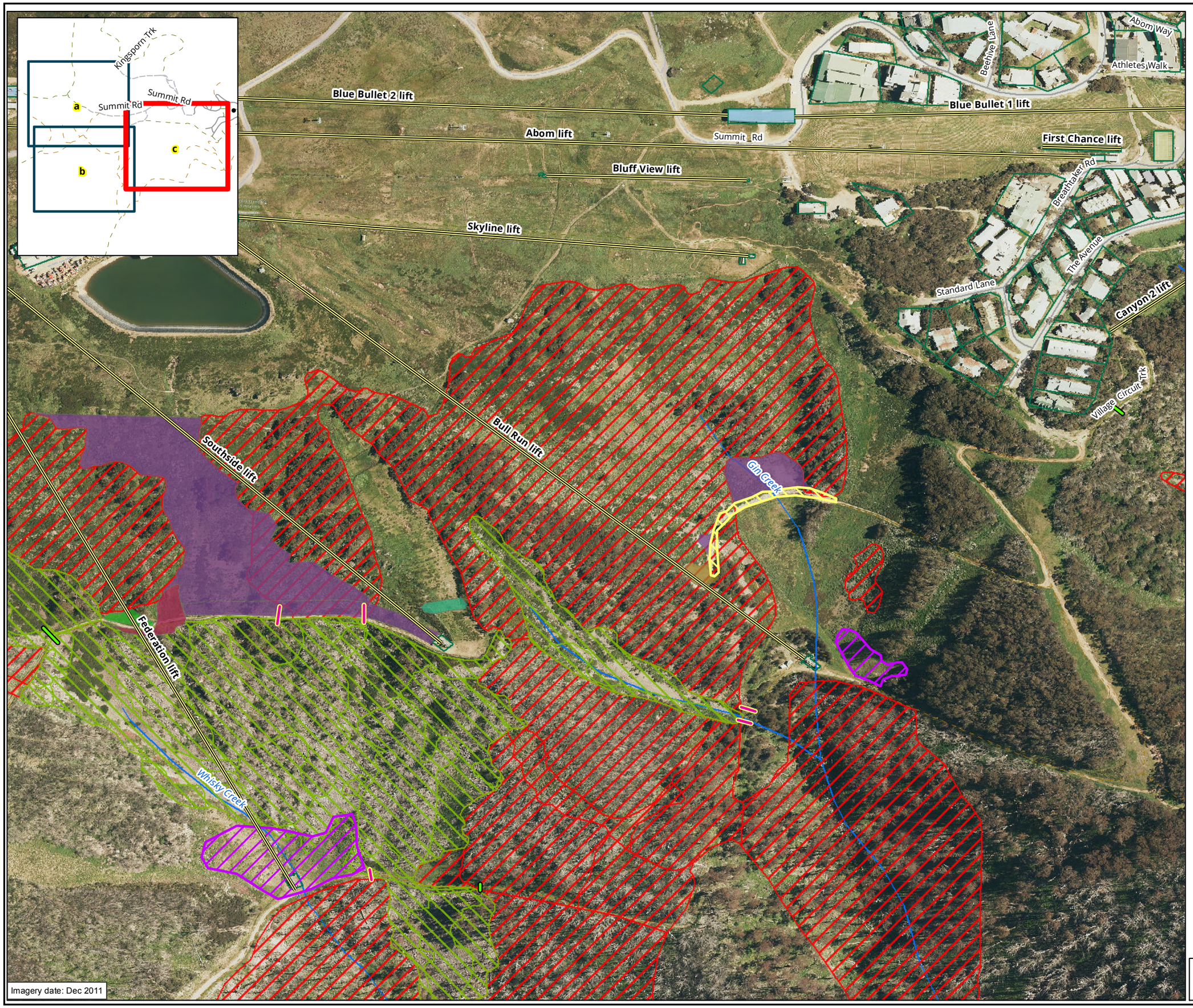

Legend

Ski Lifts

Proposed additional habitat links

Sub-surface, Medium priority

Created habitat links

Sub-surface/tunnel

Created Boulder Fields

Future vegetetation management

Medium priority

Vegetation restoration areas

(Condition and priority for follow-up)

Follow-up works: infill plant/ manage slashing, High

Follow-up works required: replant , Medium

Follow-up works required: replant, Low

Future revegetation area, Low

No immediate follow-up works required, Low

Mountain Pygmy-possum habitat

Habitat - Type 1

Habitat - Type 2

Figure 4: (map c) – Mount Buller Mountain Pygmy-possum habitat re-creation and restoration works (mapped in October 2013)

0 50 100 150 200

Metres

Scale: 1:4,000 @ A3

Coordinate System: GCS GDA 1994

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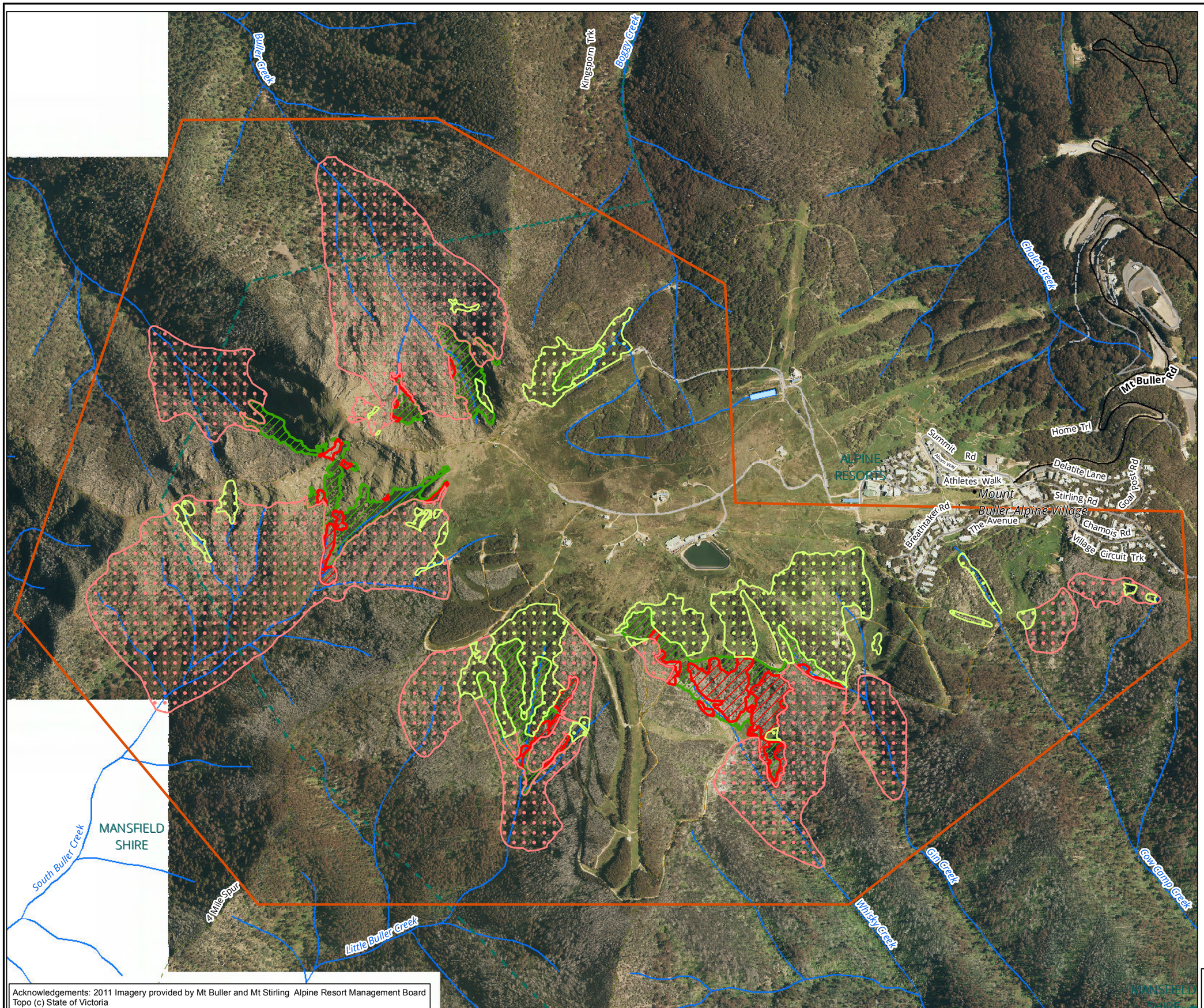

Legend

- Study Area

Type 1

- Unburnt
- Burnt or scorched

Type II

- Unburnt
- Burnt or scorched

Figure 5: Unburnt and burnt or scorched Mountain Pygmy-possum habitat, 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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17536_F5_BurntUnburntHabt