

APPENDIX C

FAUNA AND FLORA ASSESSMENT



FLORA AND FAUNA ASESMENT

Proposed Upgrade, Kosciuszko Flow Trail, Thredbo Ski Resort

Prepared for
Kosciuszko Thredbo Pty Ltd

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Executive summary

This report describes the biological environment and assesses the potential effects on threatened and migratory species, endangered populations and ecological communities of a proposal to undertake upgrades to eight separate sections of the existing Kosciuszko Flow Trail at Thredbo Ski Resort.

The study area and immediate surrounds was found to support three vegetation communities in various condition states; Tall Alpine Heath with and without Eucalypts, Subalpine Woodland and Exotic Grassland. Thirty-eight plant species were recorded within the study area or immediate surrounds during the survey period. No threatened flora species or threatened ecological communities were recorded within the study area during the survey period and none are considered likely to occur there.

Whilst the study area provides a small amount of known and potential habitat for threatened fauna species such as *Mastacomys fuscus* (Broad-toothed Rat), *Pachycephala olivacea* (Olive Whistler), *Callocephalon fimbriatum* (Gang-gang Cockatoo), and *Petroica phoenicea* (Flame Robin) similar habitats are extensive in the locality and the habitats to be affected are very small in the context of the extent of similar habitats contiguous with the study area. Under these circumstances, whilst the proposal will have some impacts on fauna habitats, the impacts are considered acceptable given their relatively minor nature, and in the context of the extensive areas of similar habitat that will continue to be available in contiguous areas. The proposal will not sever any linkages between habitats or otherwise permanently restrict fauna movement.

Following the application of the seven factors from Section 5A of the NSW *Environmental Planning and Assessment Act 1979*, as required by the *Threatened Species Conservation Act 1995* and the NSW *Fisheries Management Act 1994*, in accordance with relevant assessment guidelines, it is concluded that the proposal is unlikely to have a significant effect on threatened species, endangered populations, threatened ecological communities, or their habitats. A Species Impact Statement is not required for the proposal.

Following consideration of the administrative guidelines for determining significance under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999*, it is concluded that the proposal is unlikely to have a significant impact on matters of National Environmental Significance or Commonwealth land, and a referral to the Commonwealth Environment Minister is not required.

A number of impact mitigation and amelioration measures have been recommended to be incorporated into the proposal, as identified in Section 5.

1 Introduction

Eco Logical Australia Pty Ltd (ELA) was engaged by Kosciuszko Thredbo Pty Ltd at the request of Dabyne Planning Pty Ltd to prepare a flora and fauna assessment to accompany a proposal to upgrade the Kosciuszko Flow Trail, a mountain bike trail at Thredbo Ski Resort. This flora and fauna assessment provides the findings of a review of relevant literature, database searches and field survey. It also addresses relevant statutory considerations and makes recommendations to ameliorate the potential impacts of the proposal on vegetation and habitats.

The aim of this investigation was to assess the ecological impacts of the proposal on flora, fauna and habitats within the study area. The objectives of this investigation were:

- To identify and describe the flora species and vegetation communities present in the study area, their condition and conservation significance.
- To identify and describe the fauna habitats present in the study area and their condition.
- To identify the fauna species which are present or likely to occur in the study area, and describe their conservation significance.
- To assess the impacts of the proposal on vegetation, fauna, habitats, and other environmental features as necessary.
- To make recommendations regarding any environmental management and impact mitigation/amelioration measures, which can be implemented to limit the effects of the proposal on vegetation, fauna, habitats, and other environmental features as necessary.

1.1 The proposal

The proposal involves upgrades to eight separate sections of the existing Kosciuszko Flow Trail that are necessary to improve summer and winter resort operations and to improve the mountain bike experience. The proposed improvements can be grouped into three types of works as follows:

- **Section 1** – Modifications near the start of the trail, which will result in three existing corners, which are considered too technical and pose safety issues, being made redundant and rehabilitated in exchange for an improved alignment with wider corners and better fall line. The alignment of the Section 1 works are shown in **Photos 1-7** and will result in approximately 90 m of new trail.
- **Section 3** - To allow for the temporary overpass between the Flow Trail and Downhill Trail to be removed and become permanent, a new permanent overpass structure is proposed within the tree island adjacent to the temporary scaffold structure. This will allow for the permanent structure to remain over winter without being dismantled and erected at the start and end of each season. The location of the proposed permanent overpass structure is shown in **Photo 8**.
- **Sections 2 and 4-8** – The improvements at Sections 2 and 4-8 are all intended to achieve the same outcome. That is, to relocate the corners of the trails that are currently within the ski slope, and which include large excavated berms, into either a tree island between the ski runs, or the vegetation on the side of the ski runs. This is proposed given the impact these corners have had on winter operations, and the extent of maintenance required to dismantle and fill the berms in at the start and end of each season. This will also improve safety for both snowmobiles, grooming machines and skiers and snowboarders. **Photos 9-14** further identify Sections 2 and 4-8.

The location of the proposed works are identified in **Figure 1**.

The Proposal

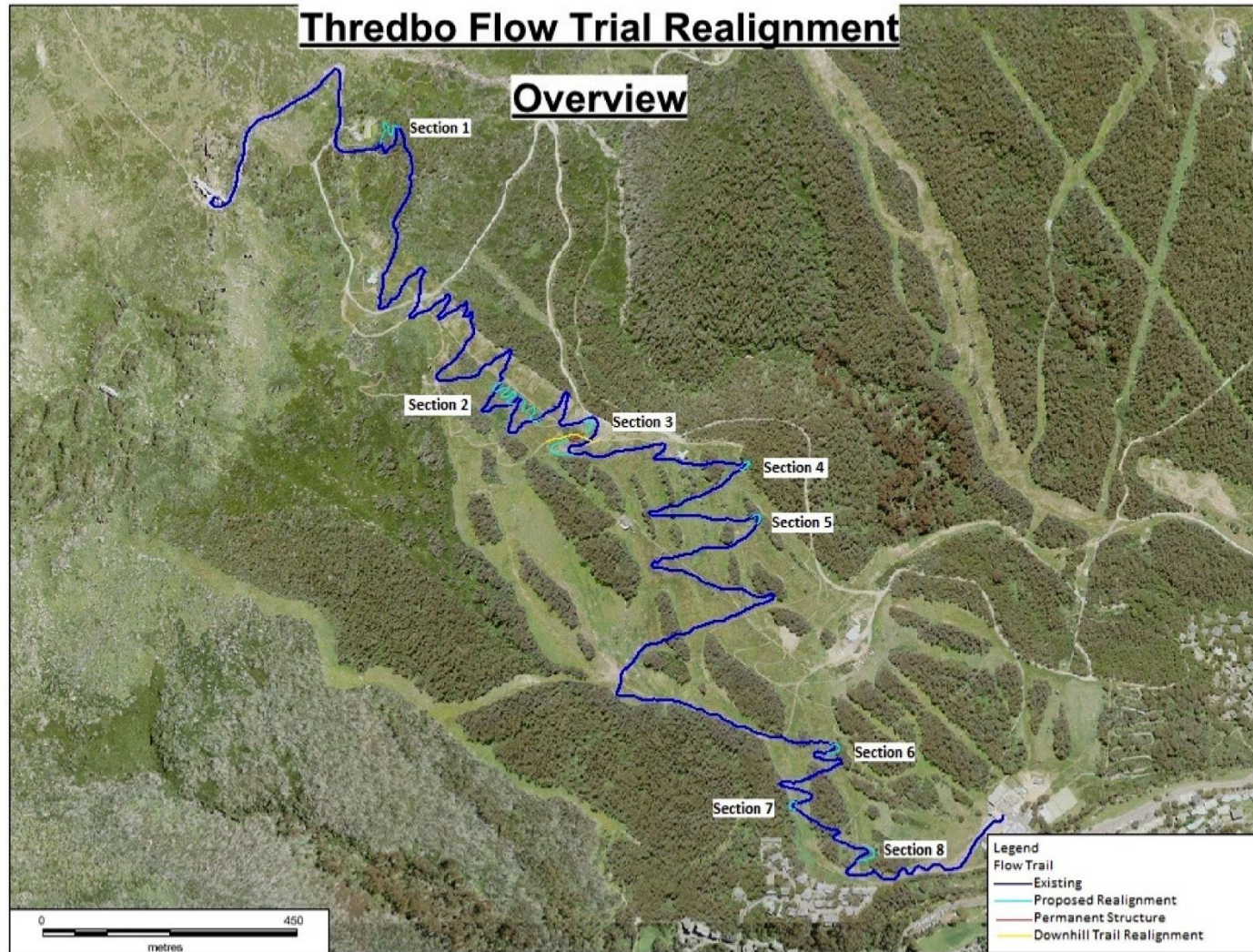


Figure 1: The proposal



Photo 1: This existing corner which is too tight will be removed and rehabilitated with the trail alignment heading through the trees to the north as shown in red.



Photo 2: The trail alignment, shown in red, will take advantage of the existing spaces between trees to minimise tree removal.



Photo 3: The realigned trail will affect a small amount of Alpine Heath below the Black Sallee's restaurant where a new corner will be established.



Photo 4: The realigned trail then heads back into the treed area, again using natural gaps in the trees to avoid the need to remove any of the larger trees evident in Photo 4.



Photo 5: A second new corner will be positioned so as to avoid any tree or rock removal.



Photo 6: This small sapling will need to be removed as the realigned trail heads towards the existing trail, just below where Peter Fleming is shown in Photo 6.



Photo 7: The third new corner will bring the realigned trail back onto the existing trail.



Photo 8: The new permanent overpass structure will traverse a small tree island just above the existing temporary structure and will take advantage of a gap in the trees.



Photo 9: Section 2 involves a realignment through the disturbed ski run.



Photo 10: Section 2 also involves a new corner in a small tree island comprising regrowth subalpine woodland.



Photo 11: Section 2 also involves a corner in an area of plantings between two tree islands. The plantings have only been partially successful with only one or two trees and a patchy cover of heath.



Photo 12: Section 2 also involves extending a corner further into the regrowth heath and hard up against the snowfence so that the corner is off the ski run.



Photo 13: Section 4 involves extending the corner further into the regrowth subalpine woodland tree island so that the corner is off the ski run.



Photo 14: Section 5 involves extending the corner further into the regrowth subalpine woodland tree island so that the corner is off the ski run.



Photo 15: Section 6 involves extending the corner further into the regrowth subalpine woodland tree island so that the corner is off the ski run.



Photo 16: Section 7 involves extending the corner further into the regrowth subalpine woodland so that the corner is off the ski run.



Photo 17: Section 8 involves extending the corner further into the regrowth subalpine woodland tree island so that the corner is off the ski run.

1.2 Direct and indirect impacts

Direct impacts on flora and fauna arising from the proposal will predominantly comprise:

- The removal or further disturbance to approximately 533 m² of native vegetation.
- The removal of 14 Snow Gum saplings.
- The pruning of branches on four Snow Gum trees.

The impacts on native vegetation have been calculated by assuming an average area of disturbance of 2.5 m where the trail traverses native vegetation in Sections 2 and 4-8, where the realignments predominately comprise corners. An average area of disturbance of 1.7 m is assumed for Section 1, which predominately comprises straight sections of trail. This is consistent with the other impact assessments undertaken for the mountain bike trails at Thredbo over recent years. The Section 3 impacts assume a 4 m wide clearing to establish the permanent overpass structure. The impacts on vegetation are summarised below in **Table 1**.

The proposal has been designed to avoid the need to remove any mature trees. The 14 trees to be removed all comprise small saplings or basal regrowth. Branches will need to be removed on an estimated four trees. A few dead and fallen branches or trees will also need to be removed for the proposal. The proposal will not involve any substantial rock removal.

Indirect impacts associated with the proposal are expected to be minor as:

- The footprint of the proposed direct impacts are relatively small.
- The affected areas are almost all already disturbed and on the edge of existing ski runs.

Table 1: Impacts on vegetation associated with each section of the proposal.

Section	Length of Disturbance (m)	Vegetation removal (m ²)	Tree pruning	Tree removal
1	90	153	3	2
2	50	125	-	2
3	20	80	1	3
4	15	37.5	-	3
5	15	37.5	-	2
6	15	37.5	-	2
7	10	25	-	-
8	15	37.5	-	-
Total	230	533	4	14

The proposal will be implemented using low impact methods and with adequate safeguards. These include undertaking the excavation from existing disturbed areas or within the proposed trail footprint, and thus not extending the disturbance footprint beyond the proposed trail realignments. These techniques have proved to be effective with the construction of other trail within the Thredbo Resort Area.

The proposal is not anticipated to result in any substantial changes in surface or subsurface hydrology which may lead to the loss or adverse modification of vegetation communities or associated habitats. Similar trails that have been constructed throughout the resort over recent years have had negligible impact on surface and subsurface hydrology, aquatic ecosystems or vegetation communities beyond the immediate development footprint. The proposal is not expected to have any substantial long-term adverse impacts on habitat connectivity, given the relatively narrow areas of vegetation that will be affected and the existing disruptions to connectivity associated with the existing ski infrastructure.

1.3 Offsets

To offset the impacts associated with the proposal, it is proposed to:

- rehabilitate and revegetate the sections of trail that will be made redundant in Section 1; and
- revegetate ‘The Rapids’ below the Cat Shed by ceasing the current management regime of bi-annual slashing.

1.4 Subject site, study area and locality

The “subject site” comprises those areas, as described in Section 1.1 and **Figure 1**, which will be directly impacted by the proposal. The “study area” extends approximately 2 m beyond the limits of the subject site given the relatively minor indirect impacts anticipated beyond the development footprint.

The locality for the purposes of this report is the area of land within a 5 km radius of the study area.

1.5 Topography, geology and soils

The study area occupies gently to moderately sloping east facing slopes at an altitude of between approximately 1810 m and 1380 m Australian Height Datum (AHD). The study area is underlain by Silurian granodiorite (Ecology Australia 2002). Soils are likely to comprise a mix of alpine humus soils, comprising sandy clay loams. There are no watercourses within the study area.

1.6 Disturbances

Much of the study area has already been disturbed in association with historic slope grooming and other resort management activities. Parts of Section 1 appear to have been disturbed in association with the construction of the Black Saltees restaurant. The most heavily disturbed areas are generally dominated by introduced grasses and herbs with patches of regrowth heath, as shown in **Photo 9**. However, beyond the first metre or so adjoining the ski runs, the vegetation is typically less disturbed and continues to support predominately native vegetation, with only scattered occurrences of weedy grasses and forbs.

1.7 Planning and legislation

It is not the intention of this assessment to document all the legislation and planning instruments that are relevant to the proposal. A detailed analysis of the statutory environment is provided in the Statement of Environmental Effects for the proposal (Dabyne Planning 2017). However, the legislation and planning instruments which are relevant to the assessment of potential impacts on terrestrial flora and fauna are discussed in brief below.

1.7.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EPA Act) is the principal planning legislation for NSW, providing a framework for the overall environmental planning and assessment of development proposals. This proposal is to be assessed under Part 4 of the EPA Act. The EPA Act places a duty on the determining authority to adequately address a range of environmental matters including the maintenance of biodiversity and the likely impact to threatened species, populations and communities. Assessment of threatened species, populations and community considerations usually occurs under Section 5A of the EPA Act relating to Assessments of Significance.

1.7.2 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) aims to protect and encourage the recovery of threatened species, populations and communities listed under the Act. Obligations on determining authorities include the consideration of threatened species, populations, endangered communities and recovery plans in fulfilling their statutory responsibilities in the development approvals process under the EPA Act. The Act requires the completion of a Species Impact Statement where a significant impact is considered likely on a threatened species, population or community listed under the Act.

1.7.3 State Environmental Planning Policy (Kosciuszko National Park—Alpine Resorts) 2007

State Environmental Planning Policy (Kosciuszko National Park—Alpine Resorts) 2007 identified the Minister for Planning as the determining authority for development within the NSW Alpine Resorts. SEPP (Kosciuszko National Park—Alpine Resorts) 2007 requires the Minister for Planning to refer for comment any development application in the Alpine Resorts to the Director General of the NSW Office of Environment and Heritage (OEH).

1.7.4 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a national scheme for protecting the environment and conserving biodiversity values. Approval from the Commonwealth Minister is required under the EPBC Act if the action will, or is likely to, have a significant impact on matters considered to be of national environmental significance (MNES). MNES relevant to the proposal include species and ecological communities that are listed under the Act. The EPBC Act does not define significant impact but identifies matters that are necessary to take into consideration.

2 Methods

2.1 Database and literature review

Data gathered during all field studies and the literature review was analysed and interpreted in accordance with the provisions of legislation and planning controls pertaining to flora and fauna. Threatened and migratory species, threatened populations and endangered ecological communities (EECs) that have been recorded, or have the potential to occur within the locality have been assessed for their likelihood to inhabit the study area (**Appendix A**). All listed species and EECs considered likely to occur within the study area, or to be affected by the proposal, require consideration pursuant to Section 5A of the EPA Act and under the EPBC Act.

2.2 Field surveys

ELA conducted flora and fauna surveys within the study area and surrounds on 17 February 2017.

2.2.1 Flora surveys

A detailed botanical survey was conducted in the study area by ELA Senior Ecologist Ryan Smithers on 17 February 2017.

Community identification and floristic audit

The study area was surveyed to document the flora species present, including those of conservation significance, and the location and extent of vegetation communities including any EECs encountered. All flora species encountered within the study area were identified to species level. A description of the vegetation was then prepared with general observations made of the wider area. The vegetation was assessed according to the floristic and structural classifications of Ecology Australia (2002). Reference was also made to McDougall and Walsh (2007).

Targeted searches

Specific searches for plant species of conservation significance known from the locality were conducted targeting areas of potential habitat. In particular searches were undertaken for *Ranunculus anemoneus* (Anemone Buttercup), *Carex archeri* (Archer's Carex), *Carex raleighii* (Raleigh Sedge), and *Rytidosperma vickeryae* (Perisher Wallaby Grass).

Limitations

The floristic audit undertaken recorded as many species as possible and provides a comprehensive but not definitive species list. More species would probably be recorded during a longer survey over more seasons and years. Nevertheless, the techniques used in this investigation are considered adequate to gather the data necessary to identify potential ecological constraints to the proposal.

Flora survey effort

The flora survey effort employed a total of three person-hours.

2.2.2 Fauna surveys

Field investigations for fauna were conducted in conjunction with the flora surveys on 17 February 2017.

Habitat analysis

A description of the fauna habitats in the study area was prepared because the type of habitat in an area influences which animals occur there, as well as diversity and abundance. This habitat assessment also has an important role in predicting threatened fauna likely to occur in an area. The information collected usually includes the type of vegetation present, the presence/absence of rock habitats, tree hollows, ponds, streams, wetlands, foraging substrates and other features likely to attract threatened fauna. The study area and immediate surrounds were traversed to identify habitat components, which were recorded and described.

Diurnal surveys

Specific searches were conducted for habitats or resources of relevance for those threatened fauna species known from subalpine areas, and which might be anticipated to occur given the vegetation communities and habitats present. In particular, targeted searches were undertaken for evidence of *Mastacomys fuscus* (Broad-toothed Rat) and *Liopholis guthega* (Guthega Skink).

Opportunistic fauna surveys involved observations of animal activity, habitat surveys and searches for indirect evidence of fauna. Diurnal mammal searches were conducted in areas of potential habitat across the study area, with emphasis on searches for scats, tracks, burrows, diggings and scratchings. Searches were also undertaken around the bases of the affected rocks for evidence of the burrow networks used by the Guthega Skink.

Limitations

The results of fauna surveys can be optimised by conducting investigations over a long period to compensate for the effect of unfavourable weather, seasonal changes and climatic variation. In general, the longer the survey the more species will be detected. Results can also be improved by using a wide range of techniques, since some species are more likely to be detected by a particular method.

However, surveys are subject to constraints that determine the amount of time allocated, the methods used and the timing of the work. Thus, the results should be viewed in the light of these limitations. The fauna detected during the survey period are a guide to the native fauna present, but are by no means a definitive list of the species occurring in the study area. Nevertheless, the techniques used in this investigation are considered adequate to gather the data necessary to identify potential ecological constraints to the proposal.

Survey effort

The fauna survey effort employed a total of three person-hours.

Survey conditions

The surveys for this assessment were undertaken in warm dry weather with light winds. Temperatures ranged between 12 and 18.5 degrees with wind speed ranging between approximately 0 and 9 km/h.

3 Results

3.1 Database and literature review

Appendix A provides a list of threatened and migratory species and threatened ecological communities (TEC) that have been recorded from database searches within a 5 km radius of the study area. The potential for each of these species to occur in the study area and the importance of the habitats within the study area are also discussed in **Appendix A**, and a decision made regarding the need for further assessment in this report. Some species which are not known from subalpine and montane habitats have been excluded from **Appendix A**.

3.2 Flora

The vegetation within the study area has been typed with reference to the classifications of Ecology Australia (2002). The study area supports three vegetation communities; Tall Alpine Heath, with and without Eucalypts, Subalpine Woodland, and Exotic Grassland.

3.2.1 Tall Alpine Heath with and without Eucalypts

Tall Alpine Heath, with and without Eucalypts, is limited within the study area, to Section 1. Where a canopy is present, it is dominated by *Eucalyptus niphophila* (Snow Gum) to a height of 3-10 m and projective foliage cover (PFC) of up to 30%.

The understorey includes is dominated by *Ozothamnus secundiflorus* (Cascade Everlasting), *Nematolepis ovatifolia*, *Olearia phlogopappa* (Dusty Daisy-bush), but also includes *Pimelea axiflora* subsp. *alpina* and *Tasmannia xerophila* subsp. *xerophila* (Alpine Pepperbush). The groundcover is dominated by as *Poa fawcettiae* (Smooth Blue Snowgrass), *Hovea montana* (Alpine Hovea), *Acaena novae-zelandiae* (Bidgee Widgee), and given historic disturbances, *Acetosella vulgaris* (Sheep Sorrel). Other groundcovers include *Oxylobium ellipticum* (Common Shaggy Pea), *Pimelea alpina*, *Stellaria pungens* (Prickly Starwort), *Coronidium monticola*, *Asperula gunnii* (Mountain Woodruff), *Geranium potentilloides* var. *potentilloides*, *Celmisia pugioniformis* and *Polystichum proliferum*. Weedy grasses such as *Festuca rubra* (Red Fescue), and common weeds such as *Hypochaeris radicata* (Flatweed) and *Achillea millefolium* (Yarrow) are also present.

3.2.2 Subalpine Woodland

Subalpine Woodland is the most common vegetation community within the study area and surrounds. The canopy is dominated by regrowth Snow Gum to a height of approximately 14-18 m and PFC of up to 60%. Occasional *Eucalyptus stellulata* (Black Sallee) individuals occur in the lower areas, but are never abundant or co-dominant. There is a very sparse sub-canopy of *Acacia obliquinervia* (Mountain Hickory) in places. The understorey is dominated by *Bossiaea foliosa* (Leafy Bossiaea) to a height of up to 2.5 m with PFC of 70-90%. Other understorey shrubs which are less abundant include *Olearia phlogopappa*, *Tasmannia xerophila*, and *Ozothamnus secundiflorus*.

The groundcover is typically sparse given the density of the understorey and includes patches of species such as *Poa fawcettiae*, *Poa ensiformis* (Purple-sheathed Tussock-grass), *Asperula gunnii*, *Senecio gunnii*, *Stellaria pungens*, *Dianella tasmanica*, (Tasman Flax-lily), *Geranium potentilloides* var. *potentilloides*, *Acaena novae-zelandiae*, *Leptorhynchus squamatus* (Scaly Buttons), and *Polystichum proliferum*. Weeds such as *Anthoxanthum odoratum* (Sweet Vernal Grass), *Festuca rubra*, *Agrostis capillaris* (Browntop Bent), *Hypochaeris radicata*, *Acetosella vulgaris*, and *Achillea millefolium* are scattered throughout.

3.2.3 Exotic Grassland

The most heavily disturbed parts of the study area, on the ski slopes, support exotic grasslands, with patches of native shrubs, grasses, and forbs. These areas are characterised by an abundance of exotic grasses and herbs, the most common species comprising *Anthoxanthum odoratum* (Sweet Vernal Grass), *Festuca rubra*, *Agrostis capillaris* (Browntop Bent), and a range of exotic herbs including *Hypochaeris radicata* (Flatweed), *Acetosella vulgaris* (Sheep Sorrel), and *Achillea millefolium* (Yarrow).

3.2.4 Flora species

Thirty-eight plant species were recorded within the study area during the survey period including 30 native species and eight exotics, and this species list appears in **Appendix B**. No threatened flora species were detected within the study area despite targeted searches and it is unlikely that any occur there.

3.3 Fauna

3.3.1 Fauna habitats

The study area contains a limited range of fauna habitats given its relatively small size and the isolation of most of the tree islands from larger patches of contiguous vegetation. As such, the study area provides only a small amount of habitat mainly for common and highly mobile native fauna species. The scats of *Vombatus ursinus* (Common Wombat) were observed in a number of locations within the study area, as were scats of the pest species *Lepus timidus* (Brown Hare). Minor evidence of *Mastacomys fuscus* (Broad-toothed Rat) in the form of scattered scats were observed in Section 1, but not elsewhere within the study area. Other common native small mammals such as *Antechinus swainsonii* (Dusky Antechinus) and *Rattus fuscipes* (Southern Bush Rat) are likely to occur throughout the study area as would a range of common reptiles such as *Pseudemoia entrecasteauxii* (Mountain Log Skink), *Pseudemoia pagenstecheri* (Grassland Tussock Skink), *Drysdalia coronoides* (White-lipped Snake) and *Austrelaps ramsayi* (Highlands Copperhead). Threatened reptiles such as the Guthega Skink and Alpine She-oak Skink would not occur within the study area, given the absence of suitable habitats.

The typical suite of birds that inhabit the subalpine and montane habitats of the Thredbo Valley are likely to be resident within the study area or occur there from time to time such as *Acanthiza pusilla* (Brown Thornbill), *Platycercus elegans* (Crimson Rosella), and *Anthus novaeseelandiae* (Australasian Pipit). The only threatened birds that are likely to occur within the study area are highly mobile species such as *Petroica phoenicea* (Flame Robin), *Pachycephala olivacea* (Olive Whistler) and *Callocephalon fimbriatum* (Gang-gang Cockatoo), which may forage there from time to time.

There are no water habitats within the study area therefore no potentially important habitats for amphibians. None of the trees to be affected by the proposal are hollow-bearing so there is no potential roosting habitat for microchiropteran bats, nor sheltering habitat for possums or other hollow-dependent species such as the Gang-gang Cockatoo.

Habitat connectivity to adjacent areas of native vegetation is generally disrupted by existing ski runs, however sections 1, 4 and 7 have good connectivity to extensive areas of contiguous vegetation.

3.3.2 Fauna species

Six native and one exotic fauna species were detected within the study area or immediate surrounds during the survey period, including three mammals and four birds, as listed in **Table 2**. A much more diverse range of native and exotic fauna would either be resident within the study area or occur there from time to time.

Table 2: Fauna species recorded within the study area or immediate surrounds

Category	Common Name	Scientific Name	Detection Method
Mammals	Broad-toothed Rat	<i>Mastacomys fuscus</i>	Scat
	Hare*	<i>Lepus timidus*</i>	Scat
	Common Wombat	<i>Vombatus ursinus</i>	Scat
Birds	Australasian Pipit	<i>Anthus novaeseelandiae</i>	Observed
	Brown Thornbill	<i>Acanthiza pusilla</i>	Observed
	Little Raven	<i>Corvus mellori</i>	Observed
	Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	Call

Bold denotes threatened species. * denotes exotic species.

4 Impact assessment

4.1 Impacts on vegetation communities

4.1.1 Tall Alpine Heath (with and without eucalypts)

The proposal will result in the removal of an estimated 150 m² of Tall Alpine Heath with and without Eucalypts.

Ecology Australia (2002) estimate that there is more than 156 ha of the Tall Alpine Heath (with and without Eucalypts) in the Thredbo Resort area, and a further 1731.7 ha within the Perisher Resort area, and 12.5 ha at Charlotte Pass. The community is extensive in the alpine areas within NSW and there is likely to be tens of thousands of hectares of the community within Kosciuszko National Park. Gellie (2006) estimated that there is 66,429 ha of the Sub-Alpine Shrub/Grass Woodland, which appears to correlate with the community, or more than 99% of its pre-European extent. McDougall and Walsh (2007) confirm that the Tall Alpine Heath is the most common vegetation community on the main range, and is under little threat from a conservation perspective.

In this context, the loss or disturbance of approximately 150 m² of Tall Alpine Heath with and without Eucalypts is a minor and acceptable impact.

4.1.2 Subalpine Woodland

The proposal will result in the removal of approximately 380 m² of the Subalpine Woodland vegetation community in association with Sections 2-8.

Ecology Australia (2002) estimate that there is approximately 443 ha of Subalpine Woodland within the Thredbo Resort area, and a further 184 ha within the Perisher Resort area, 183 ha at Mount Selwyn, and 5.7 ha at Charlotte Pass. Gellie (2006) estimates that within NSW there is 45,870 ha and 66,429 ha respectively, of the Subalpine Dry Shrub/Herb Woodland (Community 128) and Subalpine Shrub/Grass Woodland (Community 130) and that less than 0.7% of the pre-European occurrences of these communities have been cleared. Furthermore, the vast majority of the occurrence of these communities in NSW is within conservation reserves and in particular with Kosciuszko National Park.

In this context, the loss of approximately 380 m² of Subalpine Woodland is a relatively minor and acceptable impact.

4.2 Impacts on threatened ecological communities

The study area does not support any endangered ecological communities:

4.3 Impacts on flora species of conservation significance

No threatened flora species, or flora species identified on the schedules of the Kosciuszko National Park Plan of Management (KNPPOM) (DEC 2006), were recorded within the study area during the survey period and none are expected to occur there.

4.4 Impacts on fauna habitats

Whilst the study area provides known or potential habitat for a range of native fauna species, including threatened species, such as the Broad-toothed Rat, Olive Whistler, Gang-gang Cockatoo and Flame Robin, they would not be dependent upon the areas affected by the proposal nor adversely affected by the proposal. Similar habitats are widespread in adjacent areas, and elsewhere within the locality, and will continue to be available to these species.

The impacts associated with the proposal are limited to the removal of a very small amount of native vegetation (approximately 530 m²) and a few tree saplings. This comprises a very small proportion of the sheltering and foraging habitat available to these species in the areas immediately surrounding the study area, and the loss or modification of this habitat is not likely to adversely impact on fauna generally, or any threatened species.

The proposal will not affect any known Broad-toothed Rat nests or other important habitats. Whilst Broad-toothed Rat scats were observed within the study area, no major concentrations of scats or other evidence of nesting activity was detected. Evidence of Broad-toothed Rat is widespread in the locality, and it is unlikely that a minor development such as proposed, would impact adversely on any individual or local population of the species.

The proposal will not affect the Olive Whistler, Gang-gang Cockatoo or Flame Robin given the highly mobile nature of these species and the very small area of habitat affected relatively to the extent of similar habitat in the locality.

The proposal will not result in substantial modifications to the hydrological environment nor will it create barriers which prevent the movement and dispersal of fauna species. Similar developments have been undertaken over the years within and in areas immediately adjacent to the study area, and elsewhere within the NSW Alps, with negligible impacts on the hydrological environment and associated ecosystems.

Under these circumstances, the impacts of the proposal on fauna habitats are relatively minor and acceptable.

4.5 Threatened species likelihood of occurrence

As a result of database searches and field surveys, the threatened species and communities identified in **Table 3** are known or considered to have the potential to occur within the study area or immediate surrounds (**Appendix A**). The potential impact of the proposal on these species has been assessed (**Appendix C**) pursuant to relevant statutory assessments.

Table 3: Threatened species with the potential to be affected by the proposal

Scientific Name	Common Name	FM Act	TSC Act	EPBC Act	Occurrence
<i>Mastacomys fuscus</i>	Broad-toothed Rat	—	V	V	Known
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	—	V	—	Potential
<i>Petroica phoenicea</i>	Flame Robin	—	V	—	Potential
<i>Pachycephala olivacea</i>	Olive Whistler	—	V	—	Potential

V = Vulnerable, E = Endangered

4.6 Conclusion of Assessment of Significance

An assessment of significance under Section 5A of the EPA Act was undertaken for those threatened species known within the study area and immediate surrounds or with potential to occur there (**Table 2**). The outcome of the assessment was that it is highly unlikely that the proposal would significantly impact on those threatened entities assessed (**Appendix B**).

A Species Impact Statement is not required for the proposal.

Recommendations have been provided in Section 5 to further ameliorate the potential impacts of the proposal.

4.7 Conclusion of EPBC Act assessment

An application of the EPBC Act significant impact criteria was undertaken on threatened species known within the study area and immediate surrounds or with potential to occur there (**Table 2**).

The outcome of this assessment was that it is highly unlikely that the development would significantly impact on the threatened entities assessed (**Appendix C**). A referral to the Commonwealth under the EPBC Act is not necessary.

5 Recommendations

To further mitigate the potential impacts of the proposal, the following recommendations for impact mitigation and amelioration are suggested.

Vegetation and habitat management

1. All disturbance should be kept to the minimum required to achieve the proposal. In particular, excavation and any vegetation removal should be undertaken so as to minimize damage to surrounding vegetation and associated habitats.
2. As far as is possible, excavation and other activities should be undertaken from existing disturbed areas or within the proposed traverse footprint, so as to not extend the disturbance footprint beyond the proposed traverse.
3. Appropriate safeguards should be in place during the proposed works to limit the potential for invasive plants or pathogens, chemicals or any other pollutants to enter the environment in association with the action proposed.

Sediment control

4. Appropriate sediment control measures should be implemented prior to any construction work for the proposal and retained in place until exposed areas of soil or vegetation are stabilised and/or revegetated.

Rehabilitation

5. Rehabilitation activities should be consistent with the resort areas rehabilitation guidelines (NGH Environmental 2007).

6 Conclusion

This report describes the biological environment and assesses the potential effects on threatened and migratory species, endangered populations and ecological communities of a proposal to undertake upgrades to eight separate sections of the existing Kosciuszko Flow Trail at Thredbo Ski Resort.

The study area and immediate surrounds was found to support three vegetation communities in various condition states; Tall Alpine Heath, with and without Eucalypts, Subalpine Woodland, and Exotic Grassland. Impacts on native vegetation communities will primarily occur in the Tall Alpine Heath with and without Eucalypts and Subalpine Woodland vegetation communities with approximately 150 m² and 380 m² to be affected respectively.

No threatened flora species were recorded within the study area during the survey period and none are considered likely to occur there

Whilst the study area provides a small amount of known and potential habitat for threatened fauna species such as the Broad-toothed Rat, Olive Whistler, Gang-gang Cockatoo, and Flame Robin, similar habitats are extensive in contiguous areas. Under these circumstances, whilst the proposal will have some impacts on fauna habitats, these impacts are considered acceptable given their relatively minor nature, and in the context of the extensive areas of similar habitat that will continue to be available in contiguous areas. The proposal will not sever any linkages between habitats or otherwise permanently restrict fauna movement.

Following the application of the seven factors from Section 5A of the NSW *Environmental Planning and Assessment Act 1979*, as required by the NSW *Threatened Species Conservation Act 1995* and the NSW *Fisheries Management Act 1994*, in accordance with relevant assessment guidelines, it is concluded that the proposal is unlikely to have a significant effect on threatened species, endangered populations, ecological communities, or their habitats. A Species Impact Statement is not required for the proposal.

Following consideration of the administrative guidelines for determining significance under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999*, it is concluded that the proposal is unlikely to have a significant impact on matters of National Environmental Significance or Commonwealth land, and a referral to the Commonwealth Environment Minister is not necessary.

Notwithstanding the relatively minor impacts on vegetation and fauna habitats associated with the proposal, the impact mitigation measures described in Section 5 are also recommended to be incorporated into the proposal.

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Appendix A: Likelihood of occurrence

Summary of initial assessment to determine the likelihood of occurrence of threatened species, populations and ecological communities in the proposal site.

An assessment of likelihood of occurrence was made for threatened and migratory species identified from the database search. Additional flora species have been added where the study area is considered to provide potential habitat and additional fauna species that may inhabit the study area have also been included by correlating species habitat requirements with the existing environment. Five terms for the likelihood of occurrence of species are used in this report. This assessment was based on database or other records, presence or absence of suitable habitat, features of the study area, results of the field survey and professional judgement.

The terms for likelihood of occurrence are defined below:

“yes” = the species was or has been observed on the site

“likely” = a medium to high probability that a species uses the site

“potential” = suitable habitat for a species occurs on the site, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur

“unlikely” = a very low to low probability that a species uses the site

“no” = habitat on site and in the vicinity is unsuitable for the species.

Scientific name	Common name	FM Act	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
FLORA						
<i>Argyrotegium nitidulum</i> syn. <i>Euchiton nitidulus</i>	Shining Cudweed	-	V	V	A mat-forming silver-leaved perennial daisy growing in tall alpine herbfield or open heathland above or close to the treeline. The species is known in NSW only from the high alpine area in the vicinity of Mt Kosciuszko. The species was not observed within the study area despite good survey coverage. There is no suitable habitat for the species within the study area.	No
<i>Carex archeri</i>	Archer's Carex	-	E	-	This species is associated with alpine herbfield, sod tussock grassland or alpine heathland and is known in NSW only from the Club Lake and upper Thredbo River areas. There is no suitable habitat for the species within the study area.	No
<i>Carex raleighii</i>	Raleigh Sedge	-	E	-	This species is associated with alpine herbfield, sod tussock grassland or alpine heathland. There is no suitable habitat for the species within the study area.	No
<i>Glycine latrobeana</i>	Clover Glycine	-	CE	V	Clover Glycine is found across south-eastern Australia in native grasslands, dry sclerophyll forests, woodlands and low open woodlands with a grassy ground layer. There is no suitable habitat for the species within the study area.	No
<i>Haloragis exalata</i> subsp. <i>exalata</i>	Square Raspwort	-	-	V	The Square Raspwort appears to be a post-disturbance coloniser, based on observations of large numbers of plants on disturbed roadsides, cleared power-line easements, and recently burnt or flooded areas. The nearest populations are in the Geehi Valley. There is no suitable habitat for the species within the study area.	No
<i>Prasophyllum bagoense</i>	Bago Leek-orchid	-	E	CE	The Bago Leek-orchid is endemic to NSW, and is currently known from a single population at McPhersons Plain, east of Tumbarumba in the Southern Tablelands.	No

Scientific name	Common name	FM Act	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
<i>Pterostylis oreophila</i>	Blue-tongued Orchid	-	CE	CE	In New South Wales, the Blue-tongued Greenhood is known from a few small populations within Kosciuszko National Park and a population of about 40 plants (possibly now extinct) in Bago State Forest and adjoining Crown Leases south of Tumut. It grows along sub-alpine watercourses under more open thickets of Mountain Tea-tree in muddy ground very close to water. It less commonly grows in peaty soils and sphagnum mounds. It flowers from November to January. There is no suitable habitat for the species within the study area.	No
<i>Ranunculus anemoneus</i>	Anemone Buttercup	-	V	V	This perennial forb of the alpine and upper alpine zones tends to occur in areas where snow persists late into the warm season. The species is relatively common in the higher subalpine and alpine areas in the locality. This species was not observed within the study area despite good survey coverage.	No
<i>Rytidosperma pumilum</i>	Feldmark Grass	-	V	V	Feldmark Grass is limited to a tiny area of feldmark - about 3ha - of the Main Range of Kosciuszko National Park between Mt Northcote and Mt Lee.	No
<i>Rytidosperma vickeryae</i>	Perisher Wallaby Grass	-	E	-	This perennial grass is associated with treeless subalpine streamside vegetation and has been recorded from Perisher, Betts, and Spencers Creeks and tributaries, and Happy Jacks Plain. It is associated with bogs and sphagnum mounds. There is no suitable habitat for the species within the study area.	No
<i>Thesium australe</i>	Austral Toadflax	-	V	V	This species is semi-parasitic on roots of a range of grass species, mainly Kangaroo Grass.	No

Scientific name	Common name	FM Act	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
ENDANGERED ECOLOGICAL COMMUNITIES						
	Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps	-	EEC	-	The plant community characterizing this EEC is associated with accumulated peaty or organic-mineral sediments on poorly drained flats in the headwaters of streams. It occurs on undulating tablelands and plateaus, above 400-500 m elevation, generally in catchments with basic volcanic or fine-grained sedimentary substrates or, occasionally, granite.	No
	Alpine Sphagnum Bogs and Associated Fens	-	-	EEC	This EEC is typically found in alpine, subalpine and montane environments. It can usually be defined by the presence of sphagnum moss, even though it may sometimes only be a minor component. It is dominated by shrubs or species such as <i>Empodisma minus</i> and is found in permanently wet areas, such as along streams, valley edges, valley floors where soils are waterlogged.	No
	Natural Temperate Grassland of the Southern Tablelands (NSW and ACT)	-	CEEC	EEC	This community is associated with valleys influenced by cold air drainage and open plains in the Southern Tablelands. The vegetation communities within the study area do not comprise this community.	No
	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	-	EEC	EEC	Box Gum Woodland occurs where rainfall is between 400 and 1200 mm per annum, on moderate to highly fertile soils at altitudes of 170 m to 1200 m. It occurs in an arc along the western slopes and tablelands of the Great Dividing Range from Southern Queensland through NSW to central Victoria	No
	Snowy River Aquatic Ecological Community	EEC	-	-	The bed, banks, floodplains and associated vegetation of the Snowy River and all its tributaries potentially comprise part of this EEC.	No
	Disclaimer: Data extracted from the Atlas of NSW Wildlife and EPBC Act Protected Matters Report are only indicative and cannot be considered a comprehensive inventory.					
	CE = Critically Endangered; E = Endangered; EEC = Endangered Ecological Community; V = Vulnerable					

Scientific name	Common name	FM Act	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
FISH						
<i>Maccullochella peelii</i>	Murray Cod	-	-	V	The Murray Cod utilises a diverse range of habitats from clear rocky streams, such as those found in the upper western slopes of NSW (including the ACT), to slow-flowing, turbid lowland rivers and billabongs. There is no suitable habitat within the study area.	No
<i>Macquaria australasica</i>	Macquarie Perch	-	-	E	The Macquarie Perch is a riverine, schooling species. It prefers clear water and deep, rocky holes with lots of cover. As well as aquatic vegetation, additional cover may comprise of large boulders, debris and overhanging banks. Spawning occurs just above riffles (shallow running water). The Macquarie Perch was once widespread through the cooler upper reaches of the southern tributaries of the Murray-Darling river system in Victoria and New South Wales (Anonymous 1974; McDowall 1996), however its distribution did not usually extend to the sources of these rivers. There is no suitable habitat within the study area.	No
<i>Prototroctes maraena</i>	Australian Grayling	-	E	V	Currently, the Australian Grayling occurs in streams and rivers on the eastern and southern flanks of the Great Dividing Range, from Sydney, southwards to the Otway Ranges of Victoria and in Tasmania. The species is found in fresh and brackish waters of coastal lagoons, from Shoalhaven River in NSW to Ewan Ponds in South Australia. It is absent from the inland Murray-Darling system (DPI 2006; McDowall 1980b). There is no suitable habitat within the study area.	No

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
MAMMALS					
<i>Burramys parvus</i>	Mountain Pygmy-possum	E	E	This species lives only in the alpine and subalpine areas of the highest mountains of Victoria and NSW. It lives in rocky areas where boulders have accumulated below mountain peaks and is frequently associated with alpine heathlands dominated by Mountain Plum Pine. The nearest core habitats for the species are at Charlotte Pass. Given the absence of preferred sheltering or foraging habitat within the study area it is considered unlikely that the species would occur there.	Unlikely
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	The species prefers moist forest types and is often associated with escarpments. There is no denning habitat for the species within the study area and the potential foraging habitat within the study area would form only a small proportion of the home range of the species, which has been estimated at between 800 ha and 2000 ha.	Unlikely
<i>Mastacomys fuscus</i>	Broad-toothed Rat	V	V	This species occurs in two widely separated areas in NSW, the Barrington Tops area and the wet alpine and subalpine heaths and woodlands of the Kosciuszko NP and adjacent areas. The species lives in a complex of runways through dense vegetation of wet grass, sedge or heath and under the snow in winter. Evidence of the Broad-toothed rat activity was recorded in the study area and in areas adjoining areas.	Yes
<i>Petauroides volans</i>	Greater Glider	V	V	This species is associated with tall moist forests. It would not occur within the study area.	No
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E	V	This species prefers rocky habitats, including loose boulder-piles, rocky outcrops, steep rocky slopes, cliffs, gorges and isolated rock stacks. The nearest known population is more than 50 km southeast of the study area.	No

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
<i>Phascolarctos cinereus</i>	Koala	V	—	Associated with both wet and dry Eucalypt forest and woodland that contains a canopy cover of approximately 10 to 70% with acceptable <i>Eucalypt</i> food trees. It is highly unlikely that the species would ever occur in the study area and would not be resident there.	No
<i>Pseudomys fumeus</i>	Smoky Mouse	E	E	Occurs in heath on ridge tops and slopes in sclerophyll forests, heathland and open forest along the coast and inland to sub-alpine regions. Occasionally occurs in ferny gullies. It is considered highly unlikely that the species would occur within the study area or immediate surrounds give its rarity and the nature of the habitats there.	Unlikely
<i>Pteropus poliocephalus</i>	Grey-headed Flying-Fox	V	V	Inhabits a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and cultivated areas. Camps are often located in gullies, typically close to water, in vegetation with a dense canopy. There are no camps in the locality and the species would not occur within the study area.	No
AMPHIBIANS					
<i>Litoria spenceri</i>	Spotted Tree Frog	CE	E	The Spotted Tree Frog is associated with a range of vegetation communities from montane forest at high altitudes to wet and dry forest at moderate to low altitudes respectively. It occurs along sections of streams with steep banks, invariably in steeply dissected country or gorges with numerous rapids and waterfalls. It is restricted to riffle and cascade stream sections with exposed rock banks, resulting in a highly patchy distribution along most streams. Adults and juveniles most likely remain in the vicinity of the stream, rarely venturing far from the riparian zone. Tadpoles occur predominantly in slow-flowing sections of streams. There is no suitable habitat within the study area.	No

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
<i>Litoria raniformis</i>	Southern Bell Frog	E	V	This species is usually found in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys and in irrigated rice crops, particularly where there is no available natural habitat. There is no suitable habitat within the study area.	No
<i>Litoria verreauxii alpina</i>	Alpine Tree Frog	E	V	This species occurs in the alpine and subalpine zones of south-eastern NSW and Victoria. It is found in a wide variety of habitats including woodland, heath, grassland and herbfields. It breeds in natural and artificial wetlands including ponds, bogs, fens, streamside pools, dams and drainage channels that are still or slow flowing. The species has disappeared from much of its former range in the last 20 years and is restricted to a few breeding sites in murky ponds. There is no suitable breeding habitat for the species within the study area and it is highly unlikely that it would occur there.	Unlikely
<i>Pseudophryne corroboree</i>	Southern Corroboree Frog	E	E	The Southern Corroboree Frog is limited to sphagnum bogs of the northern Snowy Mountains, in a strip from the Maragle Range in the northwest, through Mt Jagungal to Smiggin Holes in the south. Its range is entirely within Kosciuszko National Park. This species is all but extinct in the wild. It is no longer present at its former southern limit at Smiggin Holes.	Unlikely

REPTILES

<i>Cyclodomorphus praealtus</i>	Alpine She-oak Skink	E	E	In NSW, the species is known from open alpine heath and tussock grassland within the Kosciuszko region, preferring treeless or lightly treed areas. The study area does not include any suitable habitat for this species and it is considered unlikely that it would occur there.	Unlikely
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Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
<i>Liopholis guthega</i>	Guthega Skink	-	E	This species is known from the Snowy Mountains and the Bogong High Plains and is associated with rocky areas in a range of alpine and subalpine vegetation communities. The species lives in extensive colonies associated with a deep burrow network that is constructed in eroded granite and humus soils beneath boulders and shrubs. The study area provides only a very small amount of marginal potential habitat for the species and no evidence of it occurring there was detected during the survey period.	Unlikely
BIRDS					
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	E, M	Associated with temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts, and riparian forests of River Oak (<i>Casuarina cunninghamiana</i>). The Regent Honeyeater primarily feeds on nectar from box and ironbark eucalypts and occasionally from banksias and mistletoes. As such it is reliant on locally abundant nectar sources with different flowering times to provide a reliable supply of nectar. The species would not occur within the study area.	No
<i>Botaurus poiciloptilus</i>	Australasian Bittern	V	E	This species favours permanent freshwater wetlands with tall, dense vegetation, particularly bulrushes and spikerushes. It hides during the day amongst dense reeds and feeds at night. It breeds during summer with nest built in secluded places in densely vegetated wetlands on a platform of reeds. There is no habitat for the species within the study area.	No
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	-	Gang-gang Cockatoos live as pairs inhabiting woodlands of south-eastern Australia. The species feeds primarily on the seeds of eucalypts and acacias and breeds in tree hollows. The species is typically associated with taller montane forests in the region but is sometimes observed foraging in Snow Gums and on the side of roads in the Perisher Resort Area. The species would fly over and is likely to forage there from time to time.	Likely

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	—	The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands, with a nearly continuous distribution in NSW from the coast to the far west. It inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and <i>Acacia</i> woodland. It is considered highly unlikely that the species would occur within the study area.	Unlikely
<i>Lathamus discolor</i>	Swift Parrot	E	CE	Breeds in Tasmania between September and January. Migrates to mainland in autumn, where it forages on profuse flowering Eucalypts. Hence, in this region, autumn and winter flowering eucalypts are important for this species. Favoured feed trees include winter flowering species such as Swamp Mahogany (<i>Eucalyptus robusta</i>), Spotted Gum (<i>Corymbia maculata</i>), Red Bloodwood (<i>C. gummifera</i>), Mugga Ironbark (<i>E. sideroxylon</i>), and White Box (<i>E. albens</i>). It is considered highly unlikely that the species would occur within the study area.	Unlikely
<i>Neophema chrysogaster</i>	Orange-bellied Parrot	E	CE, M	Breeds only in coastal south-west Tasmania and spends the winter in coastal Victoria and South Australia. It nests in hollows in eucalypt trees which grow adjacent to its feeding plains. In early October the birds arrive in the south west and depart after the breeding season usually in March and April. It feeds on the seeds of several sedges and heath plants, including buttongrass. Its main food preferences are found in sedgelands which have not been burned for between 3-15 years. Also included in the diet are seeds of three <i>Boronia</i> species and the everlasting daisy (<i>Helichrysum pumilum</i>). After breeding, migrating birds move gradually northwards up the west coast, through the Hunter Group and King Island in Bass Strait and on to the mainland. On the journey the birds usually feed on beach-front vegetation including salt tolerant species such as sea rocket (<i>Cakile maritima</i>). They also eat various coastal native and introduced grasses. There is no habitat for the species within the study area.	No

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
<i>Pachycephala olivacea</i>	Olive Whistler	V	-	This species is usually associated with moist tall forests at high elevations but has been occasionally recorded at lower altitudes. Breeding occurs above 300m within habitats providing both a thick understorey and moderate canopy. In the alps the species is more typically associated with subalpine woodlands with a heathy understorey. The species may occur within the lower parts of the study area from time to time and is common in similar habitats within the Thredbo Valley.	Potential
<i>Petroica rodinogaster</i>	Pink Robin	V	-	The Pink Robin is found in Tasmania and the uplands of eastern Victoria and far south-eastern NSW, almost as far north as Bombala. It inhabits rainforest and tall, open eucalypt forest, particularly in densely vegetated gullies. In the alps the species is more typically associated with subalpine woodlands with a heathy understorey and Montane Forests rather than alpine heaths. The species would not occur within the study area.	No
<i>Petroica boodang</i>	Scarlet Robin	V	-	This species is found in south-eastern Australia and south-west Western Australia. In NSW it occupies open forests and woodlands from the coast to the inland slopes. The Scarlet Robin breeds in drier eucalypt forests and temperate woodlands, often on ridges and slopes, within an open understorey of shrubs and grasses. Abundant logs and coarse woody debris are important structural components of its habitat. In autumn and winter it migrates to more open habitats such as grassy open woodland or paddocks with scattered trees. There is no suitable habitat for the species within the study area and it is considered unlikely that it would occur there.	Unlikely
<i>Petroica phoenicea</i>	Flame Robin	V	-	The Flame Robin is found in south-eastern Australia (Queensland border to Tasmania, western Victoria and south-east South Australia). In NSW it breeds in upland moist eucalypt forests and woodlands, often on ridges and slopes, in areas of open understorey. It migrates in winter to more open lowland habitats such as grassland with scattered trees and open woodland on the inland slopes and plains. The species is well known from the locality and would likely use the habitats within the study area from time to time for foraging.	Likely

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
MIGRATORY TERRESTRIAL AND WETLAND SPECIES LISTED UNDER EPBC ACT					
<i>Hirundapus caudacutus</i>	White-throated Needletail	—	M	Forages aerially over a variety of habitats usually over coastal and mountain areas, most likely with a preference for wooded areas. Has been observed roosting in dense foliage of canopy trees, and may seek refuge in tree hollows in inclement weather.	Unlikely
<i>Merops ornatus</i>	Rainbow Bee-eater	—	M	Resident in coastal and subcoastal northern Australia; regular breeding migrant in southern Australia, arriving September to October, departing February to March, some occasionally present April to May. Occurs in open country, chiefly at suitable breeding places in areas of sandy or loamy soil: sand-ridges, riverbanks, road-cuttings, sand-pits, occasionally coastal cliffs (ibid). Nest is a chamber at the end of a burrow, up to 1.6 m long, tunnelled in flat or sloping ground, sandy bank or cutting (ibid). The species would not occur within the study area.	No
<i>Monarcha melanopsis</i>	Black-faced Monarch	—	M	This migratory species is known to breed in damp forest types and forage in rainforest and eucalypt forest. The species would not occur within the study area.	No
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	—	M	This species inhabits lowland eucalypt forests. It is known to nest in dense gully vegetation. The species would not occur within the study area.	No
<i>Neophema chrysogaster</i>	Orange-bellied Parrot	E	E, M	SEE DIURNAL BIRDS ABOVE	No
<i>Rhipidura rufifrons</i>	Rufous Fantail	—	M	This migratory species forages by catching flying insects and is known to utilise the aerial foraging space above the dense understorey in damp forests or beside rivers. The species would not occur within the study area.	No
<i>Xanthomyza phrygia</i>	Regent Honeyeater	E	E, M	SEE DIURNAL BIRDS ABOVE	Unlikely
<i>Gallinago hardwickii</i>	Latham's Snipe	E	M	Resides in swamps, dams and nearby marshy areas that contain grasses, lignum, low scrub or open timber that provides cover. It is considered highly unlikely that the species would occur within the study area.	Unlikely

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
<i>Motacilla flava</i>	Yellow Wagtail	—	M	Frequents open wetlands along the bare shores of freshwater swamps, crops and bare bore drains, as well as short-grassed fields and rocky coasts. It is considered highly unlikely that the species would occur within the study area.	Unlikely

Disclaimer: Data extracted from the Atlas of NSW Wildlife and EPBC Act Protected Matters Report are only indicative and cannot be considered a comprehensive inventory. 'Migratory marine species' and 'listed marine species' listed on the EPBC Act (and listed on the DEW protected matters report) have not been included in this table, since they are considered unlikely to occur within the study area due to the absence of marine and wetland habitats.

CE = Critically Endangered; E = Endangered; V = Vulnerable; M = Migratory

Appendix B: Flora list

Scientific name	Common name
<i>Acacia obliquinervia</i>	Mountain Hickory
<i>Acaena novae-zelandiae</i>	Bidgee-widgee
<i>Acetosella vulgaris</i> *	Sheep Sorrel
<i>Achillea millefolium</i> *	Yarrow
<i>Anthoxanthum odoratum</i> *	Sweet Vernal Grass
<i>Agrostis capillaris</i> *	Browntop Bent
<i>Asperula conferta</i>	Common Woodruff
<i>Asperula gunnii</i>	Mountain Woodruff
<i>Bossiaea foliosa</i>	Leafy Bossiaea
<i>Celmisia pugioniformis</i>	
<i>Coronidium monticola</i>	
<i>Dianella tasmanica</i>	Tasman Flax-lily
<i>Eucalyptus niphophila</i>	Snow Gum
<i>Eucalyptus pauciflorus</i>	Snow Gum
<i>Eucalyptus stellulata</i>	Black Sallee
<i>Festuca rubra</i> *	Red Fescue
<i>Geranium potentilloides</i> var. <i>potentilloides</i>	
<i>Hovea montana</i>	Alpine Hovea
<i>Hypochaeris radicata</i> *	Flatweed
<i>Leptorhynchos squamatus</i>	Scaly Buttons
<i>Microseris lanceolata</i>	Murnong
<i>Nematolepis ovatifolia</i>	
<i>Olearia phlogopappa</i>	Dusty Daisy-bush
<i>Oxylobium ellipticum</i>	Common Shaggy Pea
<i>Ozothamnus alpinus</i>	Alpine Everlasting
<i>Ozothamnus secundiflorus</i>	Cascade Everlasting
<i>Pimelea alpina</i>	
<i>Pimelea ligustrina</i> subsp. <i>ciliata</i>	Kosciuszko Rose
<i>Poa ensiformis</i>	Purple-sheathed Tussock-grass
<i>Poa helmsii</i>	Broad-leaved Snowgrass
<i>Poa fawcettiae</i>	Smooth Blue Snowgrass

Scientific name	Common name
<i>Polystichum proliferum</i>	Mother Shield-fern
<i>Rubus rosifolius</i>	Native Raspberry
<i>Senecio gunnii</i>	
<i>Stellaria pungens</i>	Prickly Starwort
<i>Taraxacum officinale</i> *	Dandelion
<i>Tasmannia xerophila</i>	Alpine Pepperbush
<i>Trifolium</i> sp.*	A clover

* = denotes introduced species

Appendix C: Assessment of significance

EP&A ACT ASSESSMENT OF SIGNIFICANCE (7-PART TEST)

An assessment of the effects of the proposal on threatened species, populations and ecological communities, may be carried out by applying the seven factors from Section 5A of the amended NSW *Environmental Planning and Assessment Act 1979* in accordance with gazetted assessment guidelines to each identified threatened species, population and ecological community.

This assessment of significance is presented below for the threatened fauna species:

- *Mastacomys fuscus* (Broad-toothed Rat)
- *Callocephalon fimbriatum* (Gang-gang Cockatoo)
- *Petroica phoenicea* (Flame Robin)
- *Pachycephala olivacea* (Olive Whistler).

The commonwealth significant impact criteria have been applied to:

- *Mastacomys fuscus* (Broad-toothed Rat).

Part a)

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

Schedule 2 Vulnerable Species

Fauna

Broad-toothed Rat *Mastacomys fuscus* (known occurrence).

The Broad-toothed Rat generally occurs in two widely separated areas in NSW, the Barrington Tops area and the wet alpine and subalpine heaths and woodlands of the Kosciuszko NP and adjacent areas. The species lives in a complex of runways through dense vegetation of wet grass, sedge or heath and under the snow in winter. Home range size is thought to range between approximately 0.1 ha and 0.27 ha. Individuals nest alone over summer but congregate in communal nests during winter. The species is thought to be locally common in the alpine and high subalpine tracts of the Snowy Mountains area (Green 2002), where suitable habitats are present.

Evidence of the species, in the form of small numbers of occur within the study area and surrounds. Whilst the upper parts of the study area provides some known habitat for the species, no major concentrations of scats or other evidence of nesting activity was detected.

The action proposed will affect some known and potential habitat for the species, however, it will affect only a very small amount of the potential habitat for the species in the Thredbo Resort area. The action proposed will not affect any key resources for the species, and the habitats immediately adjoining the study area will continue to be available to the species after the implementation of the action proposed. As such, the action proposed is unlikely to adversely affect a significant proportion of the home range of one or more Broad-toothed Rat individuals.

The action proposed will not result in habitat fragmentation which could isolate individuals or a population of the Broad-toothed Rat.

Under these circumstances, the action proposed is considered unlikely to disrupt the life cycle of the Broad-toothed Rat such that a viable local population is likely to be placed at risk of extinction.

Gang-gang Cockatoo *Callocephalon fimbriatum* (Likely occurrence).

In New South Wales, the Gang-gang Cockatoo is distributed from the south-east coast to the Hunter region, and inland to the central and southern tablelands and south-west slopes. In summer, this species is generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, the Gang-gang Cockatoo may occur at lower altitudes in drier more open eucalypt forests and woodlands, and is often found in urban areas. It may also occur in sub-alpine Snow Gum woodland and occasionally in temperate rainforests (DECC 2005).

The species is regularly observed at Thredbo and in montane and subalpine areas in the region. Whilst the species may forage within the study area, it would not breed there given the absence of suitable nesting habitat. Given the extensive forests within the locality, breeding and roosting habitat is likely to be relatively abundant. The study area provides a very small area of suitable foraging resources for the species. The foraging resources (generally eucalypt trees) to be removed in association with the action proposed would not be important for the species, given the extent of foraging resources in the Thredbo Resort area.

Under these circumstances, the action proposed will not disrupt the life cycle of the Gang-gang Cockatoo such that a viable local population of the species is likely to be placed at risk of extinction.

Flame Robin *Petroica phoenicea* (Likely occurrence).

The Flame Robin is found in south-eastern Australia (Queensland border to Tasmania, western Victoria and south-east South Australia). In NSW it breeds in upland moist eucalypt forests and woodlands, often on ridges and slopes, in areas of open understorey. It migrates in winter to more open lowland habitats such as grassland with scattered trees and open woodland on the inland slopes and plains. There are numerous records of the species throughout the NSW Alps. It is well known from the Thredbo Resort area and is one of the most common birds of open habitats outside of the winter period.

The proposal will affect a very small amount of potential nesting and foraging habitat for the species. This is negligible in the context of the extensive areas of similar habitat within the Thredbo Resort area that will not be affected by the action proposed and which will continue to be available to the species. The species is not sedentary and undertakes substantial seasonal migrations, reducing the species dependence on any specific area of known or potential habitat.

Under these circumstances, the action proposed is unlikely to disrupt the life cycle of the Flame Robin such that a viable local population of the species is likely to be placed at risk of extinction.

Olive Whistler *Pachycephala olivacea* (known occurrence).

The Olive Whistler is found in south-eastern Australia (Queensland border to Tasmania, western Victoria and south-east South Australia). In the NSW Alps, it is associated with areas of tall dense heath, particularly riparian Tea-tree scrubs. It breeds in the thick understorey of moist eucalypt forests and subalpine woodlands. It migrates in winter to lowland habitats. There are numerous records of the species throughout the NSW Alps including within the Thredbo Resort area where it is considered a common resident. The Thredbo Valley population is considered to be contiguous with other populations to the north and south (MGP 1996). The species was not recorded within the study area during the survey period however it is likely to occur there from time to time.

The action proposed will result in the loss of a very small amount of potential foraging habitat for the Olive Whistler, where the proposed trails traverse the Subalpine Woodland in the lower parts of the study area. The species would not breed in the habitats to be affected.

Whilst the proposal will affect a small area of potential foraging habitat for the species, the habitat to be removed or modified is very small relative to the extensive areas of similar habitat which occur immediately beyond the study area. Extensive areas of potential habitat for the species are contiguous with the study area in the extensive Subalpine Woodlands within the Thredbo Valley and the Subalpine Riparian Scrubs which occur along creeks within the Thredbo Valley.

Under these circumstances, it is considered unlikely that the action proposed would affect the life cycle of the Olive Whistler such that a viable local population of the species is likely to be placed at risk of extinction.

Part b)

In the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

There are no endangered populations within the study area.

Part c)

In the case of an endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

The action proposed will not affect any endangered ecological communities.

Part d)

In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

i. Effects on Extent of Habitat

Flora

The action proposed will not affect any known habitat for threatened flora.

Mammals

The action proposed will impact on only a very small area of known habitat for the Broad-toothed Rat. The action proposed will not affect any known Broad-toothed Rat communal nesting or likely breeding sites.

Birds

The action proposed will result in the modification of a very small amount of potential foraging and breeding habitat for the Flame Robin, and only a very small amount of potential foraging habitat for the Gang-gang Cockatoo and Olive Whistler.

Endangered Populations

There are no endangered populations within the study area.

Endangered Ecological Communities

There are no endangered ecological communities within the study area.

ii. Effects on Habitat Connectivity

The action proposed involves the removal of a very small amount of vegetation predominately on the edges of existing ski runs. Therefore, it is highly unlikely that the action proposed will result in any adverse impacts on habitat connectivity for threatened fauna species, the majority of those who could use the habitats within the study area are highly mobile species capable of flying.

iii. Importance of Habitat to be Affected

Threatened Species

Flora

The action proposed will not affect any known threatened flora habitats.

Fauna

The Broad-toothed Rat habitats to be affected comprise a small area relative to the extensive areas of similar habitats provided by the heaths and other vegetation contiguous with the study area. Whilst evidence of the Broad-toothed Rat was observed in the upper parts of the study area, this is very typical of the extensive heaths in the subalpine and alpine areas within the Thredbo Resort area and elsewhere within the Australian Alps. No evidence of any important communal nesting sites was observed within the study area.

Under these circumstances, the habitats to be affected are not considered to be particularly important for Broad-toothed Rat.

In the context of the extent of similar habitat available for the Gang-gang Cockatoo, Olive Whistler and Flame Robin in the Thredbo Resort area and elsewhere in the locality, the habitats within the study area are not considered to be important.

Endangered Populations

There are no endangered populations within the study area.

Endangered Ecological Communities

There are no endangered ecological communities within the study area.

Part e)

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

The action proposed will not affect any critical habitat.

Part f)

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

Recovery Plans

Recovery plans have not been prepared for the Gang-gang Cockatoo, Flame Robin or Olive Whistler.

A draft recovery plan has been prepared for the Broad-toothed Rat. The action proposed, in avoiding disturbances to the primary habitats for the species, is consistent with the objectives and actions of this recovery plan.

Threat Abatement Plans

Threat abatement plans have not been prepared for the key threatening process *Clearing of native vegetation* is involved with the action proposed.

Part g)

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The action proposed involves the key threatening process *Clearing of native vegetation*.

Clearing of native vegetation

Whilst the proposal will result in the removal of approximately 530 m² of native vegetation and habitat for threatened species, the vegetation communities and habitat to be affected are widespread within the locality and well protected within Kosciuszko National Park. Under these circumstances, any increase in the impact of the key threatening process *Clearing of native vegetation* associated with the action proposed is minor and will not result in a substantial increase in the key threatening process *Clearing of native vegetation*. Notwithstanding this conclusion, the action proposed includes revegetation actions to offset the vegetation to be cleared.

EPBC ACT SIGNIFICANT IMPACT CRITERIA

The EPBC Act Administrative Guidelines on Significance set out ‘**Significant Impact Criteria**’ that are to be used to assist in determining whether a proposed action is likely to have a significant impact on matters of national environmental significance. Matters listed under the EPBC Act as being of national environmental significance include:

- Listed threatened species and ecological communities;
- Listed migratory species;
- Wetlands of International Importance;
- The Commonwealth marine environment;
- World Heritage properties;
- National Heritage places;
- Nuclear actions; and
- Great Barrier Reef.

Specific ‘**Significant Impact Criteria**’ are provided for each matter of national environmental significance except for threatened species and ecological communities in which case separate criteria are provided for species listed as endangered and vulnerable under the EPBC Act.

Threatened and migratory species listed under the EPBC Act that are considered likely or potentially to occur within the study area are given in **Appendix A** of the Report. The sole Commonwealth listed species which is considered to have the potential to occur within the study area is the Broad-toothed Rat.

The relevant Significant Impact Criteria have been applied to determine the significance of impacts associated with the proposal.

Matters to be addressed	Impact
(a) any environmental impact on a World Heritage Property or National Heritage Places;	No. The proposal does not impact on a World Heritage Property or a National Heritage Place as addressed in the SEE. (listed natural: Australian Alpine National Parks and Reserves; nominated historic: Snowy Mountains Scheme NSW).
(b) any environmental impact on Wetlands of International Importance;	No. The proposal will not affect any part of Ramsar wetland.
(c) any impact on Commonwealth Listed Critically Endangered or Endangered Species;	No. The study area does provide potential habitat for any Commonwealth listed endangered species.

Matters to be addressed	Impact
<p>(d) any impact on Commonwealth Listed vulnerable Species;</p>	<p>Yes. The study area provides known and potential habitat for one Commonwealth listed vulnerable species the Broad-toothed Rat.</p> <p>The significant impact criteria in terms of the vulnerable species are discussed below:</p> <p><i>a. lead to a long-term decrease in the size of an important population of a species.</i></p> <p>The proposal will affect some known and potential habitat for the species, however, it will affect only a very small amount of the potential habitat for the species in the Thredbo Resort area. The action proposed will not affect any key resources for the species, and the habitats immediately adjoining the study area will continue to be available to the species after the implementation of the action proposed. As such, the action proposed is unlikely to adversely affect a significant proportion of the home range of one or more Broad-toothed Rat individuals. The species is common in the Thredbo Resort area.</p> <p>Under these circumstances the proposal will not lead to a long-term decrease in the size of an important population of the Broad-toothed Rat.</p> <p><i>b. reduce the area of occupancy of an important population</i></p> <p>The proposal will affect only a very small amount of habitat for the Broad-toothed Rat, which is negligible in the context of the extent of habitat for the species within the Thredbo Resort area and elsewhere in Kosciuszko National Park.</p> <p><i>c. fragment an existing important population into two or more populations</i></p> <p>The habitat to be affected by the proposal is too small to fragment an existing important population of Broad-toothed Rat into two or more populations.</p> <p><i>d. adversely affect habitat critical to the survival of a species</i></p> <p>No habitat within the study area is considered to be critical to the survival of the Broad-toothed Rat.</p> <p><i>e. disrupt the breeding cycle of an important population</i></p> <p>The proposal is too small to disrupt the breeding cycle of a population of Broad-toothed Rat.</p> <p><i>f. modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</i></p> <p>The proposal will not modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the Broad-toothed Rat is likely to decline.</p> <p><i>g. result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</i></p> <p>The proposal will not result in invasive species that are harmful becoming established in habitat for the Broad-toothed Rat.</p> <p><i>h. interferes substantially with the recovery of the species.</i></p>

Matters to be addressed	Impact
	The Broad-toothed Rat is thought to be locally common in the alpine and high subalpine tracts of the Snowy Mountains area (Green 2002), where suitable habitats are present, and appears to still be very common in the Thredbo Resort Area. The impacts associated with the proposal will not interfere with the recovery of the species.
(e) Any impact on a Commonwealth Endangered Ecological Community	No: The study area does not support any endangered ecological communities.
(f) any environmental impact on Commonwealth Listed Migratory Species;	No. The proposal will not have any adverse impacts on any listed migratory species.
(g) does any part of the Proposal involve a Nuclear Action;	No. The project does not include a Nuclear Action.
(h) any environmental impact on a Commonwealth Marine Area;	No. There are no Commonwealth Marine Areas within the study area.
(i) In addition, any direct or indirect impact on Commonwealth lands	No. The project does not directly or indirectly affect Commonwealth land.

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